Napranum

Aboriginal Shire Council

Drinking Water Quality Management Plan

April 2022

Napranum Aboriginal Shire Council

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Document History and Status

Revision	Date	Reviewed by	Initials	Details
1	-	-	-	For review
2	-	-	-	For review incorporating reviewers comments
3	-	-	-	Incorporating preliminary comments from OWSR
4	-	-	-	Board approval for submission to OWSR
5	06/09/18	Stephen Turner	S.T	DWQMP updated as a fresh re-write following review undertaken in July 2018, facilitated by Viridis Consultants.
6	2/03/20	Stephen Turner	S.T.	Review facilitated by Viridis Consultants. Draft for NASC approval.
7	2/9/20	Stephen Turner	S.T.	Modified for response to DNRME information request
8	28/10/20	Scott Prenzler	SP (Viridis)	Error corrected in Table 20.
9	28/02/22	Brandon Nona Tasleem Hasan Senior Leaders Team	BN TH SLT	Reviewed and updated as part of the regular DWQMP review process.
10	20/04/22	Brandon Nona Tasleem Hasan	BN TH	Section 6.3 updated to expand on the list of SOPs as requested by the regulator.

Document Owner	Manager Operations Division
Name of document	Drinking Water Quality Management Plan
Document version	10

1. Registered Service Details

Criteria

The Plan must contain information on the registered service, including the:

- service provider identification number (SPID)
- service provider name and contact details – if the service provider is not the operator, then the operator's name and contact details must also be provided
- name of each scheme to which the Plan applies
- name of the communities that are supplied including the current and future (next 10 years) populations, connections and demands.

The registered service details are included in Table 1.

Table 1 Registered Service Details

Service description	Details
Service Provider Identification Number (SPID)	144
Council Name and Contact Details	**Napranum Aboriginal Shire Council** PO Box 538 Weipa QLD 4784 ABN: 43 593 215 992 Phone: 07 4090 5600 E-mail (general): reception@napranum.qld.gov.au E-mail (CEO): Janelle.Menzies@napranum.qld.gov.au E-mail (ESS): brandon.nona@napranum.qld.gov.au Website: www.napranum.qld.gov.au
Drinking Water Scheme operated	Napranum
Communities serviced	Napranum
Current population*	957
Current connections	255
Current demand ML/day (average)	2.6
Projected population (2026)**	1062
Future connections (2028)***	300
Future demand (2028) ML/day (average)	3.6
Projected population (2031)**	1087

* Population estimates based off the 2016 Census results, still applicable for the 2022 DWQMP review.

** Projected population (medium series), by local government area, Queensland Government, 2016 to 2041

***Based on 2016 Census population growth projections of an average annual growth rate of 14.3%, published by The Australian Bureau of Statistics, *Estimated Resident Population, Local Government Areas, Queensland,* 28 July 2017, Canberra

2. Introduction

This Drinking Water Quality Management Plan (DWQMP) documents Napranum Aboriginal Shire Council's (NASC) risk assessment and risk management process and provides a basis on which to maintain (and improve) the safety of the Napranum water supply scheme. The plan describes the current practice and is a 'living' document.

The DWQMP has been developed to meet the requirements of the *Water Supply (Safety and Reliability) Act 2008* (the Act). The structure and content of this plan was based on the *Guidance Notes and Template for Drinking Water Service Providers Draft* (DERM 2011) and the 2010 version of the *Queensland Drinking Water Quality Management Plan Guideline* (the Guideline). This version of the plan has been updated following the November 2018 version of the Guideline.

This plan contains or references the relevant documentation which underpins the drinking water quality management for the Napranum water supply scheme. The following documents make up the DWQMP:

- Main DWQMP Document (this document)
- Risk Register and Risk Management Improvement Plan (RMIP) (Excel Spreadsheet)
- Standard Operating Procedures (SOPs) (separate documents)

2.1. Napranum Aboriginal Council

The NASC area is approximately 1,995 km^2 from Brisbane, located north-east and north-west of Weipa, on the Cape York Peninsula. The Napranum township is approximately 12km south-east of Weipa and 760 km north-west of Cairns, see Figure 1.

2.2. Scope

This DWQMP applies to the drinking water service provided by NASC which includes all aspects of their potable water service from catchment to tap. It does not include the sewerage treatment system; nor does it include any non-potable water supply schemes that may be present in the Napranum Shire.

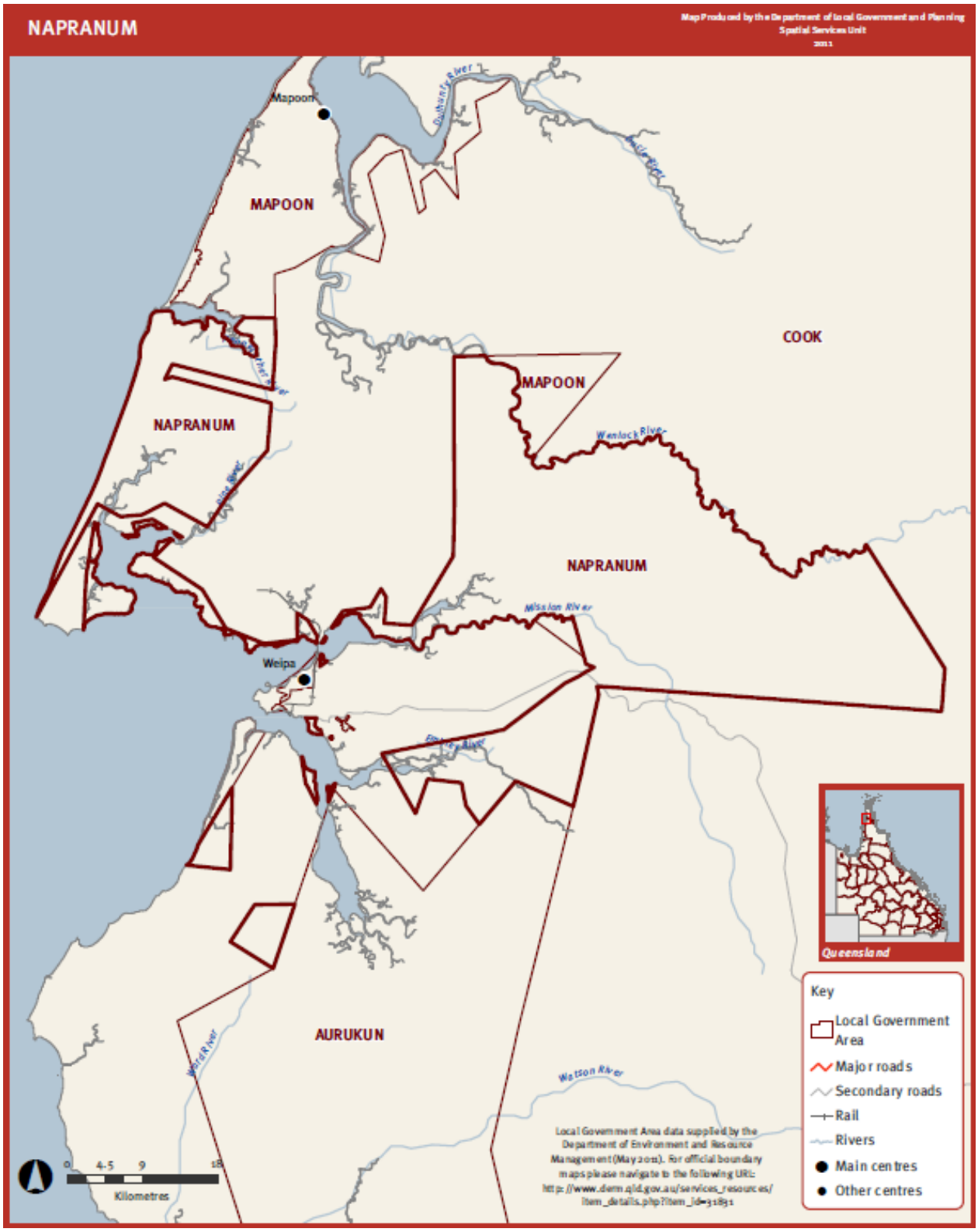

Figure 1 NASC Boundary

3. Details of Infrastructure for Providing the Service

Criteria

The Plan must describe the details of the infrastructure for each scheme including the following:

- A schematic layout for each scheme must be included in the plan and must:
  - be representative of the scheme as at the date of the submission of the plan
  - include all components of the scheme from catchment to consumer (even when a bulk supplier exists upstream of the distributor)
  - show the linkages between the major infrastructure elements including sources, treatment plants, reservoirs, pump stations and re-chlorination facilities
  - include the locations of changes in infrastructure ownership and operational responsibility
- Source details for each scheme must be provided in the plan. These details must contain information on the:
  - water source(s) including
    - name
    - characteristics
    - performance
  - Source infrastructure
- Treatment process details for each drinking water source must be provided in the plan. These details must contain information on:
  - the process steps
  - the relationship between each step design capacity
  - operation
  - current loading
  - availability of stand-by equipment
  - proportion of flow from each source
  - proportion of scheme supply distribution area
  - a list of chemicals (if added).
- A description of any variations to process operation (for example, bypassing a process step) must be included in the plan.
- A schematic(s) representing the treatment process(es) must be included in the plan.
- Any sources that do not undergo a treatment process must be identified and an explanation as to why no treatment process exists must be included in the plan.
- Disinfection process(es) for each drinking water source must be provided in the plan. These details must include:
  - location
  - type
  - operation.

Any sources that do not undergo a disinfection process must be identified and an explanation as to why no disinfection process exists must be included in the plan.

- Details of the distribution and reticulation system must be included in the plan. These must include the:
  - extent
  - characteristics
  - operation.

- Key stakeholders, who have been actively involved in the management of drinking water quality, and their relevance, must be identified for each scheme and detailed in the plan

3.1. Catchment Characteristics

Criteria

The catchment characteristics for each system's water source must be documented in the Plan. This includes a description of:

- catchment area or groundwater recharge area
- topography
- main geological features
- climatic features
- land use.

The NASC Local Government area is situated in a coastal area of western Cape York in far north Queensland approximately 5 km south of Weipa.

Water is sourced from a shallow aquifer in the Embley River catchment that drains through bauxite. The aquifer details are not well known. However, it is accepted that the aquifer has rapid connectivity to the surface, and there is a potential for surface contamination. Bore water levels have been observed to increase within 2 days of heavy rainfall. There has been no observed change in water quality with visual inspections. The bores currently extract water from 18 metres depth, and water levels range from 5 metres under the surface (wet season) down to 13 metres (2013 prior to the commence of the wet – a very dry season). The bores consistently produce water at the flow rates identified and are considered to be very reliable. See Figure 1 for NASC location details.

Table 2 Catchment characteristics

Characteristics	Details
Area	Unknown (aquifer)
Topography	Mostly flat and swampy surrounding Napranum - hills rise to the east of the catchment
Soil type	Bauxite
Annual rainfall	2000 mm predominantly in Nov – March (wet season)
Incidence of flooding and bushfires	Does not affect water quality in the bores
Land use	Residential and mining.
Agriculture, industry, mining	Bauxite mining
Potential sources of microbial and chemical contamination in the catchment	Sewerage infiltration is possible following a major rainfall event after dry.

3.2. Source

The bulk water supply for Napranum is primarily drawn from two bores (M1 and M2) installed in the late 1960s and located within the water yard. A third bore (M3), located between the Land and Sea Rangers base and the tennis courts, was drilled in 1998 to supplement the

community's water supply. This bore is now unused and disconnected. Table 3 contains the details of the current bores.

Table 3 Current Bore details

	Bore 1 (M1)	**Bore 2 (M2)**
Location	Water Yard NRW bore no. M1	Water Yard NRW bore no. M2
Operation	Bore pumps are used to deliver water to the treatment area. Two bores are operated on an alternate basis, usually with one supplying (duty) and the other on standby. If one bore cannot keep up with demand, the other bore will come online.	
Aquifer type	Unconfined	Unconfined
Yield	1.5 ML/day	0.95 ML/day
% of supply	50%	50%
Reliability	Excellent, no issues in the past	Excellent, no issues in the past
Pump type	Grundfos 60.4	
Capacity	17 L/s	11 L/s
Bore depth (m)	19 m	19 m
Bore head details	Elevated, no ingress, capped	Elevated, no ingress, capped
Diameter, casing and material	PVC	PVC
Water quality issues	Low pH (4.8 to 6)	Low pH (4.8 to 6)

3.3. Supply Infrastructure

The Napranum water supply scheme currently consists of two bores, a water treatment plant, one reservoir and the reticulation, along with appropriate dosing, pumps and monitoring. Council is currently undertaking upgrades of the reticulation. See Figure 2 for a supply system overview process flow diagram.

3.3.1. Treatment and Reservoirs

Low pH water from both bores (either separately or together) is pumped through a single pipe to an aerator / calcite (lime) pH adjustment plant. Water enters the top and flows down through 9 plates that allow aeration, before passing through a calcite/lime bed. If the resulting pH becomes too high (>8, which has not been an issue of late) then there can be blending with raw water to achieve a pH of 6.5 to 7.2. The mixing ratio is set manually if required to achieve the required pH. An SOP for this has been identified to be developed (part of the Improvement Plan).

Following pH adjustment, water is dosed with chlorine gas for disinfection. Investigating a backup disinfection supply, in instances where the chlorine gas dosing is not operational, has been identified in the Improvement Plan. pH adjustment is detailed in Table 4 below.

Table 4 pH Adjustment details

Location	Immediately after the supply bores, prior to entering the ground level reservoir. Feed from both bores combines before treatment.
pH adjustment plant	Aeration and calcite/lime contact are undertaken to raise pH. Water enters the top and flows down through 9 plates that allow aeration, before passing through a calcite/lime bed.
pH adjustment chemicals	Calcite/Lime
pH adjustment design capacity	Pumps 60 L/s
Chemicals added, storage and turnover	Three pallets of lime (3 month supply)
Inspection schedule	Routine visual check, three monthly maintenance
Bypass / variation	Yes, can by-pass. Not used.

Disinfection pumps are operated automatically (via SCADA) when required. Disinfected water flows into the ground level tank. C.*t* calculations for Napranum were undertaken, which indicate that at a free chlorine of at least 0.2 mg/L at the reservoir will provide sufficient chlorine contact time, to ensure primary kill is achieved. However, the target needs to be maintained higher than this to ensure adequate chlorine in the network.

Treatment details are in Table 5.

Table 5 Treatment details

Location	At water treatment plant (chlorine shed) prior to reservoirs
Disinfection Type	The disinfection system was upgraded to chlorine gas in 2014. Injection on the outlet side of pH correction, prior to ground level tank
Chlorine dose rate	Fixed – pumps start and stop when high flow pumps to pH adjustment plant start up
Free chlorine target residual level	At least 0.7 mg/L leaving the reservoir. The aim is for a residual of 0.5 mg/L free chlorine at the end of the reticulation network at the monitoring sites around town.
Duty / standby	Yes, duty/standby gas bottles, with auto switch over when required.
Dosing arrangement	Fixed dose rate via SCADA
Alarms	SCADA system is alarmed and sends notifications
Chemicals added, storage and turnover	Chlorine gas is stored in cylinders, stored on scales and connected to SCADA. Spare cylinders are currently kept in a dedicated storage facility in the water yard.
Inspection schedule	Daily visual operational monitoring, visual inspection of equipment and SCADA alarms

Both bores combine to supply water to the reservoir simultaneously. The ground level reservoir feeds into a common main which feeds the reticulation, via the 5 variable speed pumps. Table 6 details the ground level reservoir. There is an elevated reservoir which was used in the past, however this is disconnected and unused.

Table 6 Reservoir details

Capacity	1 ML
Location	At the Water Yard or Compound/Depot Shed Construction date unknown
Type	19.1 m diameter, abetong concrete ground level. Epoxy coated inside.
Roofed	Yes
Vermin-proof	Yes
Runoff from roof	Directed away, opening on top has raised lip which is securely covered.
Cleaning schedule	To be developed, part of the Improvement Plan.
Filling	Bore pumps are triggered by a float valve. Usually kept close to full. E.g. when reservoir is 4/5 capacity, bores commence pumping.

Figure 2 below details the NASC supply scheme.

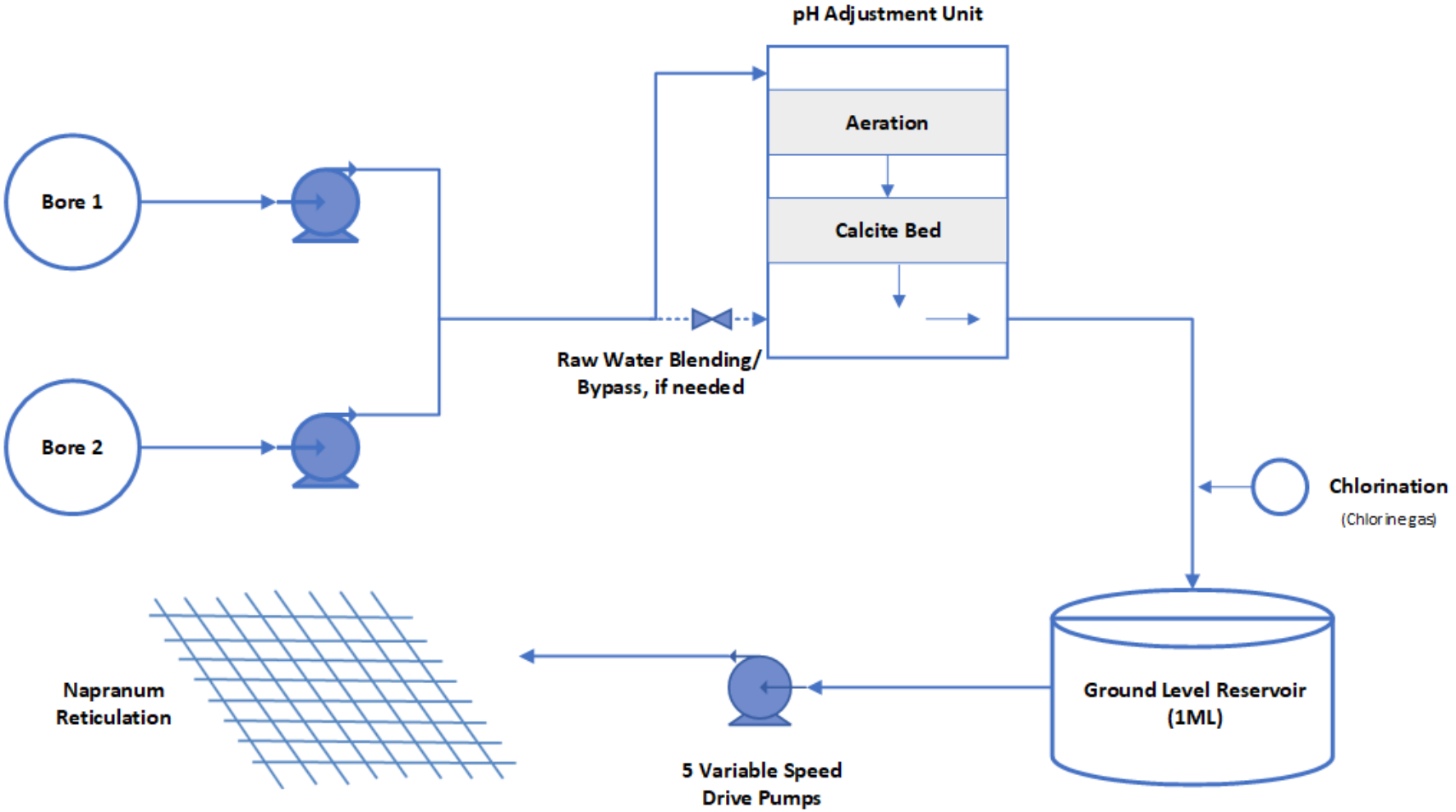

Figure 2 NASC Water Supply Overview

Figure 3 NASC Water Supply Layout

3.4. Distribution or reticulation

Five pumps supply the Napranum community reticulation network from the ground level reservoir. Details are in Table 7. A network pressure reduction program was completed in 2019 to reduce system losses.

Table 7 Reticulation network details

Pipe material(s)	Reticulation is thought to have been mostly replaced with uPVC, however, the replacement has been ad hoc, it is not suspected that cast iron mains are remaining.
Age range	Uncertain – 1960s onwards
Length of mains	8.5 km
Issues with long detection and dead ends	3 dead ends – Tavern (low point), Twal St (high point), Koutinee Ct
High pressure issues	Network pressure reduction program has reduced leakages. Operated at 240 kPa (pressure reducing valves in several locations)
Low pressure issues	No
Number of pump stations	Five pumps (variable speed drive)
Flushing	Monthly (or based on chlorine residual in the network or dead ends / incident response)

3.5. Key stakeholders

Table 8 details the key stakeholders of the Napranum supply scheme.

Table 8 NASC Key Stakeholders

Organisation	Contact details	Relevance to the management of drinking water quality	How the stakeholder is engaged in the DWQMP
Napranum community	-	Consumers or customers	Informed of water quality issues and initiates an investigation, if required, with an appropriate response.
Coogee chemicals	T: 07 3907 0400	Chemical supplier and service agent	Arrangement with Pumps & Irrigation (Mareeba)
Ergon	T: 1800 7076 633	Pumping water from bore fields	Maintaining continuity of power
Elite Chemicals (Cairns)	Glen Taylor 07 3893 7500	Hypochlorite supplier – not at this stage	Not directly at this stage, in future when hypo is considered again as contingency.
Ixom (Melbourne)	Stephanie Quattrocelli 03 9906 3274	Chlorine gas supplier	Arranging stock and supplier of chemicals required, quality of chemicals directly affects quality of drinking water supply

Organisation	Contact details	Relevance to the management of drinking water quality	How the stakeholder is engaged in the DWQMP
Aquapure Construction Pty Ltd (Brisbane)	Cyril Roots 07 3375 5307	Calcite supplier (pH correction)	Arranging stock and supplier of chemicals required, quality of chemicals directly affects quality of drinking water supply
Queensland Water Supply Regulator	T: 1300 596 709	Regulator	Consulted during development of DWQMP, water quality incidents reported to QWSR
Tropical Public Health Services (Cairns)	T: 07 4226 5555	Advice on public health in relation to water quality	Consulted, as needed, for water quality incidents
Council	T: 07 4090 5600 CEO T: 0427 390 110	Overall management, budget and finances	Informed of water quality issues
Weipa Hospital	T: 4069 7055	Not directly	Not directly, but in case of emergencies related to drinking water quality, patients from Napranum may attend the hospital, especially on weekends.
Health Services - Napranum	Qld Health T: 4082 3500 Apunipima T: 4037 7100	Consumer, high risk	Informed of water quality issues
Aged Care - NADS	T: 4069 7588	Consumer, high risk	Informed of water quality issues
Kindy and Daycare - NECC	T: 4069 7336	Consumer, high risk	Informed of water quality issues
PCYC – Napranum	T: 4069 7991 M: 0438 297 788	Consumer, high risk	Informed of water quality issues
Ibis Supermarket	T: 4069 7805	Makes water drinks	Informed of water quality issues

4. Identify Hazards and Hazardous Events

Criteria

- The Plan must include a summary of the analysis and interpretation of available and relevant water quality information.
- Where multiple providers are involved in providing the water supply, the above summary must (to the best of their knowledge) include relevant water quality information on the immediate upstream (for example, bulk supplier) and/or immediate downstream (for example, distributor) system(s).

4.1. Water Quality Information

Council previously had issues with water quality storage and an incident occurred where historical data was lost. This was rectified and as of July 2018, all water quality data has been entered into electronic spreadsheets, which are saved into the shared Council drive.

4.1.1. Operational monitoring – January 2020 to December 2021

A summary of operational monitoring from January 2020 until December 2021 is presented in Table 10. Data has also been analysed via graphs.

Table 9 Operational monitoring data for Jan 20 – Dec 21

Sites	Units	N	Ave	min	max
Free Chlorine					
208 Twal Street	mg/L	677	1.37	0.53	3.1
Preschool	mg/L	680	1.44	0.48	3.2
303 Tavern	mg/L	675	1.25	0.56	3.5
Water Treatment Plant	mg/L	660	1.47	0.57	3.5
Hospital	mg/L	459	1.49	0.57	3.5
pH					
Water Treatment Plant	pH Units	676	7.09	6.5	7.6
Turbidity					
Water Treatment Plant	NTU	25	0.23	0.08	0.78

Figure 4 indicates free chlorine was maintained in the reticulation at >0.2 mg/L (ADWG operational guidance). Figure 5 indicates free chlorine was adequate at the Water Treatment Plant, maintained at >0.5 mg/L.

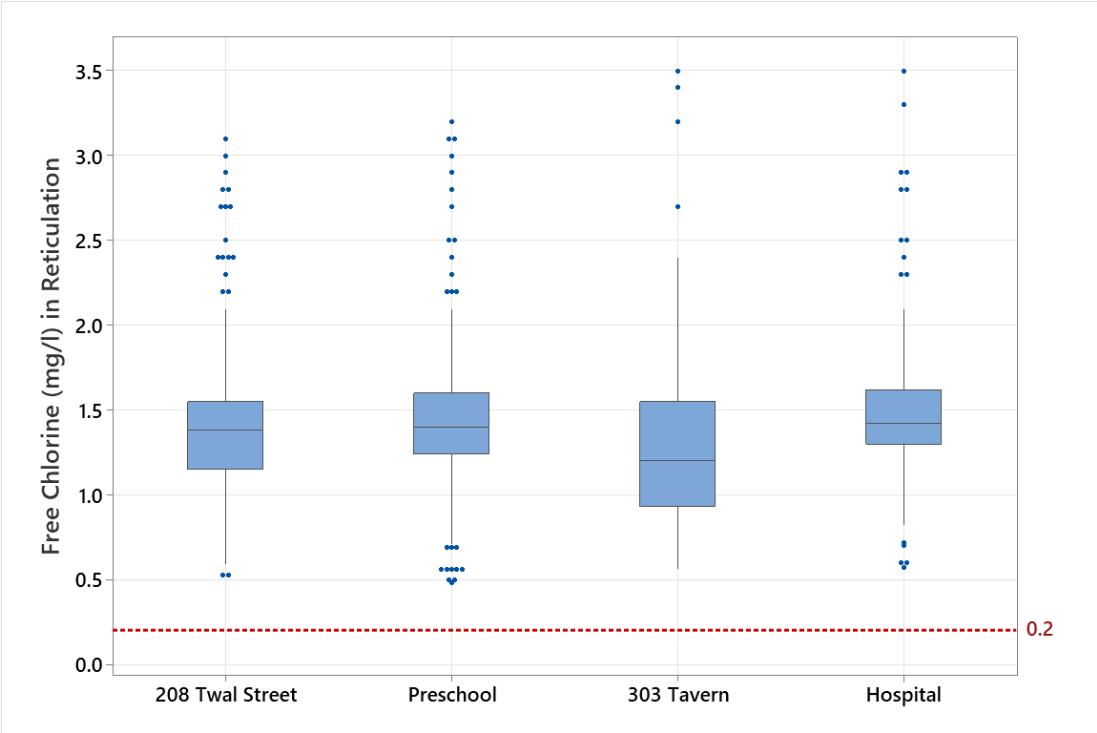

Figure 4 Operational Monitoring – free chlorine in reticulation

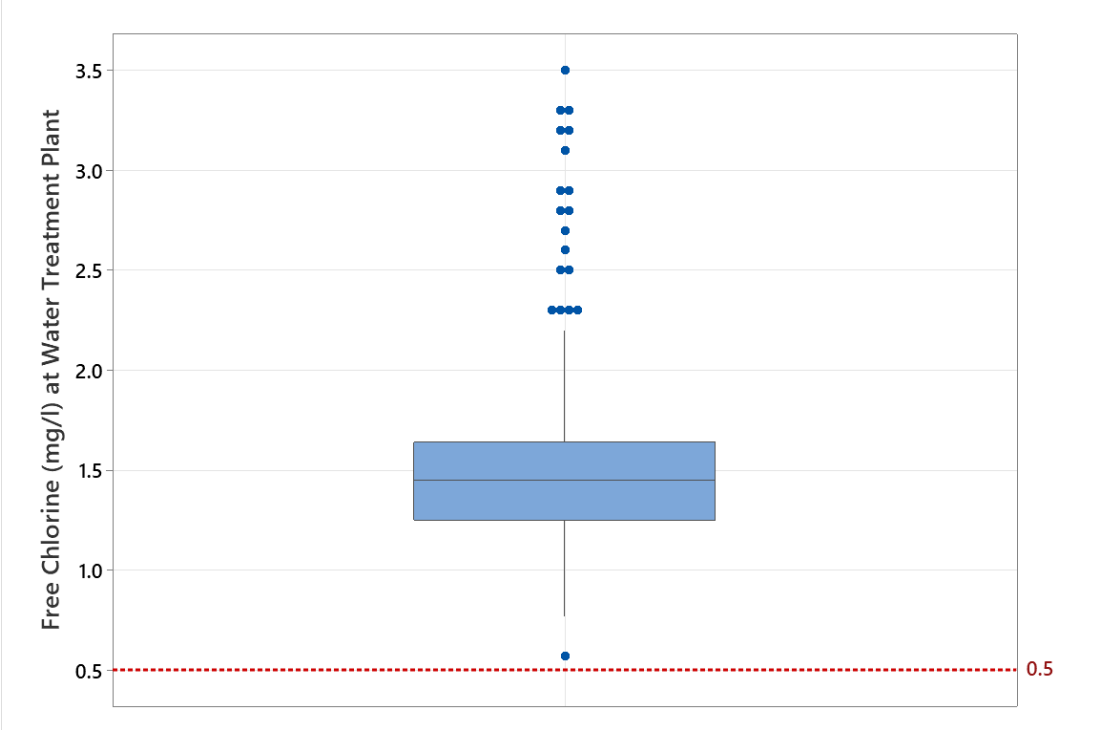

Figure 5 Operational Monitoring – Water Treatment Plant free chlorine

Figure 6 indicates pH remained within the limit of 6.5-8.5 at the Water Treatment Plant.

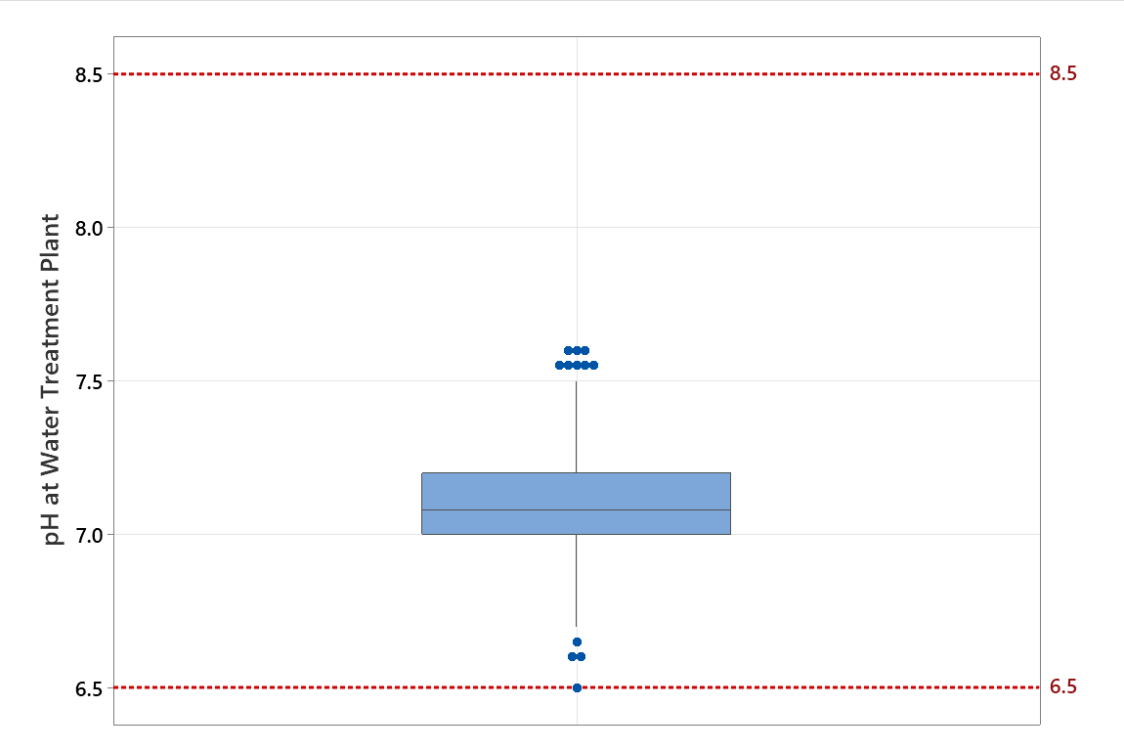

Figure 6 Operational Monitoring – Water Treatment Plant pH

Figure 7 indicates there were no exceedances of the water treatment plant turbidity target limit of 1 NTU.

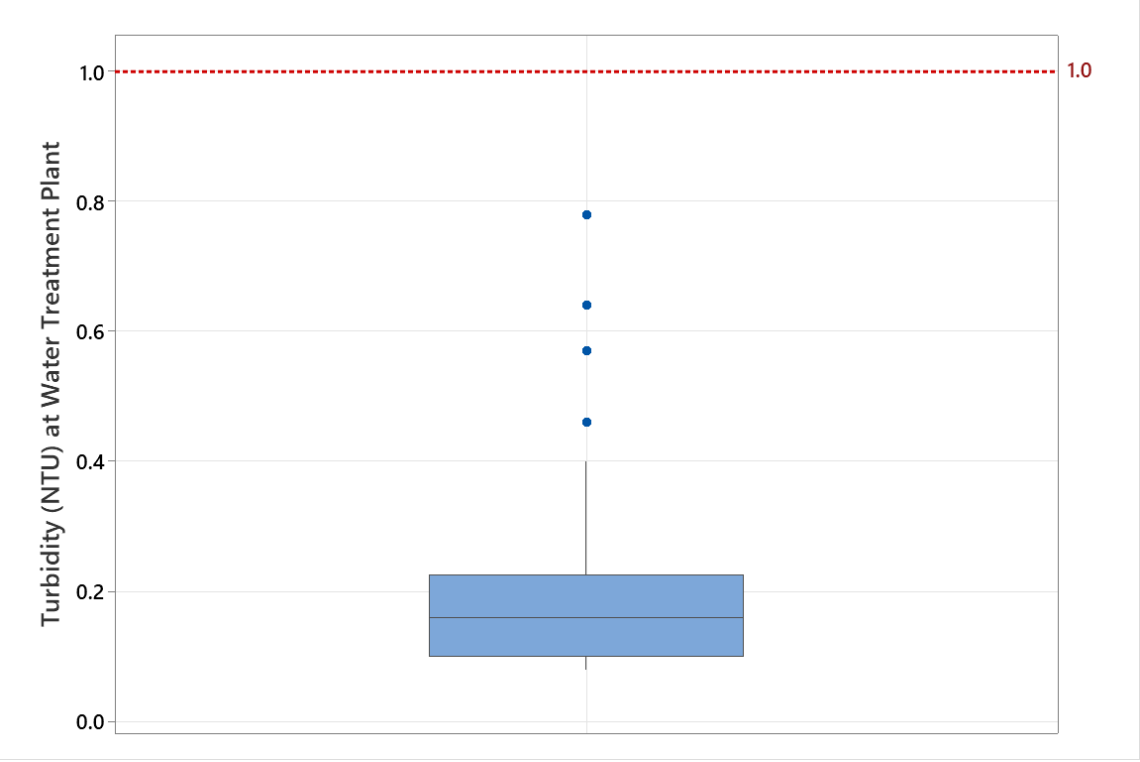

Figure 7 Operational Monitoring – Water Treatment Plant turbidity

4.1.2. Operational monitoring – Jul 18 – Dec 19

A summary of operational monitoring from July 2018 until December 2019, is presented in Table 10. This includes turbidity results which were included in the operational monitoring spreadsheet from the start of 2019. In 2019 there was only one CCP breach with a value of 0.2 mg/L free chlorine on the 29th of July.

Table 10 Operational monitoring data for July 2018 – December 2019

Sites	Units	N	Ave	SD	min	max	Target
Free chlorine							
208 Twal Street	mg/L	526.0	1.4	0.4	0.2	2.6	>0.5
Preschool	mg/L	531.0	1.6	0.4	0.7	3.3	>0.5
303 Tavern	mg/L	525.0	1.4	0.4	0.5	2.9	>0.5
Water Treatment Plant	mg/L	532.0	1.4	0.4	0.4	2.9	>0.7
Hospital	mg/L	376.0	1.5	0.4	0.7	2.5	>0.5
pH							
Water Treatment Plant	pH Units	543.0	6.9	0.8	1.2	9.3	6.8 – 7.5
Turbidity							
Water Treatment Plant	NTU	23.0	0.4	0.4	0.1	2.0	<2

4.1.3. Verification monitoring – January 2020 to December 2021

A summary of these results from January 2020 to December 2021 is shown below, for both internal and external testing undertaken. The Tables below show that there were no issues noted in the final water supplied.

Table 11 Summary of Verification Laboratory Results – Internal

Location	Parameter	No. of samples tested	Water quality criteria (spec)	No. of non-compliant samples	Comments
Water Yard / Water Treatment Plant	*E. coli* (P/A[1])	39	Absent	0	✓ Compliant.
School (or Kindy / NECC / Childcare)	*E. coli* (P/A)	40	Absent	0	✓ Compliant.

[1] P/A – Presence/Absence test

Location	Parameter	No. of samples tested	Water quality criteria (spec)	No. of non-compliant samples	Comments
Hospital (or Clinic)	*E. coli* (P/A)	21	Absent	0	✓ Compliant.
Twal Street	*E. coli* (P/A)	20	Absent	0	✓ Compliant.
Tavern Road	*E. coli* (P/A)	9	Absent	0	✓ Compliant.
HACC (or Aged Care / NADS)	*E. coli* (P/A)	38	Absent	0	✓ Compliant.
Community Hall	*E. coli* (P/A)	3	Absent	0	✓ Compliant.
Splash Park	*E. coli* (P/A)	3	Absent	0	✓ Compliant.

Table 12 Summary of Verification Laboratory Results – External

Location	Parameter	N	Water quality criteria (spec)	Min	Max	No. of non-compliant samples	Comments
Hospital	*E. coli* (CFU/100mL)	18	Not detected (ND)	ND	ND	0	✓ Compliant.
	Heterotrophic Plate Count (CFU/mL)	17	NA	ND	10	NA	✓ HPC detected, not of health significance
	Total Coliforms (CFU/100mL)	18	NA	ND	ND	NA	✓ No total coliforms detected, indicates a clean system
Overhead Reservoir	*E. coli* (CFU/100mL)	18	ND	ND	ND	0	✓ Compliant.
	Heterotrophic Plate Count (CFU/mL)	17	NA	ND	ND	NA	✓ No HPC detected, indicates a clean system
	Total Coliforms (CFU/100mL)	18	NA	ND	ND	NA	✓ No total coliforms detected, indicates a clean system
School	*E. coli* (CFU/100mL)	18	Not detected	ND	ND	0	✓ Compliant.

Location	Parameter	N	Water quality criteria (spec)	Min	Max	No. of non-compliant samples	Comments
	Heterotrophic Plate Count (CFU/mL)	17	NA	ND	20	NA	✓ HPC detected, not of health significance
	Total Coliforms (CFU/100mL)	18	NA	ND	ND	NA	✓ No total coliforms detected, indicates a clean system

During the data assessment, it was noted that verification monitoring is at times inconsistent with the DWQMP. Due to staff turnover, there have been some gaps with data monitoring and recording identified. The new Essential Services Supervisor is undertaking monitoring as per the DWQMP after resuming the role and is working on addressing the gaps.

4.1.4. Verification monitoring – 2017 to 2019

Annual DWQMP reports have reported past water quality performance from 2014 to 2019, with no *E. coli* detections within these time frames. Samples from the reticulation networks have been sent to a laboratory in Cairns for analysis as a quality check for in house testing. A summary of these results from 2017 to 2019 is shown below. In 2018 and early 2019, there were a number of logistical issues which resulted in only one sample being sent to the laboratory. In 2020 the sampling program has been amended and samples will be sent for laboratory analysis on a monthly basis.

Table 13 Summary of Verification Laboratory Results

Source	Parameter	N	Min	Max	Mean	Comments
Hospital	*E. coli* (CFU/100 mL)	8	ND	ND	ND	Compliant with water quality criteria, *Public Health Regulation (2018).*
	Heterotrophic Plate Count (CFU/mL)	8	ND	10	3.4	Not of health significance and used as an indicator of system integrity and disinfection performance.
	Total Coliforms (CFU/100 mL)	8	ND	ND	ND	Not of health significance and used as an indicator of system integrity and disinfection performance.
Overhead Reservoir	*E. coli* (CFU/100 mL)	8	ND	ND	ND	Compliant with water quality criteria, *Public Health Regulation (2018).*
	Heterotrophic Plate Count (CFU/mL)	8	ND	10	2.7	Not of health significance and used as an indicator of system integrity and disinfection performance.
	Total Coliforms (CFU/100 mL)	8	ND	ND	ND	Not of health significance and used as an indicator of system integrity and disinfection performance.
School	*E. coli* (CFU/100 mL)	8	ND	ND	ND	Compliant with water quality criteria, *Public Health Regulation (2018).*
	Heterotrophic Plate Count (CFU/mL)	8	ND	25	4.2	Not of health significance and used as an indicator of system integrity and disinfection performance.
	Total Coliforms (CFU/100 mL)	8	ND	ND	ND	Not of health significance and used as an indicator of system integrity and disinfection performance.

Detailed water analysis testing of the source water is undertaken annually, which will further build on Council's knowledge of the water quality of the bores. The source water is known to have naturally low pH, which is monitored operationally, and managed through water treatment.

Free Perfluoroalklyl Compounds (PFAS) snapshot monitoring was undertaken for Bores M1 and M2 as well as treated water in November 2017. Testing showed that there are no issues with PFAS in the source water, with no reportable levels detected.

Past water quality incidents include loss of supply and *E. coli* detections. The loss of supply was a result of one bore being repaired, and a failure of the bore pump on the service bore. The three-day loss of supply could have been prevented had staff at the time had more system understanding, as the fault in the pump could have been repaired.

E. coli has been detected at the Napranum school (5 cfu/100mL), the Overhead tank (3 cfu/100 mL) and Napranum Hospital (1 cfu/100mL) on the 19/02/2013. Council consulted with the Department of Health and issued a boil water alert and increased chlorination as a result. Further, detections at the hospital of 1 cfu/100 mL were made on the 10/12/2012, and at the Napranum school (1 cfu/100 mL) on the 11/09/2012. A common factor identified across all detections was very low chlorine levels.

A suite of ADWG parameters is analysed by a laboratory at least once a year. These results and the results from the snapshot monitoring are shown in Table 14 below. Results indicated low pH is an issue, however overall, no ADWG health-based guidelines were exceeded.

4.2. Customer Complaints

No water quality complaints have been received from the community in the last four years. The customers or community members raise any water quality issues through the Council office, which is then directed to the relevant Manager for investigation and action. The complaint is recorded in the water spreadsheet.

Table 14 Source water monitoring

Parameter	Sep 2011 result	Aug 2018 result (Bore 2)	Aug 2018 result (Bore 1)	Oct 2019 result (Bore 1)	Oct 2019 result (Bore 2)	Aug 2020 result (Bore 1)	Aug 2020 result (Bore 2)	Mar 2021 result (Bore 1)	Mar 2021 result (Bore 2)	ADWG Guideline Value	Compliant
Aluminum (mg/L)	0.005	< 0.015	< 0.015	<0.015	<0.015	< 0.015	< 0.015	<0.015	<0.015	0.2 (A)	Yes
Antimony (mg/L)	< 0.0001	-	-	-	-	-	-	-	-	0.003 (H)	Yes
Arsenic (mg/L)	< 0.0003	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.01 (H)	Yes
Barium (mg/L)	0.001	-	-	-	-	-	-	-	-	2 (H)	Yes
Beryllium (mg/L)	< 0.0001	-	-	-	-	-	-	-	-	0.06 (H)	Yes
Boron (mg/L)	0.009	< 0.05	< 0.05	-	-	-	-	-	-	4 (H)	Yes
Cadmium (mg/L)	< 0.0001	< 0.0001	< 0.0001	<0.0001	<0.0001	< 0.0001	< 0.0001	<0.0001	<0.0001	0.002 (H)	Yes
Chromium (mg/L)	< 0.0001	< 0.0002	< 0.0002	-	-	-	-	-	-	0.05 (H)	Yes
Cobalt (mg/L)	< 0.0001	-	-	-	-	-	-	-	-	n/a	n/a
Copper (mg/L)	0.005	0.007	0.004	0.005	0.009	0.007	0.007	0.016	0.007	2 (H) 1 (A)	Yes
Iron (mg/L)	< 0.005	<0.008	< 0.008	<0.008	<0.008	<0.008	<0.008	<0.015	<0.015	0.3 (A)	Yes
Lead (mg/L)	0.0004	0.0096	0.0009	0.0009	0.0042	0.001	0.0026	0.002	0.0011	0.01 (H)	Yes
Manganese (mg/L)	< 0.0001	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.5 (H) 0.1 (A)	Yes

Parameter	Sep 2011 result	Aug 2018 result (Bore 2)	Aug 2018 result (Bore 1)	Oct 2019 result (Bore 1)	Oct 2019 result (Bore 2)	Aug 2020 result (Bore 1)	Aug 2020 result (Bore 2)	Mar 2021 result (Bore 1)	Mar 2021 result (Bore 2)	ADWG Guideline Value	Compliant
Molybdenum (mg/L)	< 0.0001	-	-	-	-	-	-	-	-	0.05 (H)	Yes
Nickel (mg/L)	< 0.0001	< 0.0005	< 0.0005	-	-	-	-	-	-	0.02 (H)	Yes
Selenium (mg/L)	< 0.001	-	-	-	-	-	-	-	-	0.01 (H)	Yes
Silver (mg/L)	< 0.001	-	-	-	-	-	-	-	-	0.1 (H)	Yes
Uranium (mg/L)	< 0.0001	-	-	-	-	-	-	-	-	0.02 (H)	Yes
Vanadium (mg/L)	< 0.0001	-	-	-	-	-	-	-	-	n/a	n/a
Conductivity (uS/cm)	19	19	20	18	19	18	18	18	16	n/a	n/a
pH	6.04	5.6	5.2	5.4	5.3	5.3	5.4	5.4	5.4	6.5 – 8.5 (A)	No
Temperature (°C)	22	-	-	-	-	-	-	-	-	n/a	n/a
Total Hardness as CaCO3 (mg/L)	1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	n/a	n/a
Alkalinity CaCO3 (mg/L)	6	47	1.5	<1.5	<1.5	<1.5	2.5	<1.5	<1.5	n/a	n/a
Silica (mg/L)	6	6	6.3	6.4	6.2	6.4	6	6	5.7	80 (A)	Yes

Parameter	Sep 2011 result	Aug 2018 result (Bore 2)	Aug 2018 result (Bore 1)	Oct 2019 result (Bore 1)	Oct 2019 result (Bore 2)	Aug 2020 result (Bore 1)	Aug 2020 result (Bore 2)	Mar 2021 result (Bore 1)	Mar 2021 result (Bore 2)	ADWG Guideline Value	Compliant
Total Dissolved Solids (mg/L)	17	18	-	23	17	13	15	12	13	600 (A)	Yes
True Colour (Hazen)	1	< 1	< 1	-	-	-	-	-	-	15 (A)	Yes
Turbidity (NTU)	<1	0.2	< 0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1	5 (A)	Yes
Bicarbonate (mg/L)	8	-	-	-	-	-	-	-	-	n/a	n/a
Carbonate (mg/L)	0	-	-	-	-	-	-	-	-	n/a	n/a
Hydroxide (mg/L)	0	-	-	-	-	-	-	-	-	n/a	n/a
Chloride (mg/L)	3.4	-	-	3.8	3.8	3.9	3.7	3.6	3.5	250 (A)	Yes
Fluoride (mg/L)	< 0.1	< 0.02	< 0.02	<0.02	<0.02	< 0.02	< 0.02	<0.02	<0.02	1.5 (H)	Yes
Nitrate (mg/L)	1	0.21	0.2	-	-	-	-	-	-	50 (H)	Yes
Nitrite	-	< 0.01	< 0.01	-	-	-	-	-	-	3 (H)	Yes
Sulphate (mg/L)	< 1	< 1	< 1	<1	<1	< 1	< 1	<1	<1	500 (A)	Yes
Zinc (mg/L)	< 0.01	< 0.008	< 0.008	-	-	-	-	-	-	3 (A)	Yes

Parameter	Sep 2011 result	Aug 2018 result (Bore 2)	Aug 2018 result (Bore 1)	Oct 2019 result (Bore 1)	Oct 2019 result (Bore 2)	Aug 2020 result (Bore 1)	Aug 2020 result (Bore 2)	Mar 2021 result (Bore 1)	Mar 2021 result (Bore 2)	ADWG Guideline Value	Compliant
Sodium (mg/L)	2	-	-	2.5	2.4	2.3	2.1	2.4	2.3	180 (H)	Yes
Potassium (mg/L)	0.2	-	-	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	n/a
Calcium (mg/L)	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/a	n/a
Magnesium	0.2	0.23	0.22	0.23	0.22	0.22	0.22	0.23	0.23	n/a	n/a
Gross alpha (Bq/L)	-	<0.05	<0.05	-	-	-	-	-	-	0.5 (screening)	Yes
Gross beta activity (Bq/L)	-	<0.1	<0.1	-	-	-	-	-	-	0.5 (screening)	Yes

** (A) – Aesthetic based ADWG value, (H) – Health based ADWG value*

5. Assessment of Risks

Criteria

Details of the risk assessment results for each scheme's identified hazards and hazardous events must be documented in the plan, including:

- hazard
- source of hazard and hazardous event
- maximum risk level or equivalent process16 (i.e. without existing barriers in place for example, treatment and/or disinfection)
- existing preventive measures including multiple barriers (i.e. treatment process steps)
- residual risk level (i.e. with existing barriers in place for example, treatment and/or disinfection)
- any uncertainties.

Key stakeholders who have been actively involved in the risk assessment process, their role and rationale for inclusion must be documented in the plan.

Where multiple providers are involved, the plan must, to the best of their knowledge, explain how the relevant maximum and residual risk assessment results from other provider's service(s) have been considered.

The hazard identification and risk assessment were conducted when the DWQMP was developed in 2018 and revised as part of the DWQMP review in 2020 and 2022.

5.1. Hazard Identification and Risk Assessment Team

Criteria

The hazards and hazardous events (together with the sources of the hazards and hazardous events) that could adversely affect water quality must be documented in the Plan, including those affecting the:

- catchment
- sourcing infrastructure
- treatment plants
- disinfection process(es)
- distribution system.

When multiple providers are involved, the Plan must (to the best of their knowledge) include the hazards and hazardous events together with the sources of these hazards and hazardous events associated with the operations and water quality management processes of the other entities' systems which the provider considers could impact on the service.

Whole of service hazards and hazardous events (including cyber security threats and breaches with regard to water quality) and the sources of the hazards and hazardous events must be documented in the plan.

The Plan must detail the personnel (i.e. position) responsible for the hazard identification and risk assessment process, their roles and responsibilities and how knowledge of the actual day-to-day operation of the system(s) has been included in this process.

Key stakeholders who have been actively involved in the hazard identification process, their role and rationale for inclusion must be documented in the plan.

The risk assessment is detailed in the risk register spreadsheet, which is maintained separately to the main DWQMP document. The risk register was originally created in 2018, see Risk Register and Improvement Plan spreadsheet for risk assessment team details. The core risk assessment team in relation to drinking water quality going forward (by position) is detailed in Table 15. The actual risk team (by name) at risk workshops is included in the Risk Register spreadsheet. The core team is supported by other senior leaders and the CEO as relevant.

Table 15 Ongoing review risk assessment team

Position	DWQMP Relevance - Expertise and system knowledge
Operations Division Manager	Overall responsibility of the DWQMP, commitment for implementation, relevant system knowledge.
Essential Services Supervisor	Responsible for DWQMP implementation as relevant, commitment for implementation, system knowledge, in-charge of operator/s.
Operator/s	Responsible for DWQMP implementation as relevant, commitment for implementation, system knowledge.

5.2. Methodology

Criteria

The plan must detail the risk assessment methodology used for each scheme including:

- reference to a published version such as ADWG, HACCP, AS/NZS ISO 31000-2009
- if a published version has not been used, a description of the methodology which has been used must be provided
- the definition of likelihood, consequence and risk level used
- an explanation of the acceptable risk level and the rationale for this selection.

The methodology used for the risk assessment has been adopted from the Australian Drinking Water Guidelines and the Department of Natural Resources, Mines and Energy, Water Supply Regulator publication *Preparing a Drinking Water Quality Management Plan Supporting Information (*Sept 2010). The definitions of likelihood, consequence and uncertainty are presented in the methodology section of the *NASC Risk Register and Improvement Plan* spreadsheet.

5.3. Acceptable Risk

Residual risks scored as low and medium, were classified as acceptable risks. Risks with a rating of high or extreme in the risk assessment (unacceptable risks) have an associated action entered in the Improvement Plan. These risks will be re-evaluated during regular reviews of the DWQMP to ascertain that the risk level remains low (with an improved uncertainty level).

6. Managing Risks

Criteria

The Plan must contain an overall list of all the existing and proposed preventive actions or measures managed by the provider to achieve acceptable residual risks in the short and longer-term.

Where the provider relies on an external organisation to manage a risk to their service, the Plan must document what the preventive actions or measures are, and what arrangements are in place with the external organisation to ensure the measures remain effective.

In order to ensure that hazards and hazardous events are managed effectively, measures need to be in place to eliminate or reduce the associated risk. This DWQMP addresses this through the implementation of the following:

- preventive measures that reduce the likelihood of contaminants being at a concentration which may cause harm to the consumer (detailed in risk register)
- multiple barriers – a series of barriers that ensure contaminants are at an acceptable level
- critical control points – these are points in the system that can be monitored and action can be taken to prevent the process from becoming out of control leading to a non-compliant product
- risk treatments (or proposed additional preventive measures) to reduce any unacceptable residual risk to an acceptable level.

It is important that all of the identified significant maximum risks are managed appropriately and that there are barriers in place to manage them.

6.1. Risk Management Improvement Program

Criteria

The Plan, through the program, must describe the management measures proposed for each unacceptable residual risk. The process for providing the relevant information to the regulator must also be described. The description must include:

- measures, actions, strategies or processes
- priority for implementation
- timeframe
- other factors, for example, responsibilities between the provider and third parties and/or other stakeholders.

The risk management improvement actions from the hazard identification and risk assessment matrices have been reproduced to formulate a risk management improvement program. The improvement actions are available in the *NASC Risk Register and Improvement Plan* spreadsheet, which is a supporting DWQMP document.

6.2. Operational Control

6.2.1. Existing preventative measures

Barriers and preventative measures were identified during the risk assessment review for the identified hazards, and this can be seen in the *NASC Risk Register and Improvement Plan* spreadsheet - supporting document.

Operational control is essential for the management of the drinking water supply system. In order to manage a process, it must be capable of being monitored and corrective action applied to ensure processes function within the defined operational envelope.

Preventive measures that manage a significant risk are to have a documented procedure in place or an improvement action to document and formalise the procedure (see section 6.3).

Within a process, a number of points may be identified as critical, where increased control is required to ensure a quality product. These are identified as critical control points (CCPs). A CCP is defined as an activity, procedure or process at which control can be applied and which is essential to prevent a hazard or reduce it to an acceptable level. Not all activities are amenable to selection as CCPs. A CCP has several operational requirements, including:

- operational parameters that can be measured and for which critical limits can be set to define the operational effectiveness of the activity (e.g. chlorine residuals for disinfection)
- operational parameters that can be monitored frequently enough to reveal any failures in a timely manner (online and continuous monitoring is preferable)
- procedures for corrective action that can be implemented in response to deviation from critical limits to bring the process back into control.

All preventive measures in the NASC drinking water supply system were assessed to determine if they were a CCP. There could be more than one CCP for a particular hazard.

For each identified CCP, critical and alert limits were set and defined as follows:

- critical limit - a set point that once exceeded the treatment process is taken to be out of control, which may result in a non-compliant product and action must be taken to remedy the situation
- alert limit - a warning allowing an opportunity to take appropriate action to avert the breach of the critical limit

6.2.2. Critical control points

For NASC, two CCPs were identified – one for bore water integrity (via turbidity) and one for disinfection, which are detailed in Appendix A. Table 16 below states the targets and critical alarm limits for operation parameters for disinfection to be effective and for bore water integrity.

Table 16 Critical limits

What is the operational monitoring parameter?	How is it monitored?	Where is it monitored?	Target value for optimal performance	Is it a Critical Control Point?	Early warning limit for loss of control	Critical limit for unacceptable public health risk (if applicable)	Procedure
Turbidity	Grab	Bores	<1 NTU	Yes	>0.5 NTU	>1 NTU	Appendix A
pH	SCADA Continuous / Grab	After pH Adjustment	6.5-7.5	No	<6.5 >8.0 – low and high alarms	-	Appendix B
Chlorine	SCADA Continuous / Grab	After Chlorination	0.9-1.5 mg/L	Yes	<0.5 or >3.0 mg/L	<0.2 or >4.0 mg/L – low and high alarms	Appendix A

6.2.3. Proposed preventative measures

Proposed preventative measures are included in the *NASC Risk Register and Improvement Plan* spreadsheet, alongside timeframes and responsibilities for implementation.

6.3. Operation and maintenance procedures

Criteria

The Plan must contain, for each existing preventive measure identified in the risk assessment as a measure for achieving the documented residual risk, a list of the documented operation and maintenance (or other) procedures that are required to ensure the integrity of the measures, including:

- title
- date last revised
- the process used for maintaining the documented procedures
- the process for implementing the procedures.

The following work checklists, records and procedures are used in the operation of the drinking water scheme, see Table 17. The Manager Operations Division / Essential Services Supervisor is responsible for delegating the tasks.

The Manager Operations Division / Essential Services Supervisor is responsible for developing and maintaining these documents and these are stored electronically in Council's shared drive. These documents are updated as needed. If there is a change in the operating practice then the relevant staff (e.g. operator) informs the Essential Services Supervisor to coordinate the revision. All staff concerned have input into the revision of documents and procedures, as relevant. The revision dates, if there is no need to revise a procedure earlier, is monitored through Table 17. The Improvement Plan has identified development of several additional key procedures, as identified from the risk assessment. When developed the revision dates will be assigned.

The Manager Operations Division / Essential Services Supervisor ensures that staff have appropriate understanding of procedures and uses verbal checks to ensure understanding. Ensuring that procedures are implemented appropriately is the responsibility of the relevant staff (e.g. operator) and the Essential Services Supervisor. Staff are trained in procedures relevant to their role through on-the-job training and guidance from the Essential Services Supervisor. Relevant staff also hold water operations certificates and are in the process of upgrading to the next level.

Table 17 List of procedures

Procedure	Last revised	Next revision	Comments/Status
pH correction plant operating instruction	NA (dated July 2012)	NA, suppliers manual	Given to Council after plant handover
Water testing guide	NA	NA, suppliers manual	From supplier
Palintest operating instruction	NA	NA, suppliers manual	From supplier
pH adjustment procedure	Feb 2022	Feb 2024	See Appendix B
Disinfection CCP	Feb 2022	Feb 2024	See Appendix A

Procedure	Last revised	Next revision	Comments/Status
Mains/pipes repair	To be developed	To be assigned after completion	Improvement Plan action #20
Implementing and lifting Boil Water Alerts	Feb 2022	Feb 2024	See Appendix C
Checks and inspections – chlorine gas facility	To be developed	To be assigned after completion	Improvement Plan action #1
Operation of calcite filter	To be developed	To be assigned after completion	Improvement Plan action #13
Daily check sheet for drinking water services tasks	To be developed	To be assigned after completion	Improvement Plan action #15
3-monthly detailed reservoir inspection checklist	To be developed	To be assigned after completion	Improvement Plan action #16
Reservoir cleaning and inspection program	To be developed	To be assigned after completion	Improvement Plan action #17
Flushing	To be developed	To be assigned after completion	Improvement Plan action #19
DWQMP induction package	To be developed	To be assigned after completion	Improvement Plan action #25
Preventive maintenance schedule for pumps	To be developed	To be assigned after completion	Improvement Plan action #28
Equipment calibration	To be developed	To be assigned after completion	Improvement Plan action #32
Chemical quality	To be developed	To be assigned after completion	Improvement Plan action #33
Sampling procedure	To be developed	To be assigned after completion	Improvement Plan action #34 – part of QA/QC framework
Testing and records	To be developed	To be assigned after completion	Improvement Plan action #34 – part of QA/QC framework

6.4. Management of Incidents and Emergencies

Criteria

The process for managing drinking water incidents and emergencies must be described in the Plan, including:

- incidents and emergencies *(including cyber security incidents/emergencies associated with drinking water quality)*
- the level of emergency (for example, green, amber, red or level 1, 2)
- summary of action(s) taken for each level including emergency contacts
- internal and external communication processes and protocols including those with other key stakeholders that are actively involved
- responsible positions.

When multiple providers are involved in providing drinking water, the Plan must explain how incidents and emergencies are managed between the entities.

The process for managing drinking water incidents and emergencies is described in the tables below. Table 18 provides the overview (alert level, description, key responsibilities and positions responsible). The Table 19 gives the summary of actions and procedures. This has also been included as flow charts in this section.

Alerts (levels 1-2) related to drinking water quality are notified to and/or managed by the Essential Services Supervisor, who remains on call by mobile phone on **0458 697 855**. The Essential Services Supervisor is supported with this by the Manager Operations and CEO as relevant. The CEO is overall responsible for the Emergency level related to drinking water. Water staff have received on the job training in incident and emergency response protocols to operate as required, with overall supervision and management provided by the Manager Operations Division.

Table 18 Alert levels of incidents and emergencies

Alert Level	Description	Key management response(s)	Position(s) responsible
Level 3 or High: **Emergency**	• outbreak of waterborne disease • major event (something that has happened or is likely to happen, in relation to a drinking water service that may have an adverse effect on public health, and is unable to be controlled using normal procedures (e.g. terrorism, deliberate contamination of treated water, source water where treatment is ineffective) • declared disaster or emergency situation by the Council or state/national government • Cybersecurity Breach Event *Requires coordination across the provider (Council) departments and is likely to require external resourcing and support from agencies, such as Queensland Water Supply Regulator, Queensland Health, local disaster management groups, emergency responders QFRS, Police*	Activate disaster management plan if appropriate Activate incident response and reporting protocols. Request advice from external experts as appropriate to regain control. Notify Queensland Water Supply Regulator on 1300 596 709 (24/7) – Event Reporting *Refer to summary of actions and procedures*	CEO with support from the Manager Operations Division and ESS
Level 2 or Medium: **Incident**	• non-compliance (typically against the ADWG health-based values) • minor event. Examples include natural disasters (flood, drought), bushfires, inability to operate system within acceptable operational limits but where rectification is likely prior to unsafe water delivered. *Incident likely to be managed within the team responsible for drinking water operations and management in line with their DWQMP. In some cases, it may require coordination across the Council departments and external resources and support, such as from Queensland Water Supply Regulator, Queensland Health. Possible customer complaints.*	Activate drinking water incident response and reporting protocols. Ensure all control measures identified in the DWQMP are functioning effectively. Notify Queensland Water Supply Regulator on 1300 596 709 (24/7) – Non-compliance Reporting *Refer to summary of actions and procedures.*	ESS, with Operator/s and Manager Operations Division, as relevant.
Level 1 or Low: **Operational Exceedance**	• Exceedances of operational limits (e.g. low or elevated chlorine in reticulation, pH, exceedance of ADWG aesthetic values). *Issue can be managed within the water operations team. An incident is not declared and the issue can be managed by local team in line with their DWQMP.*	Ensure all operational steps identified in the DWQMP are functioning effectively. Check and act upon operations and maintenance records and procedures. Incident response and reporting protocols on standby. *Refer to summary of actions and procedures*	Operator/s and/or Essential Services Supervisor

Table 19 Summary of IERP Actions

Alert Level	Key management response(s)	Brief summary of actions	Documented Plans & Procedures
Level 3 **Emergency**	Activate incident response and reporting protocols. Request advice from external experts as appropriate to regain control. Activate disaster management plan if appropriate	• CEO to notify Council and assemble team • Coordinate notification, investigation and response of water related aspects • Consider what community notification / messaging is needed (e.g. do not drink alert, boil water alert or bottle/emergency water distribution) • Coordinate community messaging, for e.g. boil water alert, do not drink alert as required • Notify Queensland Water Supply Regulator as soon as practicable on **1300 596 709** (24 hours line), as per reporting requirements. • For emergencies triggered by cybersecurity events, ensure all automated systems are isolated until verified as safe.	Disaster management plan, including communications protocols.
Level 2 or Medium: **Incident**	Activate incident response and reporting protocols. Ensure all control measures identified in the DWQMP are functioning effectively.	• Essential Services Supervisor to inform the Manager Operations Division • Notify Queensland Water Supply Regulator on **1300 596 709** (24/7), as per reporting requirements • Ensure all control measures identified in the DWQMP are working well • Arrange for re-samples to be taken where required • Instigate immediate remediation actions, including isolation of affected area where possible • Review associated laboratory reports and operational records. • In case of customer complaints, coordinate investigation and resolution, including obtaining water samples where required	See **Table 20** for reporting protocols Napranum DWQMP
Level 1 or Low: **Operational Exceedance**	Ensure all operational steps identified in the DWQMP are functioning effectively. Check and act upon operations and maintenance Incident response and reporting protocols on standby.	• Operations staff to notify Essential Services Supervisor • Review operations and maintenance records for anomalies • Commence investigation to determine cause, if not identifiable through operational records • Instigate immediate remediation actions • Ensure all control measures identified in the DWQMP are functioning effectively • Increase operational monitoring frequency where required • Ensure incident response and reporting protocols are on standby if the need arises	Operations and maintenance procedure Napranum DWQMP.

6.4.1. Process for incident reporting

The incident response and reporting protocols have been adopted from the Queensland Water Supply Regulator Drinking Water Service Provider Monitoring and Reporting Requirements guidelines.

Queensland Water Supply Regulator reporting forms *Notification of a drinking water event or detection of a parameter with no water quality criteria: Form WSR507* and *Notice of*

noncompliance with water quality criteria: Drinking water: Form WSR017 are submitted as required.

Incident reporting forms used are located online at:

https://www.business.qld.gov.au/industries/mining-energy-water/water/industry-infrastructure/industry-regulation/drinking-water/forms-guidelines

These are summarised in Table 20 as below, and also represented as flow charts in Figures 8-10.

Table 20 Incident reporting requirements

Incident	Reporting Requirements (to Water Supply Regulator)
Detection of *E. coli,* detection of a pathogen, failure to meet ADWG health guideline values	Figure 8 and Figure 9 outline the reporting requirements.
Radiological (exceed levels described in the notice)	By telephone within 3 hours of receipt of test results
Parameters with no ADWG guideline value, which cannot be managed under approved DWQMP	Immediately and then written confirmation within 24 hours
An event likely to affect water quality	By telephone as soon as practicable Also refer to Figure 10 which includes some guidance

Reporting number is 1300 596 709

Email: DrinkingWater.Reporting@rdmw.qld.gov.au

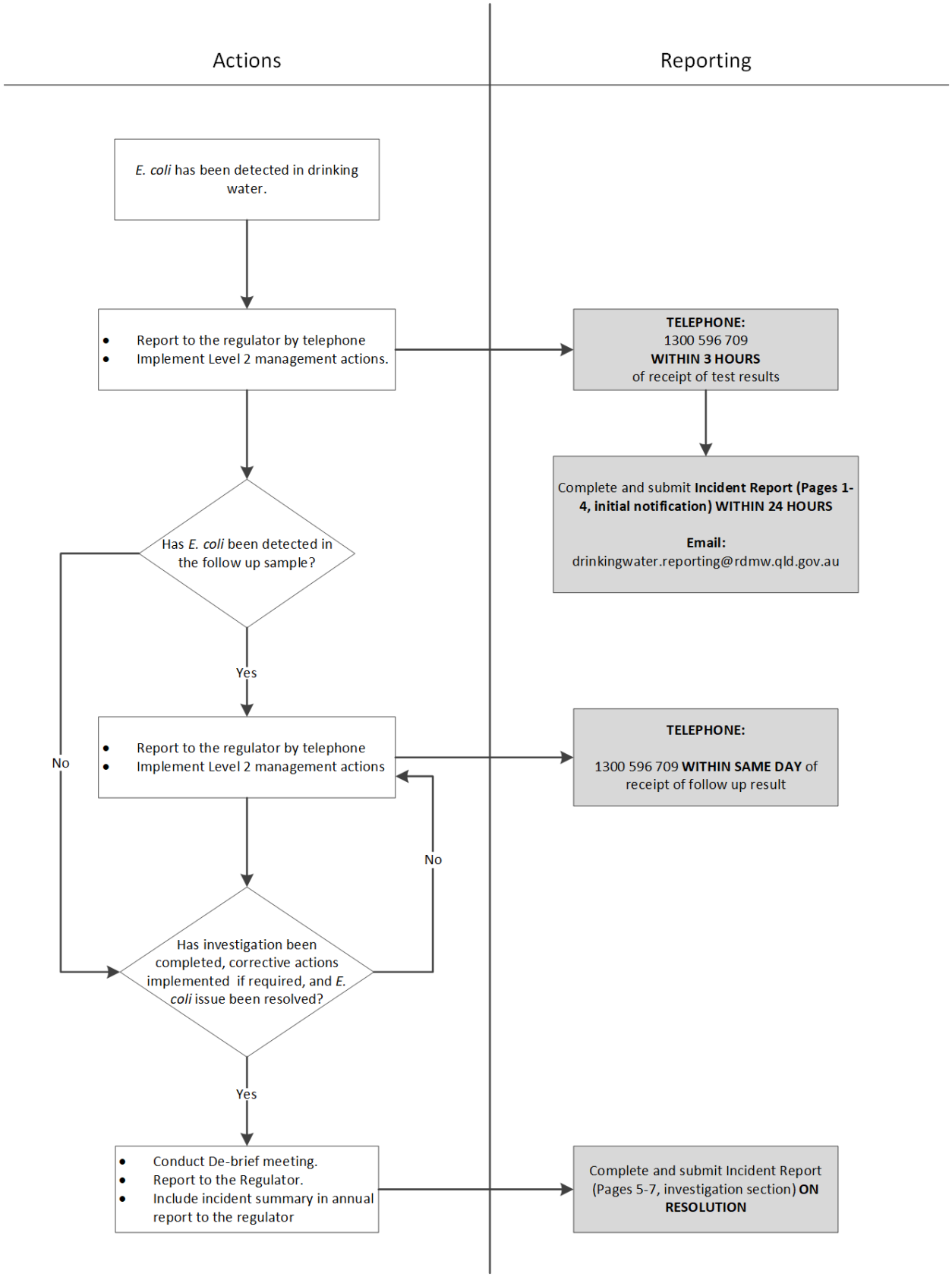

Figure 8 Actions and Reporting for Detection of *E. coli*

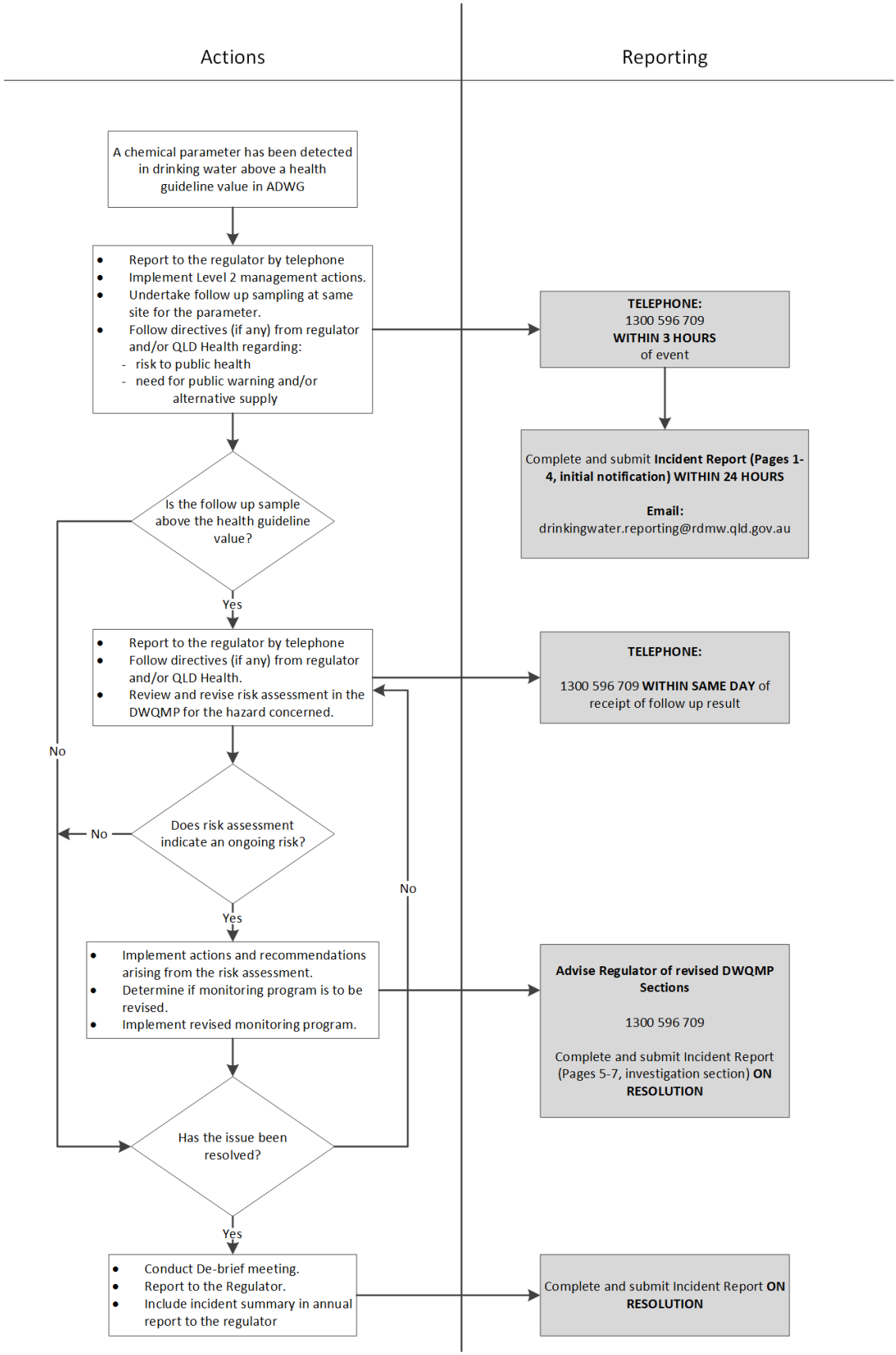

Figure 9 Actions and Reporting for Detection of Chemical Parameters above ADWG Health Guideline Values

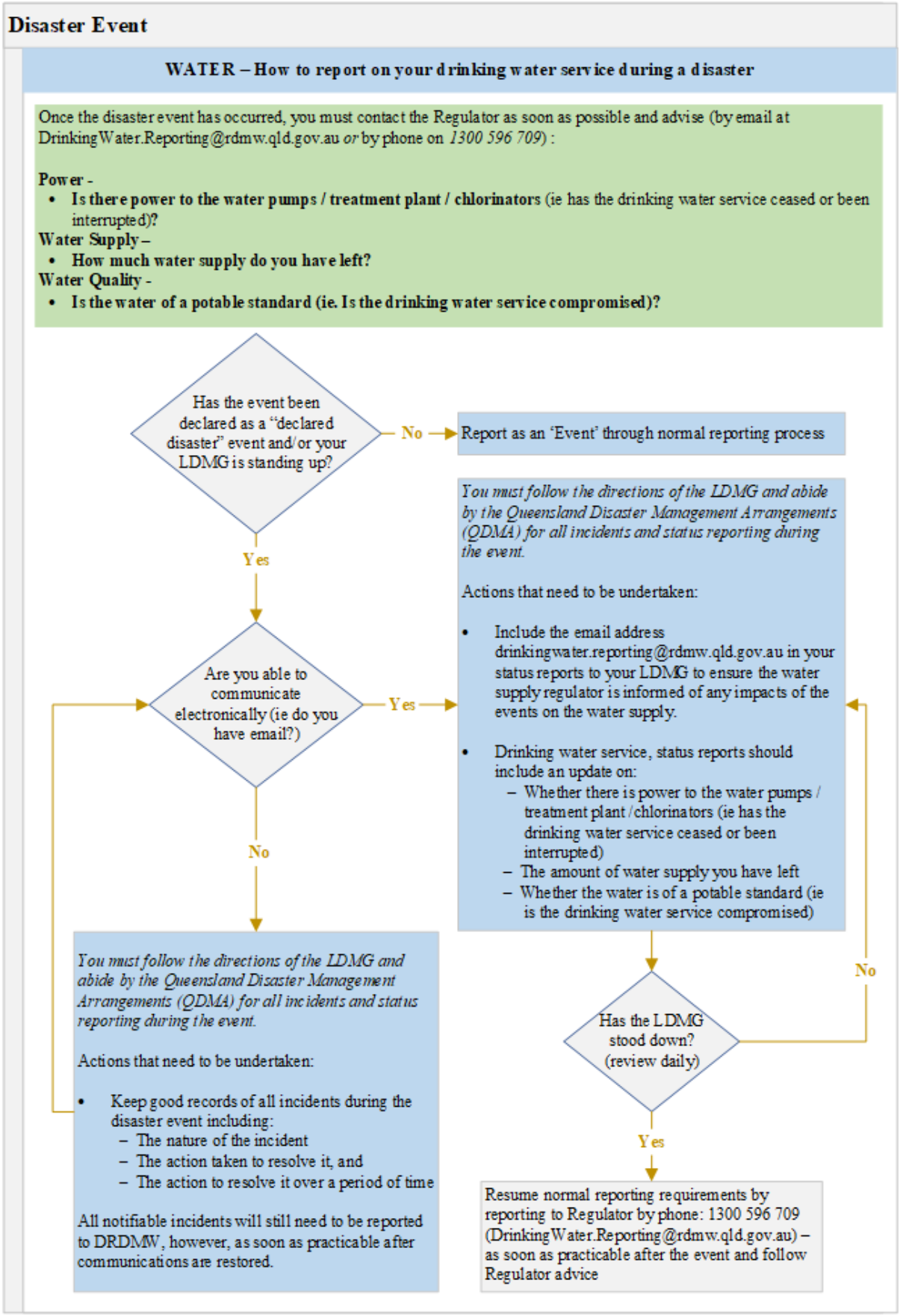

Figure 10 Actions and Reporting during a Disaster

6.4.2. Notification of Alerts about water quality

Any water quality alerts are currently communicated via an electronic bulletin board outside the Council office, the Council social media page, email bulletins and flyers.

Customers with vulnerable health may need to be notified by phone such as:

- Hospitals
- Schools
- Retirement home

Vulnerable customers within the Napranum scheme are listed in Table 21 .

Table 21 Vulnerable customer details

Vulnerable Customers	Contact Person	Phone numbers
Health Services – Napranum	Director of Nursing	Qld Health T: 4082 3500 Apunipima T: 4037 7100
Aged Care - NADS	Shanice Gomm (Acting Aged and Disabilities Service Manger)	M: 0460 013 023 T: 4069 7588
Pre-school and day care – Napranum NECC	Carmen Dixon (NECC Nominated Supervisor)	M: 0428 858 953 T: 4069 7336
PCYC – Napranum	Officer in-charge	T: 4069 7991 M: 0438 297 788

6.5. Service Wide Support – Information Management

Criteria

The Plan must describe the information management, record keeping and reporting processes relevant to drinking water quality management, including how they address:

- accessibility
- currency
- record retention requirements.

The following table summarises the recording keeping activities undertaken at NASC pertaining to the DWQMP. Table below summarises the activities.

Table 22 Information Management Activities/Document Summary

Information	Storage Location/Retention	Currency	Responsible Person(s)
Daily Water Quality Testing Records (Excel spreadsheet)	Shared Council drive Hard copy and USB	Results recorded on spreadsheet and saved onto shared council drive and USB	Staff undertaking the sampling, reviewed by ESS
External Laboratory Water Quality Results (Cairns Laboratory)	Shared Council drive Hard copy and USB	As received from external laboratory	ESS and Manager Operations Division
DWQMP and supporting documents	Shared Council drive Hard copy and USB	Reviewed as needed, current version saved in shared drive and USB	Manager Operations Division and/or ESS
pH correction plant operating instruction	At Water Yard	July 2012	Manager Operations Division and/or ESS
Water testing guide	At Water Yard	No version control	Manager Operations Division and/or ESS
Palintest operating instruction	At Water Yard	Original Copy in shared drive and USB	Manager Operations Division and/or ESS
Water Supply Regulator Water Quality Incident Notification Form (WSR507, WSR017)	Queensland Water Supply Regulator Website	Current as from website	n/a
Boiled Water Alert form	Part of the DWQMP	Reviewed as part of the review of the DWQMP	Manager Operations Division and/or ESS

Five year old data are archived through Council's system, by Council officers.

7. Operational and Verification Monitoring

7.1. Operational Monitoring

Criteria

The Plan must contain details of the operational monitoring program, including:

- a link to the process step or operational function
- the parameter being tested
- location of monitoring
- frequency
- summary of how excursions are managed and/or corrective action is taken.

The Plan must describe why the operational monitoring program is appropriate to confirm and maintain the effective operation of the existing preventive measures.

The current operational monitoring program is presented in this section, with site details in Table 23 and testing and parameter details in Table 24. Table 24 also includes corrective actions when target and critical limits are breached. The ESS collects the operational monitoring samples around town and has received on the job training. The ESS is responsible for assessing the operational and verification monitoring water quality results weekly and investigating any trends.

Visual inspections and checks are conducted as part of the operational monitoring to ensure preventative measures function as required, in conjunction with water quality testing.

The frequency of daily (Mon-Fri, except public holidays or 7 days) is included in the Table below. The operational monitoring program is appropriate to confirm and maintain the effective operation of the preventive measures due to the broad spectrum of sampling sites throughout the community. These parameters will ensure that the most significant hazard of harmful bacteria are not present.

Table 23 Operational monitoring sites, sampling parameters and frequencies

Site	Sampling	
	Parameters Tested	Frequency
Bore M1	Turbidity	Weekly
Bore M2	Turbidity	Weekly
Ground level reservoir outlet (final water in pressure pump room) – Water Yard	Residual free chlorine, turbidity, pH	Daily (7 days)
Water Yard (point of dosing)	Residual free chlorine, pH	SCADA online
NECC (vulnerable customers)	Residual free chlorine, turbidity	Daily – Mon-Fri
Health Services (vulnerable customers)	Residual free chlorine, turbidity	Daily – Mon-Fri
203 Twal St. (dead end)	Residual free chlorine, turbidity	Daily - Mon-Fri
303 Tavern (dead end)	Residual free chlorine, turbidity	Daily – Mon-Fri

Table 24 Operational monitoring undertaken at NASC, including targets

Process step / location in system	Parameter	Associated hazard	Sampling			Target limit	Action if target limit is not met	Critical limit	Action if critical limit is exceeded
			Frequency	Method	Analysis				
Bores Sites	Turbidity	Harmful Pathogens	Weekly	Grab Sample	In-house	<1 NTU	Flush the bore line, re-sample to confirm, take an *E. coli* sample, isolate bore if possible until *E. coli* reading is available, investigate and rectify cause. Ensure residual chlorine level is maintained in the reticulation/reservoirs. Increase dose rate as required. Consider shutting down plant Increase monitoring until system conforms	>1 NTU	Same as if target is not met.
	Bore operation	Water Supply	Daily	Visual inspection	n/a	Bores operating normally	Notify ESS/Manager Operations Division, investigate issue, repair asset	n/a	n/a
	Fence integrity around bores	Bore integrity	Daily	Visual inspection	n/a	Good fence integrity	Notify ESS/Manager Operations Division, repair asset, ensure residual chlorine level is maintained in the reticulation / reservoirs	n/a	n/a
	Aquifer Level	Water Supply	Daily	Manual	n/a	n/a	n/a	n/a	n/a
Water yard (WTP)	pH	Bacteria and Viruses, pH	Continuous, Daily	SCADA, Grab Sample	In-house	6.5 to 7.5	Follow pH control procedure	n/a	n/a
	Chlorinators working properly	Bacteria and Viruses	Daily	Visual inspection	n/a	Chlorinators in good working condition	Notify ESS, Manager Operations Division, repair asset	n/a	n/a
	General site maintenance and fence integrity check	Water Supply	Daily-Weekly	Visual inspection	n/a	Good asset condition	Repair asset, if possible take immediate action to rectify the breach. Notify the ESS/Manager Operations Division	n/a	n/a

Process step / location in system	Parameter	Associated hazard	Sampling			Target limit	Action if target limit is not met	Critical limit	Action if critical limit is exceeded
			Frequency	Method	Analysis				
							If contamination is suspected, undertake testing of chlorine residual and *E. coli*. If *E. coli* is detected, begin Emergency response protocol.		
	Inspection and testing of switchboards (by electrician)	Water Supply	Bi-monthly	Visual inspection/ appropriate tests	n/a	Switchboards operating normally	Notify ESS/Manager Operations Division, repair asset	n/a	n/a
Ground Level Reservoir	Turbidity	Bacteria and Viruses	Daily	Grab sample	In-house	<1 NTU	Ensure residual chlorine level is maintained in the reticulation/reservoir. Increase dose rate as required. Consider shutting down plant Increase monitoring until system conforms	n/a	n/a
	Free chlorine	Bacteria and Viruses	Continuous, Daily	SCADA. Grab sample	In-house	>0.9 mg/L	If free chlorine is < 0.5 mg/L ensure residual chlorine level is maintained in the reticulation/reservoir. Increase dose rate as required. High Chlorine level alarming occurs at 4 mg/L and higher and the raw water pumps will shut down. Decrease dosing and check reticulation network.	<0.2 mg/L, > 5 mg/L	If free chlorine is < 0.2 mg/L in the reservoir, check residual chlorine levels in the reticulation, increase dose rate as required. Take an *E. coli* sample. Investigate and rectify issue. Consider Boil Water alert if *E. coli* is detected. If free chlorine > 4mg/L, isolate the reservoir if possible, confirm free chlorine levels are acceptable in the reticulation. Consider shutting down the plant. Test for total chlorine, if total is > 5mg/L then begin the Emergency Response

Process step / location in system	Parameter	Associated hazard	Sampling			Target limit	Action if target limit is not met	Critical limit	Action if critical limit is exceeded
			Frequency	Method	Analysis				
									Protocol for breach of an ADWG health-based target.
	Reservoir level	Water Supply	Daily	Visual inspection SCADA	n/a	> 80%	Reservoir is generally maintained at > 80% capacity. Investigate any water supply/asset issues if levels are consistently below this.	n/a	n/a
	Integrity check, looking for leaks, overflow or vandalism	Water Supply	Daily	Visual inspection	n/a	Good reservoir integrity	Repair asset, if possible take immediate action to rectify the breach. Notify the ESS/Manager Operations Division If contamination is suspected, undertake testing of chlorine residual and *E. coli*. If *E. coli* is detected, begin Emergency response protocol.	n/a	n/a
Reticulation sites	Free Chlorine	Bacteria and Viruses	Daily – Mon-Fri	Grab sample	In-house	>0.5 mg/L <3 mg/L	Follow disinfection procedure. If free chlorine > 3mg/L decrease dose rate and monitor reservoir. If free chlorine is <0.5 mg/L consider flushing the network, increasing chlorine dose as needed, check system integrity and action accordingly.	n/a	n/a
	Turbidity	Harmful Pathogens	Daily – Mon-Fri	Grab Sample	In-house	<1 NTU	Consider flushing the network, check system integrity and action accordingly. Check residual chlorine level is maintained. Increase dose rate as required. Increase monitoring until system conforms	n/a	n/a

7.2. Verification Monitoring

Criteria

The Plan must contain details of the verification monitoring program including:

- the parameter being tested
- location of monitoring
- frequency
- summary of how excursions are managed and/or corrective action is taken.

The Plan must also describe why the verification monitoring program is appropriate to confirm that the drinking water complies with the water quality criteria for drinking water (including the rationale for the choice of the parameters).

Verification monitoring for NASC is used to confirm that safe water is delivered to customers in compliance with the ADWG and *Public Health Act (2005)*.

Verification monitoring conducted at monitoring locations weekly is *E. coli* (samples collected by ESS, and in-house analysis is undertaken via Colilert testing). *E. coli* samples are sent to Cairns Regional Council's NATA accredited laboratory on a monthly basis to confirm in-house testing results as a quality assurance check. The verification monitoring program design is based on the risks identified in the risk assessment, and the *E. coli* frequency required for this community size (i.e. weekly, since the population served is close to 1000). Monitoring locations are representative and appropriate as they address vulnerable customers, and dead ends in the reticulation. Verification monitoring sites are included in Table 25.

If *E. coli* is detected in the reticulation, this is considered a level 2 incident and actions are taken as per the emergency response section.

Council also conducts standard water analysis and metals scan via an external lab at the bores to better characterise changes in the catchment, and to confirm the risk assessment is accurate (improvement plan action is to conduct this quarterly). Disinfection by-products (Trihalomethanes) will also be analysed from one location in the reticulation (may be rotated, quarterly). A list of parameters for the standard water analysis is listed below.

Table 25 Verification monitoring sites

Site	Sampling	
	Parameters Tested	Frequency
Water Yard (Reservoir outlet)	*E. coli*	Weekly
NECC (vulnerable customers)	*E. coli*	Weekly
Health Services (vulnerable customers)	*E. coli*	Weekly
NADS Aged Care	*E. coli*	Weekly

Parameters to be included in the complete water analysis are as follows:

Bores:

Each bore will be tested quarterly for:

- Aluminium
- Arsenic
- Antimony
- Barium
- Beryllium
- Boron
- Cadmium
- Calcium
- Chloride
- Chromium
- Colour
- Copper
- Electrical conductivity
- Fluoride
- Iron
- Lead
- Magnesium
- Manganese
- Mercury
- Molybdenum
- Nitrate
- Nitrite
- Nickel
- pH
- Potassium
- Selenium
- Silicon
- Silver
- Sodium
- Sulphate
- Total alkalinity
- Total dissolved solids
- Total hardness
- Turbidity
- Uranium
- Zinc

Reticulation:

One location in the reticulation network will be tested quarterly for (location may be rotated every quarter):

- Aluminium
- Arsenic
- Antimony
- Barium
- Beryllium
- Boron
- Cadmium
- Calcium
- Chloride
- Chromium
- Colour
- Copper
- Electrical conductivity
- Fluoride
- Iron
- Lead
- Magnesium
- Manganese
- Mercury
- Molybdenum
- Nitrate
- Nitrite
- Nickel
- pH
- Potassium
- Selenium
- Silicon
- Silver
- Sodium
- Sulphate
- Total alkalinity
- Total dissolved solids
- Total hardness
- Turbidity
- Uranium
- Zinc
- Trihalomethanes
- Chlorate
- Chlorite

Table 26 Verification monitoring undertaken by NASC

Parameter	ADWG or regulation value	Associated Hazard	Frequency, method		Analysing Authority	Response to exceedance
			Bores	Town		
E. coli	Not detected in 100mL	Pathogens	n/a	Monthly Weekly	Cairns Water Lab (NATA accredited) In-house	*E. coli* - Refer to tables describing incident and emergency management. Notify the Queensland Water Supply Regulator for town samples and complete incident reporting forms. Check that residual chlorine level is maintained. Increase dose rate as required. Check bore head structural integrity and reservoir security, review sampling method used, retest, and investigate
Complete water analysis	Refer to ADWG	Metals, physical and aesthetic parameters (bores and treated) Disinfection by-products (treated)	Quarterly	Quarterly	Cairns Water Lab (NATA accredited)	Assess any new hazards.

Glossary

Word	Description
CCP	Critical Control Point
C.*t*	Chlorine contact time
DWQMP	Drinking Water Quality Management Plan
ESS	Essential Services Supervisor
NASC	Napranum Aboriginal Shire Council

References

National Health and Medical Research Council (NHMRC) and Natural Resource Ministerial Management Council (NRMMC), 2016, Australian Drinking Water Guidelines 6, < https://www.nhmrc.gov.au/_files_nhmrc/file/publications/nhmrc_adwg_6_version_3.3_2.pdf>

Department of Natural Resources, Mines and Energy, Preparing a Drinking Water Quality Management Plan Supporting Information, September 2010, https://www.dews.qld.gov.au/__data/assets/pdf_file/0011/45587/dwqmp-supportinginfo.pdf

Appendix A

CCP procedures

Process Control		Disinfection CCP	Water Yard
Element		Chlorination	
Process Control		Set point controlled via SCADA	
Purpose		Disinfection	
Major Potential Hazards		Bacteria and Virus	
Hazardous Events		Sewerage infiltration, ingress into storage, ingress in reticulation	
Existing Preventative Measures		Daily Monitoring (sampling), SCADA alarms, visual inspections, regular servicing	
Monitoring Limits	Limits	 **Critical Limit > 4 mg/L or < 0.2 mg/L** **Action Limit 0.5 mg/L** **Or 3 mg/L** **Target Limit 0.9-1.5 mg/L**	
	Frequency	**Seven days a week (grab), continuous online**	
	Primary Responsibility	**Essential Services Supervisor / Operator/s**	
	Parameter	**<u>Free Chlorine after the Water Treatment Plant (Water Yard)</u>**	
Corrective Actions	Action	• **Resample to confirm. If action limit is breached, then adjust chlorine dose at water yard to bring back into target and flush reticulation to pull through disinfected water** • **If free chlorine is < 0.2 mg/L in the final treated water the plant will shut down via SCADA. Investigate and rectify issue, increase chlorine dose, check integrity of bores and pH adjustment plant, check bore water turbidity, consider manual chlorine addition (e.g. tablets into reservoir), bring plant back online after rectifying issue. Take an *E. coli* sample in final treated water. If issue is not resolved and *E. coli* is detected then consider implementing Boil Water Alert.** • **If free chlorine is > 4 mg/L in the final treated water the plant will shut down via SCADA. Investigate and rectify issue, decrease chlorine dose, isolate the reservoir if possible, confirm free chlorine levels are acceptable in the reticulation, test for total chlorine, if total is >5 mg/L in the reticulation then report to the Regulator.**	
	External Reporting	Report to QWSR if total chlorine becomes > 5 mg/L in the reticulation, if *E. coli* is detected during investigation	
	Primary Responsibility	Essential Services Supervisor and/or Operator/s	
Records		Analysis report held by Essential Services Supervisor	
Internal Notifications		**Action limit breach – operator/s to ESS** Critical limit breach – ESS to Manager Operations Division, if Boil Water Alert contact CEO	

Process Control		Bore Water Integrity CCP	Bores
Element		Bore water is safe from contamination	
Process Control		Bore integrity, aquifer integrity	
Purpose		To check that bore water is safe from contamination, surface runoff	
Major Potential Hazards		Pathogens	
Hazardous Events		Sewerage infiltration, runoff, flooding around bores	
Existing Preventative Measures		Weekly Monitoring (sampling), visual inspections	
Monitoring Limits	Limits	 **Critical Limit > 1 NTU** **Action Limit > 0.5 NTU** **Target Limit < 1 NTU**	
	Frequency	**Weekly (grab)**	
	Primary Responsibility	**Essential Services Supervisor and/or Operator/s**	
	Parameter	**Turbidity at the Bores**	
Corrective Actions	Action	• **Resample to confirm. If action limit is breached, then flush the bore line, investigate and rectify any issue, ensure the Disinfection CCP is working well.** • **If turbidity is > 1 NTU, investigate and rectify issue, flush bore line, take an *E. coli* sample for the bore, isolate bore if possible until *E. coli* reading is available, ensure disinfection CCP is working well. If issue is not resolved and *E. coli* is detected then report to the Regulator as an Event, take *E. coli* samples in the reticulation, arrange for protozoa (*Cryptosporidium* and *Giardia*) testing for the bores.**	
	External Reporting	Report to QWSR as an Event as specified above, if *E. coli* is detected in the reticulation during investigation then report as Incident – Non-compliance	
	Primary Responsibility	Essential Services Supervisor and/or Operator/s	
Records		Analysis report held by Essential Services Supervisor	
Internal Notifications		**Action limit breach – operator/s to ESS** Critical limit breach – ESS to Manager Operations Division, if Boil Water Alert contact CEO	

Appendix B

pH control procedure

Process Control		pH control	Water Yard
Element		pH control	
Process Control		pH tested daily to ensure it remains within spec.	
Purpose		Appropriate pH for effective disinfection and to manage pH for asset protection	
Major Potential Hazards		Bacteria and Virus, pH	
Hazardous Events		Incorrect pH correction	
Related Procedure		pH adjustment plant procedure	
Monitoring Limits	Limits	 **Action Limit < 6.5 or >8.0** **Target Limit 6.5 to 7.5**	
	Frequency	**Seven days a week, SCADA continuous**	
	Primary Responsibility	**Essential Services Supervisor and/or Operator/s**	
	Parameter	**pH after adjustment at water yard**	
Corrective Actions	Action	• **If pH is outside of action limits, then SCADA will send out an alarm. Resample to confirm. If pH is <6.5 then check the calcite pallets, determine need to change, investigate and rectify. If pH is >8.0 then investigate need to undertake raw water blending to bring back into target.** • **Check also pH in reticulation if <6.5 > 8.5 consider flushing, check reservoir and network integrity as well.**	
	External Reporting	Not required.	
	Primary Responsibility	Essential Services Supervisor and/or Operator/s	
Records		Analysis report held by ESS	
Internal Notifications		**Action limit breach – operator/s to ESS** **ESS to Manager Operations Division, if needed**	

Appendix C

Templates - Boil Water Alert and Cancellation

Boil Water Alert – Napranum Aboriginal Shire Council xx/xx/20XX

All residents and guests in Napranum should boil drinking water until further notice.

This advice has been issued following the detection of *E. coli*, which indicates that drinking water may be contaminated.

Customers should bring water to the boil and then allow it to cool before using it. Boiled water can be stored in a clean, closed container for later use. Customers should boil ALL water used for:

- drinking,
- brushing teeth,
- washing and preparing food or drinks,
- preparing baby formula,
- making ice
- Unboiled water can be used for:
- flushing toilets
- showers and baths – (but babies and toddlers should be sponge bathed.)
- washing dishes (if allowed to dry completely before using again)

Drinking unboiled water could lead to illness. Contact the Hospital if you become sick at this time.

Council is working hard to identify and fix the problem as soon as possible, and is sorry for the inconvenience.

Please share this advice with neighbours and friends.

Boil water alert no longer needed as of xx/xx/20XX

Napranum Aboriginal Shire Council advises that the town water is again safe to drink, and it is no longer necessary to boil water before use.

As a final check, please run your internal taps for 2-3 minutes to ensure that any contaminated water is removed from the plumbing.

Please share this advice with neighbours and friends.

www.viridis.net.au