



Drinking Water Quality Management Plan

Pormpuraaw Aboriginal Shire Council
Service Provider Number 148
May 2023

Prepared by

This document was initially prepared by NWM for Pormpuraaw Aboriginal Shire Council in 2021. Pormpuraaw Aboriginal Shire Council has amended the document based upon the independent audit conducted by Bligh Tanner in late November 2022.

Document Control

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Document History

#	Author	Checked	Approved	Issue Purpose	Date
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PASC Approvals

This document is authorised for release once all signatures have been obtained. In signing this approval, I agree that the document meets the standards required for the project and approve the

project to progress.

This document is endorsed by the Senior Plumber, Jack Wiles

Signature



Date 13/10/2023

This document is endorsed by the Executive Manager Operations, Piet Baxter

Signature



Date 13/10/2023

Glossary of Terms

Acronym	Definition
ADWG	Australian Drinking Water Guidelines 2016, published by the National Health and Medical Research Council of Australia.
CCP	Critical Control Point
CFU/100mL	Colony-forming units per 100millilitres
DRDMW	Department of Regional Development, Manufacturing and Water
DWQ	Drinking Water Quality
DWQMP	Drinking Water Quality Management Plan
E. coli	<i>Escherichia coli</i> , a bacterium that is considered to indicate the presence of faecal contamination and therefore a potential health risk
HACCP	Hazards and Critical Control Point
HBT	Health Based Targets
ISO	International Organization for Standardisation
KPI	Key Performance Indicator
LRV	log ₁₀ reduction value
mg/L	Milligrams per litre.
MPN/100mL	Most Probable Number per 100 millilitres
NHMRC	National Health and Medical Research Council
NTU	Nephelometric Turbidity Units
NWC	National Water Commission
PASC	Pormpuraaw Aboriginal Shire Council
QCP	Quality Control Point
QH	Queensland Health

UV	Ultra-Violet
WQ	Water Quality
WSAA	Water Services Association of Australia
WTP	Water Treatment Plant
<	Less than
>	More than

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1. Executive Summary

ES.1 Strategic Purpose

The intent of this plan is to protect public health through the identification and mitigation of any public health-related risks associated with drinking water. This plan follows a risk and outcomes-based system for managing the supply of drinking water. It is also intended that the plan be a living document that reflects our obligations our daily activities both now and in the future.

The structure of this plan reflects in part the structure of the framework as set out in ADWG and includes all 12 elements to demonstrate PASC’s commitment to achieving acceptable industry standards.

To demonstrate PASC’s commitment to effectively manage its water supplies, this plan was prepared in accordance with legislative requirements created by DRDMW and Queensland Health that impose rigorous and mandatory management practices on drinking water infrastructure to ensure compliant drinking water quality. To be effective the plan has included:

1. A description of the services to which the plan applies.
2. Details of the infrastructure for providing the services.
3. Identification of the hazards and hazardous events we consider may affect the quality of water to which the services relate;
4. An assessment of the risks posed by the hazards and hazardous events;
5. A demonstration of how PASC intends to manage the risks posed by the hazards and hazardous events;
6. Details of the operational and verification monitoring programs, including the parameters to be used for indicating the effectiveness of the plan and the water quality criteria for drinking water; and,
7. An improvement plan to ensure shortfalls are actioned within a reasonable timeframe.

To ensure that this is achieved, senior management will need to be actively involved in the development and implementation of the plan and encourage an organisational philosophy and culture that supports drinking water quality.

ES.2 Summary of Current Position and Actions Required for Success

With the undertaking of this plan, PASC has demonstrated an intent to commit to improving the drinking water quality for the various sites to acceptable industry standards.

We have in place several controls for each element and have also proposed several enhancements as follows:

Table E.1 – Summary of Current Position and Actions Required for Success

No.	Element	Current Position and Actions Required for Success
1.	Commitment to Drinking Water Quality Management	<ul style="list-style-type: none"> ▪ <i>Our DWQMP has been in place for several years;</i> ▪ <i>We have updated the DWQMP to include cybersecurity risks and align the plan with the independent audit recommendations;</i> ▪ <i>Partner with QH in the Safe and Healthy Drinking Water in Indigenous Local Government Areas Program.</i> ▪ Update our risk assessment and risk improvement plan

No.	Element	Current Position and Actions Required for Success
2.	Assessment of the Drinking Water Supply System	<ul style="list-style-type: none"> ▪ We have updated our description of the water supply system, the raw water quality information, and have undertaken a major update of the risk assessment.
3.	Preventive Measures for Drinking Water Quality	<ul style="list-style-type: none"> ▪ We have reviewed our CCPs as part of the risk assessment and advise that a future water treatment plant for chemical dosing and filtration/ion exchange is likely needed.
4.	Operational Procedures and Process Control	<ul style="list-style-type: none"> ▪ We are in the process of reviewing and revising procedures utilising input from QH. ▪ New procedures -Main break repair, Reservoir inspection, chlorination, bore inspections, incident reporting
5.	Verification of Drinking Water Quality	<ul style="list-style-type: none"> ▪ We have a reasonable program in place and will continue to review it annually. ▪ Additional Radiological testing to investigate sources of Gross alpha and beta to determine radiological risk ▪ Update our water sampling procedures
6.	Management of Incidents and Emergencies	<ul style="list-style-type: none"> ▪ We are reviewing and revising response protocol in place. ▪ commit to training all operators on the escalation process
7.	Employee Awareness and Training	<ul style="list-style-type: none"> ▪ We are continuing to train staff to achieve/maintain competency. ▪ We will get access to additional training from QH as part of the WASH program ▪ Staff are currently enrolled Cert 3 in water
8.	Community Involvement and Awareness	<ul style="list-style-type: none"> ▪ We understand that the community is an important stakeholder that can alert us to issues. We propose to provide additional information on council's website. ▪ We have an additional asset in the form of a digital sign that provides info to the community
9.	Research and Development	<ul style="list-style-type: none"> ▪ Given we are a small council, investigations have been limited to establishing minimum health requirements. ▪ In the future we propose to review: <ul style="list-style-type: none"> ▪ Our procedures to include early warning actions. ▪ Water quality at CCPs to ensure they are effective. ▪ Our sampling procedures ensure the accuracy of information.
10.	Documentation and Reporting	<ul style="list-style-type: none"> ▪ Our reporting is compliant with Queensland Government requirements; ▪ We plan to continue to undertake annual reviews of our procedures.
11.	Evaluation and Audit	<ul style="list-style-type: none"> ▪ Evaluation has been limited to DWQMP reviews; ▪ It is proposed that an annual review of monitoring results over the preceding year will be undertaken as part of the annual report.
12.	Review and Continual Improvement	<ul style="list-style-type: none"> ▪ Our DWQMP has met minimum requirements and has provided a sound basis to manage DWQ risks;

No.	Element	Current Position and Actions Required for Success
		<ul style="list-style-type: none"> ▪ <i>Our Drinking Water Quality Management Improvement Plan has been expanded because of the major risk assessment update including cybersecurity.</i>

ES.3 Closing Statement

PASC is moving positively to achieving success in providing acceptable drinking water to its staff and customers. The next step is to enhance the management of our systems to acceptable industry standards in line with the progressing requirements set by DRDMW and Queensland Health.

1. Commitment to drinking water quality management

1.1 Application of the Plan

This plan applies to the 1 scheme described in this document.

1.2 Plan Status

This plan was updated in December 2022 as per the findings from the independent water audit and the current version responds to the IRN from the Regulator. Our aim is to provide the best service by revising our plan based on the information we have received during the audit process.

This plan was previously updated in September 2020 principally to include cybersecurity risk however the risk assessment was externally reviewed to ensure that health-based targets were understood and to check that a range of contaminants was addressed. The revision also included a layout update to better align with the ADWG's 12 elements.

Prior to that the last update was in May 2018 to reflect the 2017 additions to the water service, namely the inclusion of a new 2ML storage reservoir and the associated chlorination system upgrade

1.3 Registered Service Provider Details

PASC is responsible for the management of the potable water reticulation network and the provision of safe and reliable drinking water to residents.

The Registered Service Provider Number for TCC is SP148.

1.4 Approach

The structure of this plan reflects the structure of the framework as set out in ADWG and includes all 12 elements to demonstrate PASC's commitment to achieving acceptable industry standards.

The ADWG is based on the elements of HACCP, ISO 9001 (Quality Management) and AS/NZS 4360:2004 (Risk Management). However, this plan has adopted AS/NZS ISO 31000:2009 as the basis of the risk assessment.

The intent of this plan is to protect public health through the identification and minimisation of any public health-related risks associated with drinking water. This plan follows a risk and

outcomes-based system for managing the supply of drinking water. It is also intended that the plan be a living document that reflects our obligations to be actioned in our current daily activities now and in the future.

1.5 Regulatory Requirements and Relevance

The key regulations that apply in Queensland that are relevant to the management of drinking water quality risk are shown below.

Table 1.1 – Key Regulations

Legislation	Relevance
<i>Water Supply (Safety and Reliability) Act 2008</i>	<p>Council registered as a service provider.</p> <p>Service provider given powers to do certain things (e.g. disconnect customers, restrictions).</p> <p>Required to have an approved DWQMP and comply with the DWQMP.</p> <p>Required to report and respond to drinking water incidents.</p> <p>Plumbers are required to install water meters.</p>
Public Health Act 2005 and the Public Health Regulation 2005	<p>The object of this Act is to protect and promote the health of the Queensland public.</p> <p>These documents include provisions relating to drinking water quality. As the administrator of the Public Health Act and the Public Health Regulation, Queensland Health has 1) Set specific standards for drinking water quality in the Regulation; and, 2) The power to respond when drinking water supplied by a provider may present a risk to public health or be considered unsafe.</p> <p>Under section 57E of the Public Health Act, it is an offence for a Provider to supply drinking water that the provider knows, or reasonably ought to know, is unsafe. The maximum penalty for the offence is 3000 penalty units or 2 years imprisonment.</p> <p>Section 57C of the Public Health Act states that 'drinking water is unsafe at a particular time if it would be likely to cause physical harm to a person who might later consume it, assuming nothing happened to it after that particular time and before being consumed by the person that would prevent it's being used for its intended use'.</p>
Water Fluoridation Act 2008, and associated regulations	Not relevant unless this treatment is introduced, which is very unlikely.
Plumbing and Drainage Act 2002	Only licenced plumbers and drainers are permitted to install water pipes and fittings etc.
Environmental Protection Act 1994	This Act is primarily relevant in 2 areas 1) Protecting the environment from operational activities and infrastructure associated with water supplies. This includes hazardous material management, and also the management of river extraction.
Work Health and Safety Act 2011	Council must ensure safe work practices, including in the provision of drinking water.
Australian Standards	Numerous standards for plumbing, chemical handling etc.

1.6.1 Current Operating Agreements and Licences

There is only 1 licence relevant to the plan for the extraction of water from the 4 bores. There is currently 1 approval from the state government for PASC's DWQMP dated 21 August 2018.

1.7 Engaging Stakeholders

The following is a list of stakeholders and the impacts on them, or how they impact water quality.

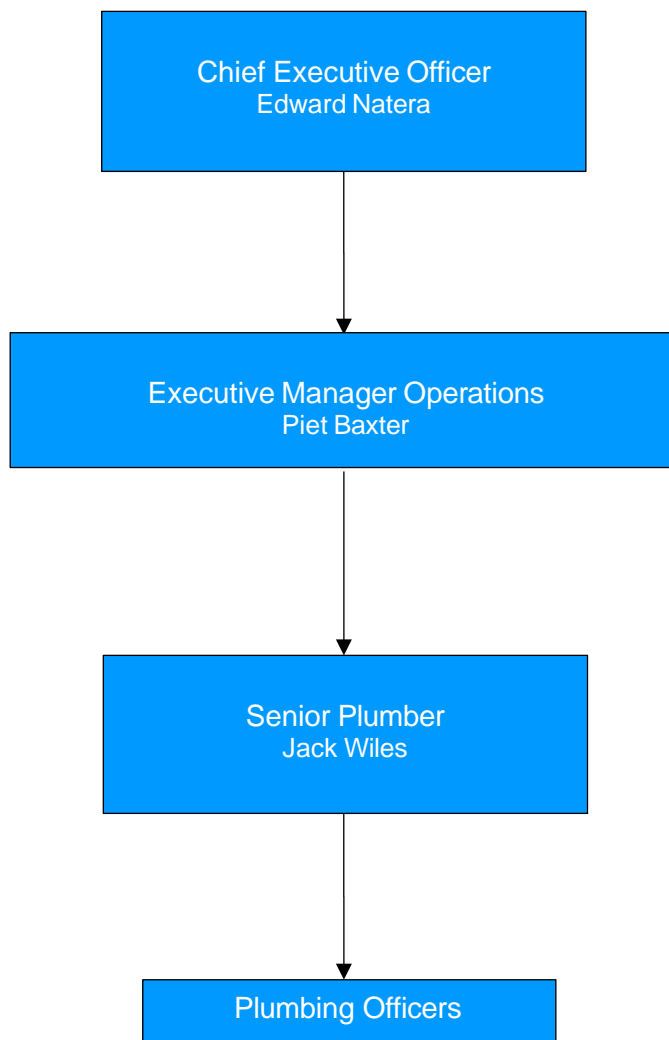
Table 1.2 – Stakeholders

Stakeholder and contact info	How impacts on, or is impacted by water quality	Communication or Consultation
PASC staff Tel: 07 4060 4600 admin@pormpuraaw.qld.gov.au	Operational procedures	Informed of any water quality issues.
CEO & Council Tel: 07 4060 4600 admin@pormpuraaw.qld.gov.au	Overall Management, Budget and Finances	Informed of any water quality issues.
Consumers	Public health, use of catchments and storages, septic tanks, vehicles in catchment, farming	Informed of any water quality issues.
Vulnerable residents or visitors	Public health – Includes micro-biological and chemical risks for people at risk, the young and elderly.	Informed of any water quality issues.
Hospital (Clinic) P: 07 4060 4800 MD21-TorresCape- HHS@health.qld.gov.au	Consumer	Informed of any water quality issues & they will provide advice during any public health incidents.
School Tel: 07 4060 4777 principal@pormpuraawss.eq.edu.au	Consumer	Informed of any water quality issues.
Catchment users and/or managers	Impacts on raw water quality include cattle graziers. Either upstream or downstream.	
Chemical Suppliers- Chlorine, IXOM: +61 3 9906 3229 Acid -Coxen Chemicals 07 4051 9355	Nonconforming products, including, chlorine, acid, and lime. Availability and supply of stock	70 Kg Cylinders have specifications stamped into cylinder. No Issue with acquiring stock as required. No Issues with Chlorine degradation. 1 cylinder is lasting approx one month before a changeover.
DERM for environmental management P: 13 74 68	Use of treatment chemicals which are disposed of into waterways	
DRDMW P: 1300 596 709	Regulator	Informed of any water quality issues & Consulted during development of all strategic plans to ensure compliance.

Stakeholder and contact info	How impacts on, or is impacted by water quality	Communication or Consultation
Queensland Health P: 13 43 25 84	Public health	Informed of any water quality issues. Point of Contact for Water Quality Issues
Cairns Regional Council Laboratory Phone: +61740448339	NATA Certified Laboratory where monthly waters samples are sent for analysis	Informed of any water quality issues. Scheduled water samples are collected and sent every month to this laboratory to ensure compliance.
Plumbers P:0400513491 plumber@pormpuraaw.qld.gov.au	Quality of water supply for reduced maintenance of pipes, fittings and appliances	

1.8 Organisational Structure

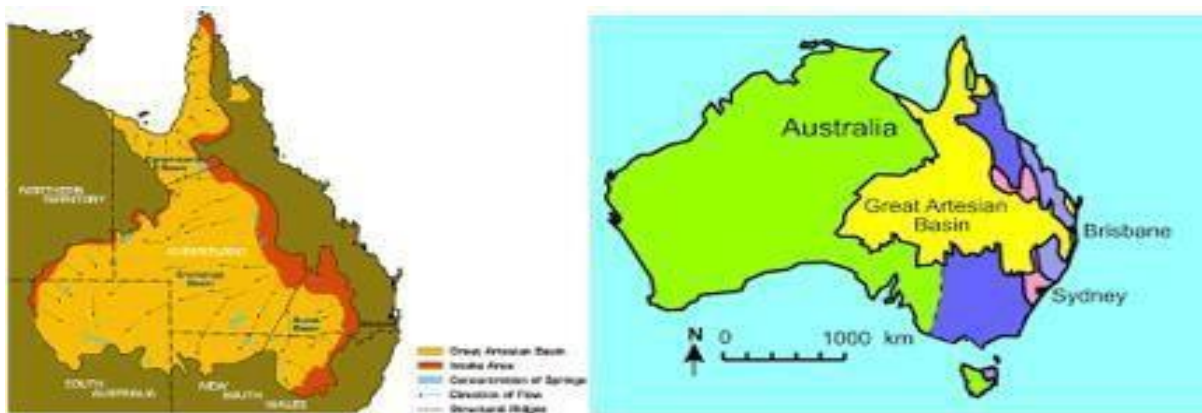
Drinking water is managed in PASC by the Senior Plumber and support staff, under the Executive Manager Operations, who reports to the CEO. A diagram of this structure is presented below.



2. System analysis and management - Assessment of the Drinking Water Supply System

2.1 Location and Catchment

Pormpuraaw is located on the west coast of Cape York in Queensland, about 500 Kms from the northern tip of Queensland. It is approximately midway between Weipa and Karumba. The Pormpuraaw DOGIT area is approximately 436,000ha, bordering Kowanyama to the south and Aurukun to the north. The Township of Pormpuraaw is situated between the Chapman River (2km to the south) and the Mungkun Creek (6kms to the north). The Artesian bore water for Pormpuraaw is sourced from the sub-artesian from the deep Wyaaba bed hosted aquifer overlying the Carpentaria Basin. Maps showing this are below.



The Bulimba Formation is predominately recharged via infiltration of rainfall in outcrop areas and via some upward leakage from the underlying GAB aquifers.

Pormpuraaw experiences two distinct seasons, wet and dry. The wet season runs from November to March and the dry season is the remainder of the year. Wet Season temperature can easily reach 36 Degrees Celsius. “Summer” is in the wet season and this is when the region receives most of its annual rainfall, in the form of heavy thunderstorms and/or cyclonic weather conditions. Throughout the wet season, Pormpuraaw can receive in excess of 1230mm of rainfall. By comparison, the dry season may yield less than 75mm during its months.

The area suffers occasional flooding and bushfires, under normal conditions both of which do not interfere with the water supply.

The country surrounding Pormpuraaw is a flat, heavily forested and bushy area with wet swampy sections.

The soil in and around Pormpuraaw is predominately sandy, loamy soils. The area does not support agriculture or pasture for grazing to any extent.

2.2 Water Supply System Analysis

2.2.1 Details

This plan covers 1 scheme under the control of PASC as follows:

Table 2.1 – Water Supply System Information

Item	Details	
Scheme Name	PASC Township	
Operator	Pormpuraaw Aboriginal Shire Council	
Water Sources	Bores 1 & 2, new Bore 5 to be commissioned 11/23	
Alternative Water Sources	Bores 3 & 4. This is not used and would require system augmentation and disinfection capability for them to be added to the system	
Towns supplied	1 - Pormpuraaw	
Treatment processes	Chlorination only with pump station	
Treatment Capacity	1.3 M/L per day	
Clear Water Storages	1 x 500kL 1 x 2ML	
Town Reservoirs	2 x 120kL elevated water tanks	
Reticulation Network	Approximately 35 kilometers	
Verification Sampling Points	12 located within the reticulation network	
Operational Sampling Points	3, located at Bore 1, Bore 2, and the chlorine analyzer at the Water Treatment Plant	
Population	Current	750
	Projected in 10 yrs.	825
Residential Connections	Current	207
	Projected in 10 yrs.	250
Other connections	Current	35
	Projected in 10 yrs.	42
Demand ML/D	Current	1.1
	Projected in 10 yrs.	1.5

PASC is responsible for the provision, operation and maintenance of infrastructure used to source, treat and transport potable water to the community residents for domestic and community purposes.

Water for Pormpuraaw is sourced from underground bore fields. There are 2 main production bores currently in operation bores. We will have a third bore operational late 2023 to early 2024 to ensure water security for the community

We have two older redundant non-potable bores are established in the town area; however, these bores are used for construction and irrigation purposes only.

Water is pumped using submersible pumps from the bores. The disinfection is done through chlorination and acid. Primary disinfection is done prior to the smaller of the 2 storage reservoirs, followed by trim dosing on the larger main reservoir. Both storage reservoirs and the chlorination system are in the water treatment site east of the town.

Treated water from the main reservoirs is pumped to 2 high -level header tanks in water compound site in town. Water pressure is then boosted via a VSD booster pump set and distributed through the town reticulation system.

Detailed locality and environs information on these schemes are provided in Appendix A – Water Supply System Information.

2.3 Assessment of Water Quality Data

2.3.1 General

Presented in Appendix B – Water Quality Analysis are:

- Table of operational monitoring for a selected period of time
- Excel worksheet of the Cairns Regional Council LIMS data extract with all available data.

2.3.2 Indicators Studied

The following paragraphs were focussed on as the main indicators:

- E. coli;
- Metals;
- pH;
- Turbidity;
- Nutrients and anions;
- Chlorine residual;
- Total dissolved solids;
- Electrical Conductance;
- Total Alkalinity;
- PFAS.

2.3.3 Results Summary

The following is a summary of the results

Table 2.2 – Summary of Water Quality Results

Parameter	Comments
E. coli	<i>E. coli</i> results were found to be consistently good which indicates a good raw water supply and good protection throughout the water supply system consistent with the HBT assessment in the appendix. There have been 63 samples collected over the past 8 years, of these there have been 3 results that have returned results that were not recorded as <1. 2 of these results were diluted by the laboratory prior to analysis, increasing the detection limit to <10. The results were recorded by the laboratory as “est 10”. The very first <i>E. coli</i> sample from bore 2 was also recorded as “est 1”. That is the data demonstrates there are not regular detections of <i>E. coli</i> in the bores, although there is now increased uncertainty.
Metals	These were found to be naturally below health and aesthetic values.
pH	pH results are all between 7.5 and 8.1, which is ideal.
Turbidity	Turbidity is typically low, with the 95%ile value for turbidity for bore 1 of 0.51NTU and a single elevated turbidity of 1.5 NTU (n=30). Bore 2 has a 95%ile of 0.5 NTU, and a maximum of 1 NTU (n = 30). It is noted that these are laboratory measurements, not field.
Nutrients and anions	These were found to be naturally below health and aesthetic values.
Chlorine residual	The lowest average value across the sampling sites was 0.51, and the minimum was 0.37, and a maximum of 0.97. The ADWG considers 0.3 as a recommended minimum value.
Fluoride	Fluoride is naturally around 0.7 mg/L with a range of 0.62 to 0.77 mg/L (bore 1 n =30) and 0.61 to 0.72 (bore 2 n=30). Fluoride is a conservative tracer, and the low level of variance is consistent with a water source that is not directly impacted from surface water.
Total dissolved solids	TDS in bore 1 has a 95%ile value of 610 mg/L slightly above the aesthetic guideline of 600 mg/L. Bore 2 has a 95%ile of 530 mg/L.
Electrical Conductance	EC is elevated with 95%iles of 990 µS/cm (Bore 2) and 1100 µS/cm (Bore 1) . Good drinking water is below 800. This is an aesthetic parameter, and there are no health risks.
Sodium	Sodium values are elevated with 95%ile values of 145 and 120 mg/L (Bore 1 and 2). Values above 20 mg/L can be of concern for customers with hypertension or kidney issues.
Total Alkalinity and Total Hardness	The alkalinity is ~280 mg/L and hardness is 240 mg/L. These values are likely to cause scaling problems.
PFAS	all results are non-detect.

Colour was not on the data sheets however the assessment team noted that this had not been observed to be an issue in the water samples, nor were there any complaints recorded.

From the above assessment, it is considered that the raw water quality is generally adequate for drinking water, however, there are several aesthetic concerns which may warrant treatment in the future. The chlorine and turbidity management are generally within acceptable ranges.

None of the remaining contaminants were found to exceed ADWG.

2.4 Hazard Identification and Risk Assessment

2.4.1 High-Level Strategic Assessment

An HBT investigation was undertaken, as shown in Appendix C – Health Based Targets Assessment, to provide a strategic assessment of the catchment. It required the undertaking of a Tier 1 sanitary survey, characterisation, a vulnerability assessment, microbial indicator assessment, and assignment of a log reduction value deficit. Log reduction value credits were assigned to existing disinfection facilities. The difference in values was calculated to assess water safety.

A summary of catchment protection status is summarised below.

Table 2.3 – Assessed Catchment Protection Status

Determined Category	Description	LRV Status		
		Crypto	Bacteria	Viruses
1	Protected catchment	0	-4	0

It was concluded that for the catchment, disinfection is the only required and is consistent with the water quality data assessment in terms of public health. This information assisted in moderating the risk assessment risk scores. PASC plans to monitor the catchment category status and cross-checks any occurrence of *E. coli* in the raw water supply as a regular verification process.

There have been 2 recent “detections” of *E. coli* in the raw water (3 in total out of 63 the 3rd result is “est 1”). These results were for samples that were diluted prior to analysis and reported as “est 10” with a limit of reporting of <10. Council has upgraded the sampling point to new stainless steel ball valves with a capped outlet to minimise the risk of contamination during collection. We also re-educated staff around collection protocols.

If *E. coli* detections continue, we will further review the causes. We plan to do this in conjunction with QH when they are in community delivering the WASH program.

2.4.2 Risk Assessment Team and Workshop

A video conferencing workshop was held on Wednesday 8 September 2020. A team was assembled to undertake the risk assessment that was judged to have appropriate knowledge and expertise to assess the risk for the system. The workshop initially concentrated on the HBT assessment and then applied it to the risk assessment.

The following personnel were assembled for the workshop:

Table 1.1 – Hazard Identification and Risk Assessment Team

Name	Organisation	Position	Expertise & System Knowledge
Glen Harris	PASC	Executive Manager Environmental	Environmental Industry 5 years Water and Sewerage 7 years
Jack Wiles	PASC	Senior Plumber	Water and Sewerage 10 years
Jeff Ballard	Northern Water Management	Water Quality Specialist	Water Industry 27 years
Ian Ribbons	Welcon	SCADA Network Specialist	Water Industry 30 years

Table 2.4 – Instructure Requirements – Existing Scheme Layout

CCP			
Filtration	Chlorination	UV	Secondary Chlorination
Not Required as bores are protected	Existing	Not Required	Not Required

2.4.3 Risk Assessment

Appendix D – Risk Assessment contains the risk assessment and actions summary.

In addition to the health-based contaminants (*Cryptosporidium*, bacteria, and viruses) the previously mentioned contaminants were of main interest to the risk assessment. The above scoring system is an excellent tool for determining if your physical systems can reduce the health-based risks to an acceptable level, however, it does not assist in managing the infrastructure for routine operations, events, or variability in contaminants or flows, where active management by personnel/automated infrastructure systems is needed. It also does not address non-HBT risks. Therefore, a risk assessment was needed to guide personnel on what risks may occur and what procedures will be needed to mitigate them to an acceptable level or eliminate them. All relevant catchment hazards were entered into the main risk table. Only risks that were medium or above were checked in the next infrastructure area. However new risks were introduced at each infrastructure area.

2.4.4 Previous Risk Assessments

The risk assessment from the previous DWQMP revision was used for reference and included in the latest version. Specific contaminants were cross-checked for consideration for inclusion in the new risk assessment which was created from first principles.

2.4.5 Cybersecurity

PASC relies on SCADA systems for remote monitoring and control of its disinfection plant, processes, and ancillary equipment. Because of the critical importance of SCADA to manage and operate critical infrastructure, it is imperative that SCADA systems are secure and can be recovered in the event of a disaster. PASC has identified that its SCADA system may be a target for security attacks that can lead to shut-down or interference, which would result in poor water quality consumption by the community. The 2020 risk assessment included a cybersecurity component and is based on the referenced documentation, numbers 1 to 5. A specialist water quality consultant was engaged to assess this hazard area in consultation with our SCADA maintenance contractor.

2.4.6 Risk Assessment Framework

The DRMMW risk assessment framework was used as the basis of the DWQMP risk assessment. This is described below. This included a definition of the likelihood, consequence and risk level, an explanation of the acceptable risk level and the rationale for this selection. The methodology is based on the premise that risk is defined as the likelihood of identified hazards causing harm in exposed populations in a specified timeframe, with consideration for the severity of the consequences (i.e. risk = likelihood x consequence) (NHMRC). The descriptors for uncertainty are also presented below.

Table 2.6 – Likelihood Description Table

Likelihood	Descriptor	Definition
A	Rare	Occurs less than once every 5 years
B	Unlikely	Occurs more often than once every 5 years and up to once per year
C	Possible	Occurs more often than once per year and up to once a month
D	Likely	Occurs more often than once per month and up to once per week
E	Almost Certain	Occurs more often than once per week

Table 2.7 – Consequence Description Table

Consequence	Descriptor	Definition
1	Insignificant	Little or no disruption to normal operation
2	Minor	Minor impact for a small percentage of the population, manageable operational disruption
3	Moderate	Minor impact for a large percentage of the population. Significant disruption in normal operation but manageable
4	Major	Major impact for a small percentage of the population, systems significantly compromised
5	Catastrophic	Major impact for a large percentage of the population, complete failure of systems

Table 2.8 – Risk Table

		Consequence				
	Likelihood	Insignificant-1	Minor-2	Moderate-3	Major-4	Catastrophic-5
E	Almost Certain	Moderate	High	Very High	Very High	Very High
D	Likely	Moderate	High	High	Very High	Very High
C	Possible	Low	Moderate	High	Very High	Very High
B	Unlikely	Low	Low	Moderate	High	Very High
A	Rare	Low	Low	Moderate	High	High

Table 2.9 – Uncertainty Descriptors

Uncertainty Level	Descriptor
Certain	The processes involved are thoroughly understood and supported by extensive on-site knowledge, and/or high frequency (weekly or better) water quality data.
Confident	The processes involved are well understood and supported by extensive operational experience, and/or monthly water quality data
Reliable	There is a good understanding of the process which is supported by quarterly water quality data and operational experience.
Estimate	The process is reasonably well understood and is supported by some water quality data.
Unreliable	The process is not well understood, and there is little to no water quality data.

2.4.7 Acceptable Risk

Low and medium residual risks are considered acceptable risks and have appropriate control measures to manage the risks for continuous improvement.

High and above risks have been associated with an improvement action. In addition, an improvement action has also been associated with places where the level of uncertainty is uncertain or estimated. A few medium and low residual risks may have an improvement action where it was decided that the action would strengthen the performance of the existing control measures.

2.4.8 Strategic Management Outcomes

The following strategic management actions were also considered as part of the risk assessment:

- The HBT LRV scores relating to an installed solution assume that the facilities are effectively operated. Where a score of say 0 has been achieved, the client should consider a higher score to allow for any operational issues such as attendance. This may be overcome through some operational management improvements such as automated control systems and remote access.
- It is particularly important for a future water treatment plant that the incoming raw water operating limits are established to achieve a treated water turbidity < 1 NTU.

2.4.9 Management Area Identification

In consultation with water management staff, the following management areas were identified as supporting the risk assessment:

- The writing of new and updated procedures ;
- An updated and extended data management system such as SWIMLocal r;
- Training needs are assessed and implemented. It is important that water industry operator Certificate III certification is held for at least 2 personnel so that backup personnel can step into roles if and when needed. Specific training for chlorine and pH dosing has been identified as has emergency response training. Operator training occurred during the recent pH unit commissioning phase and will be reviewed. This included chemical safety such as addressing the Material Safety Data Sheet, and unit programming and control limits;
- The operational and verification monitoring plan is reviewed and clear;
- The water capital and operational budget planning process reflect the above medium to long-term aspirations.
- Look to upgrade our system to offer better quality water supply .The bores are protected, indicator chemicals (fluoride, calcium, magnesium, sodium) don't show rapid changes with rain – therefore low potential for ingress and contamination. The Water Val Chlorine Disinfection Validation Protocol seems applicable.
- The radiological (potential issue, not yet confirmed) is more likely dissolved, and the scaling issue wont be improved by filtration. Ion exchange is probably a better option.
- Conduct an analysis of the benefits of upgrading the SCADA system from a manual to an automatic system.

3. Preventative measures for drinking water

3.1 Multiple Barrier Assessment

The risk framework in ADWG recommends a multiple barrier approach. This requires the application of preventative measures eg actions, activities, and processes used to prevent hazards. Microbiological risks are acute and present in every drinking water supply system. Other risks are considered chronic such a lead. The risk assessment of the drinking water supply system considered high to very high risks in the catchment, and the barriers in place to manage these risks.

3.2 Critical Control Points

A “hazards and critical controls points” (HACCP) assessment process was used to identify and understand existing and future CCPs for each scheme. CCPs are locations where preventative measures are placed such as a chlorine dosing point. This is shown in Appendix E– HACCP Summary - Target, Alert and Critical Breach Limits.

For raw water turbidity, a critical limit of 1 NTU was placed on the un-filtered scheme. In practice, this is not achievable. However, the ADWG must be adhered to. Typical industry values for all other contaminants including iron, manganese, pH and chlorine, were used and were obtained from the ADWG or the document “Water Safety Plans, Managing drinking-

4. Operational procedures and process control

water quality from catchment to consumer”, World Health Organisation, 2005.

4.1 Operational Procedures

Appendix F – Operational Procedures and Program, contains PASC’s operational procedures and program.

The operational procedures cover a range of required actions from catchment to tap.

4.2 Quality Control

A QA framework is needed for procedures to be regularly checked and updated.

The Executive Manager Operations is responsible for informing operational staff on revision requirements if procedures are to be changed or to be updated.

4.2.1 Process for Storing Procedures and Related Information

All paper versions of the water-related procedures, checklists, and log sheets, require filing in the Plumbing Office, Pormpuraaw and shall be accessible by all authorised operational staff.

All information required to be entered into the electronic SWIMs database by the senior plumber, or another system, shall be undertaken on the day that the information was received or produced.

The Water Quality data received from the Cairns Water Laboratory Services is received electronically in their Laboratory reporting format and is stored in the Senior Plumber’s

computer in U-Drive as well as a hard copy is kept in his office. The Report is also electronically sent to the “the Executive Manager Operations. The Senior Plumber is responsible for alerting the Executive Manager Operations to any non-compliance issues with the results that are received from the Cairns Water Laboratory.

4.2.2 Process for Implementing Procedures

Ensuring that all water-related operational procedures are carried out appropriately is the responsibility of the Executive Manager Operations, Senior Plumber, and the Water and Sewerage Officers.

Staff members are trained in the procedures relevant to their role through induction and on the job training, as well as guidance and supervision by the Senior Plumber and the Executive Manager Operations.

It is the responsibility of the Executive Manager Operations to ensure that these procedures are understood and that they are implemented by all operational staff. We are in the process of implementing written standard operating procedures for testing processes that will include a VOC to demonstrate competency.

To ensure staff have understood and adhere to these procedures, the Executive Manager Operations shall undertake to visit and inspect work frequently.

These site inspections are done to check and ensure that procedures are been followed and to identify and emergent issues

4.3 Operational Monitoring

This monitoring is the day-to-day inspections that are needed to maintain systems in good working order. For example, monthly catchment monitoring is required to ensure the livestock is kept away from the catchment or ensuring that carted water has been taken from a potable supply. It is also intended to check that the processes and equipment that have been put in place to protect and enhance water quality are working as intended. The operational monitoring data are used, if necessary, as a trigger for immediate short-term corrective action to protect water quality. Operational monitoring data are generally not used for assessing conformance with the ADWG or compliance with agreed levels of service. Typically, operational monitoring is ongoing (routine) and frequent. For PASC, monitoring is proposed at twice weekly intervals for more changeable scenarios and less frequently or as required for other scenarios.

The operational monitoring procedures outline the recommended operational monitoring necessary to check the performance of the processes and equipment relevant to the relevant water supply, in terms of the key risks identified.

ALL operational monitoring is undertaken by the water and sewerage operational team. The team uses HACH PACIFIC EQUIPMENT for all in house water testing:

- Free Chlorine – HACH Pocket Colorimeter II 58700-00
- Total Chlorine – HACH Pocket Colorimeter II 58700-00
- Turbidity – HACH Portable Turbidimeter 2100Q01
- pH – HACH pH meter HQ11D (To be acquired)
- Temperature – HACH temp meter HQ11D
- E.coli – HACH MEL/MPN Coliforms and E.coli Presence only (To be acquired)

The HACH operational equipment can be re-calibrated by the operational team as required (quarterly minimum).

The operational equipment is also to be sent to HACH Pacific in Brisbane for re-calibration and servicing as required by the HACH service manuals.

Daily in-house monitoring is undertaken by the Essential Services Officer under the supervision of the Senior Plumber. These are undertaken for each of the 12 sites indicated in Appendix F. The samples are collected using standard water collection procedures. The operations team then act upon the results as described previously if the critical limits have been exceeded.

The Senior Plumber assesses the water quality results as they become available while keeping an overview of all monitoring and frequent meeting with the operations team. Operational staff have received on the job training from the Senior Plumber t in:

- Proper sampling procedures;
- In-house testing procedures;
- Analysing test result procedures.

Written Procedures are being developed and have been included in the Pormpuraaw Aboriginal Shire Council's continuous improvement policy.

4.4 Operational Monitoring using SCADA

Where possible the required checks are embedded into the SCADA system. This removes some of the risks that the procedure is not implemented as the SCADA system will send pages and alarms to operators or shut down processes automatically.

The critical limits are included in the HACCP plans in Element 3 as they are more easily accessible to operators in this format.

4.5 Corrective Action

All the procedures contain a corrective action column in the operational monitoring table. Where relevant, these are also embedded in the HACCP summary.

4.6 Equipment Capability and Maintenance

The CCP list was used to identify equipment associated with the control and dosing of water. This is summarised as listed in the operational procedures in Appendix F.

Both inspection and maintenance procedures are included for each equipment in this table along with information on hydraulic capacity and backup equipment.

4.7 Materials and Chemicals

Appendix F also mentions chlorine gas and sulfuric acid, which are the only chemicals used in the system.

Generally, only approved suppliers for materials, coatings and chemicals are used and are assessed at tender stage. Chemicals and materials are accepted by the operators using a procedure where they check the consignment before dropping off or pick up.

It is important that only approved suppliers, materials, coatings, and chemicals are used and are assessed before purchase.

5. Verification of Drinking Water Quality

5.1 Overview

The purpose of verification monitoring is to provide confidence that water supplied to consumers is safe, meets the State regulations and is in line with the ADWG, and does not contain unacceptable levels of hazardous substances. As it is not practical to test for all hazardous characteristics that may be present in water, monitoring effort and resources should be directed at the key characteristics of the supply.

The verification monitoring procedures recommend water quality monitoring necessary to verify the safety of each water supply, in terms of the key risks identified by the risk assessment.

5.2 Drinking Water Quality Monitoring

The verification monitoring plan and procedures are contained in Appendix G – Verification Procedures and Program. The program outlines the key water quality parameters that require testing for and are associated with the key risks.

Verification sampling is predominantly undertaken by the Environmental Health Officer under the supervision of the Senior Plumber, or when that person is on leave, the Senior Plumber however we will also have 2 additional options if required. The samples are placed in a sealed esky with ice bricks and flown to Cairns, usually mornings for delivery early next morning for the independent analysis.

Whilst there are regulatory requirements to take E. coli samples at a certain frequency which are met, this is not the driver of the verification monitoring program. The purpose of this sampling program is to identify any water quality problems and ensure that they are rectified promptly and appropriately managed into the future.

Sampling locations include raw, treated, and reticulation samples. This ensures that the samples are representative of the water received by customers, and targets higher-risk locations.

5.2.1 E. coli

There are regulatory requirements under the Public Health Regulation 2005 (Schedule 3A) that specify the minimum monitoring frequency and number of samples for Escherichia coli (E. coli). PASC undertakes sampling exceeding the legal requirements. The frequency and number of samples are identified in Appendix G.

The Essential Services Officer undertakes monthly sampling at 6 locations within the reticulation system and sends the samples to Cairns City Council for analysis and reporting using their NATA accredited laboratory. In addition, Total Coliforms and Heterotrophic Plate Count are also tested from these samples.

E. coli is also tested in the bores quarterly.

5.2.2 Additional Physical and Chemical monitoring

Appendix G also identifies the parameters that are monitored quarterly, and their locations (bores and treatment). The parameters monitored allows PASC to observe trends in water quality throughout the schemes. For example, by monitoring for turbidity, we can observe

changes in the reticulation network over time. Metals, chemistry, physical, and nutrients and anions properties are also monitored.

5.2.3 Event-Based and Investigative Monitoring

PASC will also initiate water quality sampling if there are events likely to impact water quality eg Mains break.

5.3 Consumer Satisfaction

Consumer complaint and response programs are in place. The established procedure for complaints is by contacting the council main administration centre where the issue can be passed onto the Executive Manager Operations and the Senior Plumber where it will be managed until resolved. Staff complaints are managed through the council management structure. This procedure forms a basis for troubleshooting issues raised. Appendix H– Water & Sewerage Complaints Checklist & Register contains a complaints checklist and register.

5.4 Short-Term Evaluation of Results and Corrective Action

Any monitoring results that reveal a reportable result are immediately reported by the testing laboratory to the Senior Plumber and Executive Manager Environment who are required to act by activating the incident and emergency plan and is immediately treated as a Reportable incident or emergency.

6. Management of Incidents and Emergencies

6.1 Communication

Currently, communications protocols are covered in the procedure below. The incident response and reporting protocols have been adopted from the Queensland Water Supply Regulator’s Drinking Water Service Provider Monitoring and reporting requirement guidelines.

Table 6.1 – Process for Incident Reporting

Incident	Reporting Requirements to Queensland Water Supply Regulator
<ul style="list-style-type: none"> ▪ Detection of E.coli; ▪ Detection of a pathogen; or, ▪ Any failure to meet ADWG health guidelines. 	By telephone within 3 hours of receipt of test results. 1300 596 709
Radiological (exceeding levels as described in the notice)	By telephone within 3 hours of receipt of test results. 1300 596 709
Parameter with no ADWG guideline value	Written confirmation within 24 hours
ANY event that is likely to affect water quality within the community.	By telephone as soon as practicable. 1300 596 709

We are in the process of developing procedures relating to communications and emergency response during incidents/emergencies and ensuring that all employees are trained in these procedures.

6.2 Contact Persons

Table 6.2 – Contact Persons

Position	Person	Email	Phone
Chief Executive Officer	Mr Edward Natera	ceo@pormpuraaw.qld.gov.au	(07) 40604600
Executive Manager Operations	Mr Jason Raggatt	Operationsmanager@pormpuraaw.qld.gov.au	0409 211 067
Senior plumber	Mr Andrew Veveris	plumber@pormpuraaw.qld.gov.au	0400 513 491

6.3 Incident and Emergency Response Protocols

Details of the incident and emergency response protocols are detailed below.

The first table provides the overview (Alert Level, Description, Key Responses, and positions responsible).

The second table provides a summary of actions and procedures.

ALL levels 1, 2 and 3 alerts will be notified through the Executive Manager Operations, who shall remain on call via mobile phone.

All the current water staff will be receiving on the job training concerning incident and emergency response protocols to operate as required.

All water staff will work for the Council under the guidance and supervision of the Executive Manager Operations.

Table 6.3 – Management of Incidents and Emergencies

Alert Level	Description	Key management Response(s)	Position(s) responsible
Level 3 Emergency	<ul style="list-style-type: none"> Outbreak of waterborne disease. Declared Disaster or Emergency Situation by the Pormpuraaw Aboriginal Shire Council / State or National Government. Any cybersecurity activity that causes a Level 3 water quality incident. <p><i>Requires coordination across all Council departments and is likely to require external resourcing and support from other agencies, such as the Queensland Water Supply Regulator, Queensland Health, Local Disaster Management Team Members and organisations, Emergency Responders Queensland Fire and Rescue and Police</i></p>	<ul style="list-style-type: none"> Activate the Pormpuraaw Aboriginal Shire Council's Disaster Management Plan. <p><i>Refer to the Summary of Actions and Procedures.</i></p>	<p>All of Council.</p> <p><i>As per Pormpuraaw Aboriginal Shire Council, lines of Authority</i></p>
Level 2 Incident	<ul style="list-style-type: none"> Non-compliance (typically against the ADWG values). 	<ul style="list-style-type: none"> Activate drinking water incident response and reporting protocols. 	Executive Manager Operations,

Alert Level	Description	Key management Response(s)	Position(s) responsible
	<ul style="list-style-type: none"> ▪ Event (anything that has happened or is likely to happen, in relation to a drinking water service that may have an adverse effect on public health). ▪ Examples include any natural disaster (floods, droughts) bushfire, the inability to operate the system within acceptable operational limits, contamination of source water, contamination of treated drinking water and or terrorism. ▪ Any cybersecurity activity that causes a Level 2 water quality incident. <p><i>The Incident will be managed within the water team who are the responsible operators for the communities' drinking water and the management of PASC and its DWQM Plan. In some cases, it may require extra coordination across Council's departments and with external resources and support, such as from the Queensland Water Supply Regulator and or Queensland Health</i></p>	<ul style="list-style-type: none"> ▪ Ensure all control measures identified in the DWQMP are functioning correctly. ▪ The Disaster Management Plan and team to go on to "STANDBY" notification. <p><i>Refer to the Summary of Actions and Procedures.</i></p>	<p>Senior Plumber</p>
<p>Level 1 Operational Exceedance</p>	<ul style="list-style-type: none"> ▪ Exceedance of Target Limits (as per the Councils operational monitoring section of this plan). ▪ Any cybersecurity activity that causes a Level 1 water quality incident. <p><i>These Incidents can be managed within the water operations team. An incident is not declared and the issue can be managed in line with the DWQMP.</i></p>	<ul style="list-style-type: none"> ▪ Ensure all operational steps are identified in the DWQMP are functioning effectively. ▪ Check and act upon operational records. Incident response and reporting protocols will be on standby. <p><i>Refer to the Summary of Actions and Procedures.</i></p>	<p>Executive Manager Environment, Senior Plumber</p>

Table 1.2 – Incident and Emergency Actions Required

Alert Level	Key management response(s)	Summary of Actions	Documented Plans & Procedures
Level 3 Emergency	<p>Activate PASCs Disaster Management Plan.</p>	<ul style="list-style-type: none"> ▪ CEO to notify council and assemble disaster management team ▪ Coordinate notification, investigation and response of water-related aspects ▪ Consider what community notifications/ messaging is required ▪ Coordinate community notifications ▪ Notify Queensland Water Supply Regulator as soon as practicable (Phone 1300 596 709) ▪ Cybersecurity additional requirements: ▪ Same as Level 2 cybersecurity actions. 	<ul style="list-style-type: none"> ▪ Emergency Response/ Disaster Management Plan ▪ Communication Protocols ▪ Alert Templates. ▪ Boil Water Alert ▪ Do Not Drink Alert ▪ Availability of Emergency Supply ▪ Cybersecurity Master Controls and actions
Level 2 Incident	<ul style="list-style-type: none"> ▪ Activate drinking water incident response and reporting protocols. ▪ Ensure all control measures identified in the DWQMP are functioning correctly. ▪ The Disaster Management Plan and team to go on to “STANDBY” notification. 	<ul style="list-style-type: none"> ▪ Senior Plumber to notify and advise Executive Manager Operations. ▪ Report Incident to Queensland Water supply regulator within the required timeframe. ▪ Ensure all control measures identified in the DWQMP are functioning effectively. ▪ Commence Investigation to determine cause, if it is not traceable through the DWQMP. ▪ Arrange for re-sampling where required. ▪ Instigate immediate remedial remediation actions, including isolation of affected areas as required. ▪ Review associated laboratory reports and operational records. ▪ In case of customer or consumer complaints, coordinate, investigate and seek resolution, including obtaining water samples as required. ▪ Disaster management plan is to be on standby if the need arises. ▪ Cybersecurity additional requirements: ▪ Level 1 cybersecurity actions, plus: ▪ Contact Police if relevant <ul style="list-style-type: none"> o Contact Australian Cyber Security Centre for all external activity 1300 292 371 ▪ Contact insurer 	<ul style="list-style-type: none"> ▪ Incident Response and reporting protocols ▪ QWSR Water Quality and Reporting Guideline ▪ Pormpuraaw DWQMP ▪ Cybersecurity Master Controls and actions

Alert Level	Key management response(s)	Summary of Actions	Documented Plans & Procedures
<p>Level 1 Operational Exceedance</p>	<ul style="list-style-type: none"> ▪ Ensure all operational steps are identified in the DWQMP are functioning effectively. ▪ Check and act upon operational and maintenance records. 	<ul style="list-style-type: none"> ▪ Operational staff to notify supervisor ▪ Review operations and maintenance records for any anomalies ▪ Commence Investigations to determine cause. ▪ Instigate immediate remedial actions ▪ Ensure all control measures identified in the DWQMP are functioning effectively. ▪ Increase operational monitoring as and where required. ▪ Ensure Incident responses and reporting protocols are on standby if the need arises. ▪ Cybersecurity additional requirements: ▪ Contact Police if relevant <ul style="list-style-type: none"> o Contact Australian Cyber Security Centre for all external activity 1300 292 371 ▪ Contact insurer ▪ For internal unintentional cybersecurity breach: ▪ Rectify water quality incident ▪ Determine lack of cyber security control ▪ Rectify control to prevent further incidents 	<ul style="list-style-type: none"> ▪ Operational and Maintenance Schedules ▪ Pormpuraaw DWQMP ▪ Cybersecurity Master Controls and actions

The following is intended to enhance the management system:

- Disinfection of mains procedure;
- The written process for providing safe drinking water to customers in the event of an emergency (particularly vulnerable customers);
- The process for training employees for emergencies;
- The process and frequency of testing emergency response procedures; and
- How incidents and emergencies are investigated, and protocols revised as necessary.
- Emergency response – commit to training all operators on the escalation process

6.4 Operational Action

At the low alert level, operational actions are required to manage the issue and prevent escalation. Issues at this level are normally identified through operational monitoring. Corrective actions will be taken e.g., according to the operational procedures identified in this plan. Exceedance of a critical limit does not automatically escalate to the next level if the water quality criteria are not breached.

6.5 Reportable Incident or Emergency

At this level, there is a potential for an adverse public health impact (or environmental harm).

These issues are identified through either operational or verification monitoring of the processes and water quality, or where there has been a significant widespread treatment or reticulation network failure resulting in the loss (or likely loss) of water supply for a period >6 hours. When identified, these issues are escalated as required.

In general, the Senior Plumber still manages the incident, but in close consultation with the Executive Manager Operations.

Appropriate corrective actions will be identified and implemented as soon as practicable to minimise the effect of the incident.

Incidents at this level are reportable to the Queensland Water Supply Regulator. We will inform the Regulator within 3 hours of becoming aware of the incident. 3 hours allows sufficient time to investigate the cause of the incident and commence corrective actions as soon as possible. Advice may be directly sought from Queensland Health if required.

Resampling: A resample will be arranged immediately (before corrective actions) for any parameter where the initial sample did not meet the ADWG health guideline value and another sample taken when corrective actions have been implemented.

6.6 Declared Disaster

The CEO and the Coordinator of the Local Disaster Management Group activate the Disaster Management Plan/ a Disaster is declared by the State Government.

This requires coordination across QLD State Government departments and requires external resourcing and support from agencies, such as Department of Emergency Services, Department of Energy and Water Supply, Department of Health, local disaster management groups, emergency responders like QFRS, Police.

When a Disaster Management Group is enacted, drinking water quality management actions will be taken as necessary to respond to the requirements of the Disaster Coordinator. The Executive Manager Operations is a core member of the Local Disaster Management Group and will report directly to the Coordinator of the LDMG on water requirements.

While every effort will be made to continue to implement the DWQMP, Disaster Management actions may take precedence. Every effort will be made to keep DRDMW informed of the situation as soon as practicable.

7. Employee Awareness and Training

7.1 Employee Awareness and Involvement

Records of the training that is undertaken by our personnel are kept as part of the council-wide training database.

There would be a benefit in undertaking additional targeted training of individuals to aid in ongoing staff development.

To enhance the management system, we will ensure staff have an understanding of this plan and procedures.

Internal training for operational staff is conducted by way of Toolbox Talks. These are short group information sessions that ensure staff know their responsibilities and are made aware of any changes that affect their daily work processes and tasks.

7.2 General Water Employee Training

Where there are deficiencies, specific staff training is planned to be undertaken by the Water Industry Operators Association.

There is currently no formalised procedure for the identification of training requirements. It is proposed that the following be undertaken:

- A training needs analysis;
- Training & Development Plan;
- Provision of training and skills development; and,
- Maintaining or enhancing water quality management skills in the organisation through recruitment, succession planning, mentoring etc.

For individuals, the job skills required and their current competency level should be consistent to allow for staff turnover. It is expected that the following generic list will be used as the basis of the analysis:

- General water quality understanding;
- Environmental obligations;
- Water biology and water chemistry;
- Specific training to optimise system performance such as:
 - Proper filtration operation;
 - Disinfection system operation;
 - Reticulation management;
 - Sampling, monitoring and analysis;
 - Interpretation and recording of results; and,
- Maintenance of equipment.
- Incident and emergency response;
- Documentation;
- Record keeping; and,
- Reporting.

Commonly used training techniques and methods can be used including a combination of:

- Formal training courses accredited by a national training body;
- In-house training;
- On-the-job experience;
- Mentor programs;
- Workshops;
- Demonstrations; and,
- Seminars, courses and conferences.

Training programs should encourage employees to communicate and think critically about the operational aspects of their work.

Training will be documented, and records of all employees who have participated in training maintained. Mechanisms for evaluating the effectiveness of training will also be established and documented.

As training is an ongoing process, the requirements will be regularly reviewed to ensure that employees maintain the appropriate experience and qualifications. For those activities that have a significant impact on drinking water quality, periodic verification of the capability of operations staff is necessary.

It is an expectation of the Council and the Manager of Water and Waste that this plan is understood and implemented by relevant staff.

7.3 Specific Water Employee Training

Water treatment operators are essential to ensure the safe operation of water treatment plants, and in implementing the actions identified in this plan.

To engage operators, much of the development of these plans was done in conjunction with the relevant stakeholders to encourage ownership.

8. Community Involvement and Awareness

8.1 Community Consultation

To assist in ensuring the raw water sources are managed as best as possible, and to enable community feedback for water supplied (whether it be potable or non-potable) the community must be informed.

There is currently general information on the protecting catchments on the council website. This goes a long way to protect the water source, however, it is intended that information is added for locations that have a potable water supply. This highlights an additional but important consideration to acting responsibly in a catchment. The data should provide information on:

- Description of how PASC manages water quality;
- Discussion of issues on drinking water quality, public health and risk assessment, cost of treatment and levels of service;
- Details of the water supply system and the drinking water quality management system;
- Incident and emergency response plans, including procedures for notification when drinking water quality poses a health risk;
- Consumer responsibilities beyond the tap;
- The need for further treatment of water for special purposes (e.g. vulnerable persons); and,
- The role and responsibility of the community in protecting water supply catchments and water conservation.

8.2 Communication

Please refer to Section 5.3 and Section 6.1 for previous discussions on this topic.

9. Documentation and Reporting

9.1 Management of Documentation and Records

Primarily, PASC uses a cloud network to manage documents and records. All documents on file are accessible by management, team members and other internal staff. A copy of the latest version and the relevant documents that apply to their work are available in hard copy, for example, on notice boards within the depot and plants.

Records, procedures, this plan, monthly water reports, and the like, are saved into appropriate files where they should receive a unique document number and are stored under a set filing structure. For example, there are other methods in which records are collected and stored. At the Water Treatment Plants, daily sheets are manually filled out to record operational parameters, and these are stored in hard copy at the WTP. WTP monthly and quarterly reports are provided to the Executive Manager Operations electronically.

Verification monitoring data is entered daily into SWIMs. The Executive Manager Operations also report quarterly to Councillors on all water matters.

All records are kept in accordance with Public Records Act requirements.

.SWIMLocal permits automatic generation of reports for specified periods and assess results with values from the Australian Drinking Water Guidelines.

Continuous online operational data is captured and stored by the SCADA system. The current system retains 12 months of data to allow operators to look at annual trends and archives all older data.

9.2 Process for Maintaining and Implementing Procedures

Several procedures are in place however we will look at working towards more procedures such as ;Main break repair, Reservoir inspection, chlorination, bore inspections, (update water sampling), incident reporting and emergency response. We are also working with WASH to develop standard operating procedures. PASC has taken the position that all the procedures will require review in a quality assurance system. These will be reviewed periodically.

Operational Procedures and CCPs are primarily documented through this plan and are intended to be embedded within the SCADA system and quality controlled.

Reporting processes are the responsibility of the Senior Plumber and signed off by the Executive Manager Operations.

9.3 Structural Review of Documentation

In addition to the previous statement, the procedure should include a 2-yearly review of this plan.

9.4 Reporting

The external DWQMP annual reports be used as the primary tool for reporting both internally and externally. Specific complaints or incidents may require reporting to the council at a monthly council meeting.

10. Evaluation and Audit

10.1 Long-Term Evaluation of Results

We will conduct an annual review of monitoring results over the preceding year will be undertaken as part of the annual report. The previous 3 years will be reviewed for long term evaluation as part of the DWQMP review cycle. This will ensure that:

- There is a process to assess overall performance against numerical guideline values, obligations or agreed levels of service;
- The business identifies emerging problems and trends; and,
- Priorities are determined for improving drinking water quality.

The interpretation of data sets may include a statistical evaluation of results and graphs or trend charts using a 'control chart' format.

Evaluation of results will be reported to the CEO.

10.2 Audit of Drinking Water Quality Management

10.2.1 Internal Audits

Auditing is the systematic evaluation of activities and processes to confirm that objectives are being met. It includes an assessment of the implementation and capability of management systems. Auditing provides valuable information on those aspects of the systems that are effective, as well as identifying opportunities for improvement. These audits will cover any aspect of drinking water management, and in particular the following:

- Implementation of CCPs and responses to exceedances;
- Progress against the Improvement Plan;
- Record keeping;
- Data collection and management, including reporting requirements.

10.2.2 Regulatory Audits

Under the plan approval, there is a regulatory requirement for an external audit. The frequency is currently every 4 years. We have recently had one in November 2022 , findings and the actions we will take are found below:

Item	Type	Action	Status of Actions	Responsible Officer/Position
1.	Non-conform	Source a correct schematic from the contractor	Open-Following up with contractor	Senior plumber
2.	Non-conformance	Review the CCP implementation	Open – processes to be reviewed and revised where applicable	Executive Manager Operations
3.	Non-conformance	Review the monitoring and reporting procedures/plan	Open – processes to be reviewed and revised where applicable.	Executive Manager Operations
4.	Non-conformance	Review the management of Incidents and Emergencies / Incident and emergency response protocols	Open – processes to be reviewed and revised where applicable.	Executive Manager Operations
5.	Non-conform	Review and revise record keeping procedures	Open – processes to be reviewed and revised	Executive Manager Operations
6.	Non-conformance	Review and revise how we keep onto of key milestones even if key staff leave	Open – processes to be reviewed and revised.	Executive Manager Operations
7.	Non-conformance	Review and Continual Improvement / Drinking water quality management improvement plan / RMIP Actions / Test for THMs	Open – processes to be reviewed and revised..	Executive Manager Operations

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8.	OFI	Review and revise our commitment to Drinking Water Quality / Regulatory and Formal Requirements	Open – develop training plans and review processes	Executive Manager Operations
9.	OFI	Re-assessment of the Drinking Water Supply System / Water supply system analysis / Scheme	Open – processes to be reviewed and revised	Executive Manager Operations
10.	OFI	Preventive Measures for Drinking Water Quality Management / Preventive measures and multiple barriers	Identify and Document the preventive measures and strategies into a plan addressing each significant risk and establish mechanisms for operational control.	Executive Manager Operations
11.	OFI	Operational Procedures and Process Control / Equipment capability and maintenance	Open – review and revise procedures as required	Executive Manager Operations
12.	OFI	Verification of Drinking Water Quality / Corrective action	Open – Establish and document procedures for corrective action in response to non-conformance or consumer feedback.	Executive Manager Operations
13.	OFI	Management of Incidents and Emergencies / Incident and emergency response protocols	Open – Train employees and regularly test emergency response plans.	Executive Manager Operations
14.	OFI	Employee Awareness and Training / Employee training	Open- Ensure the appropriate experience and qualifications are maintained and identify training needs .	Executive Manager Operations
15.	OFI	Community Involvement and Awareness / Communication	Open – Develop an active two-way communication program to inform consumers and promote awareness of drinking water quality issues	Executive Manager Operations
16.	OFI	Research and Development / Design of equipment	Open – we are talking to QH about several issues inc radionuclide testing and training. We are also reassessing the business case for additional filtration .	Executive Manager Operations
17.	OFI	Documentation and Reporting / Management of documentation and records	Establish a records management system and ensure that employees are trained to fill out records. Periodically review documentation and revise as necessary	Executive Manager Operations
18.	OFL	Evaluation and Audit / Audit of drinking water quality management	Establish processes for internal audits	Executive Manager Operations

19.	OFI	Review and Continual Improvement / Drinking water quality management improvement plan / RMIP Actions / CMT1	Ensure that the plan is communicated and implemented, and that improvements are monitored for effectiveness Eg Was the action implemented within the timeframe state in the plan?	Executive Manager Operations
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11. Review and Continual Improvement

11.1 Review by Senior Executive

The review of all information at an executive level is a necessary part of the ongoing commitment to drinking water quality. The following will be reported to and reviewed by management:

- Annual report;
- Reports from audits;
- Drinking water quality performance;
- Previous management reviews including concerns of consumers, regulators and other stakeholders;
- This plan’s progress;
- Evaluation of the suitability of the drinking water quality policy, objectives and preventive strategies concerning changing internal and external conditions such as:
 - Change of expectations and obligations;
 - Changes in the activities of the organisation;
 - Advances in science and technology;
 - Outcomes of drinking water quality incidents and emergencies; and,
 - Reporting and communication.

The review by senior executive should generally be undertaken against the 12 Elements during regular management meetings which should be minuted.

11.2 Drinking Water Quality Management Improvement Plan

The priorities have been set as detailed in Table 12.1 below.

Table 11.1 – Action Priority Ranking

Priority	Details
2023	Urgent/ Highly Important
2024	High priority/ Important
2025	Medium Priority
2026	Low Priority
Ongoing	Re-occurring

The drinking water quality improvement plan is provided in Appendix I – Drinking Water Quality Management Improvement Plan and it includes the risk management improvement actions from the hazard identification and risk assessment, plus those actions identified in the remainder of this document.

For those items with budgets attached to them, they will need to be negotiated, sought and granted.

12. References

1. Key performance indicators for annual performance reporting for Queensland urban water service providers, Definitions Guide, Version 2 (amended July 2020) Queensland Government. Section 6 contains the key areas to address.
2. Water Sector Cybersecurity Risk Management Guideline, American Water Works Association, 2019.
3. Queensland Audit Office - Security of Critical Water Infrastructure, 2017.
4. Water ISAC - 15 Cybersecurity Fundamental for Water and Wastewater Utilities, 2019.
5. Victorian Auditor-General's Office - Security of Water Infrastructure Control Systems, May 2019.
6. Report on the Assessment of the Pormpuraaw Aboriginal Shire Council Drinking Water Service, DEWS, 31 October 2017

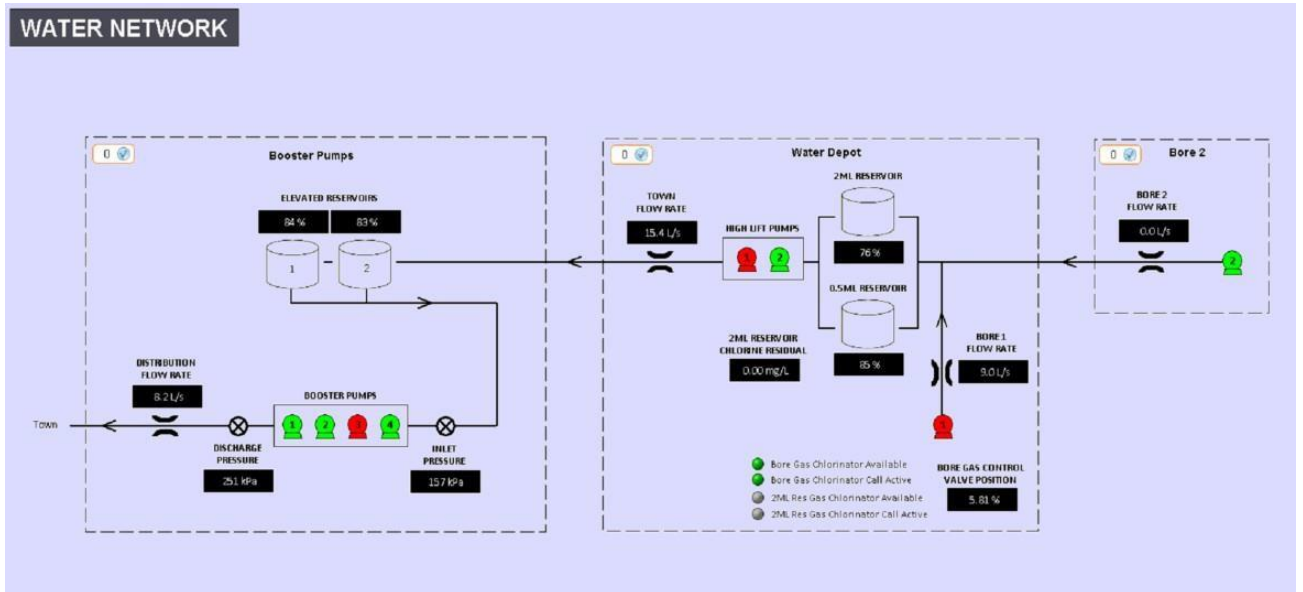
Appendix A- Water Supply System Information

Water Supply Schematics

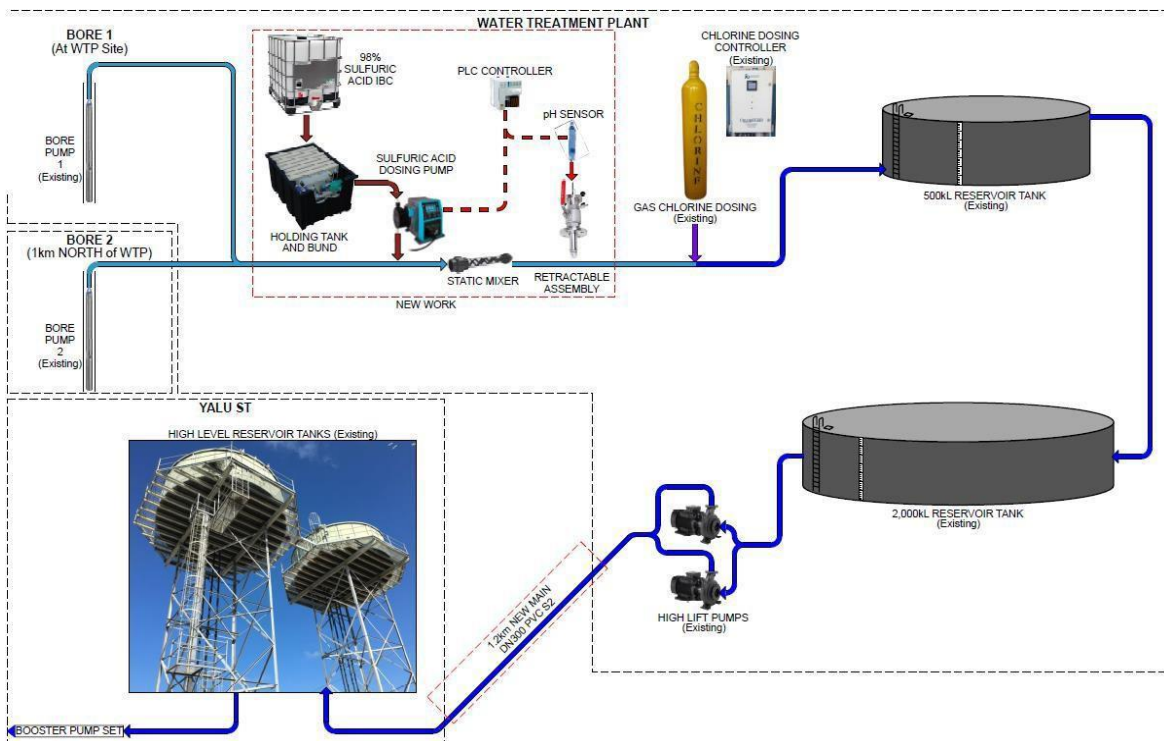
The schematic diagrams show below are taken from the SDADA screens. The first schematic is an overview of the water system, followed by details of the individual sites: Please note that we are waiting on updated schematics from our supplier to capture;

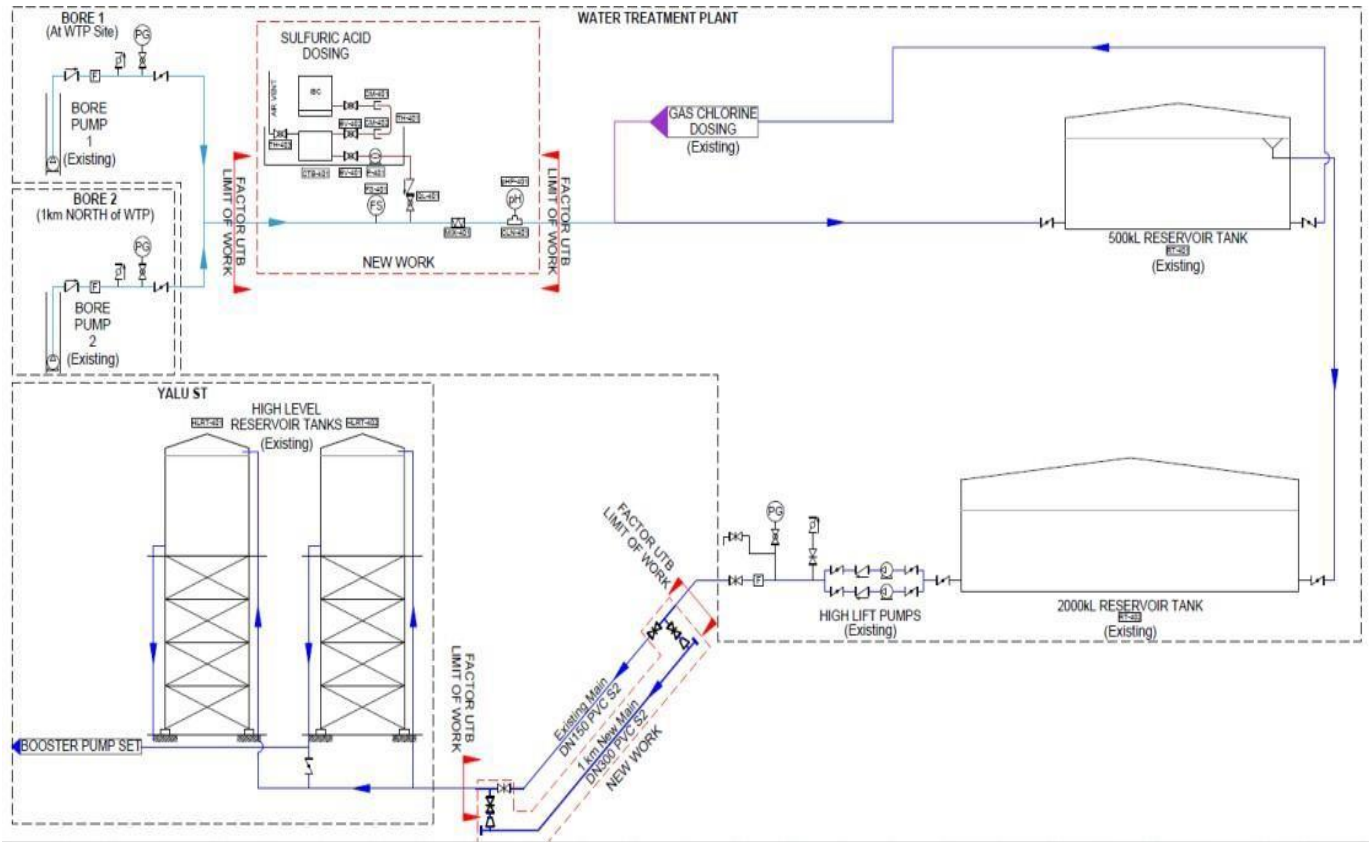
- Contact factor as the schematic isn't correct for the 0.5 tank
- Contact Factor as the SCADA system doesn't show acid dosing

Water Network Overview

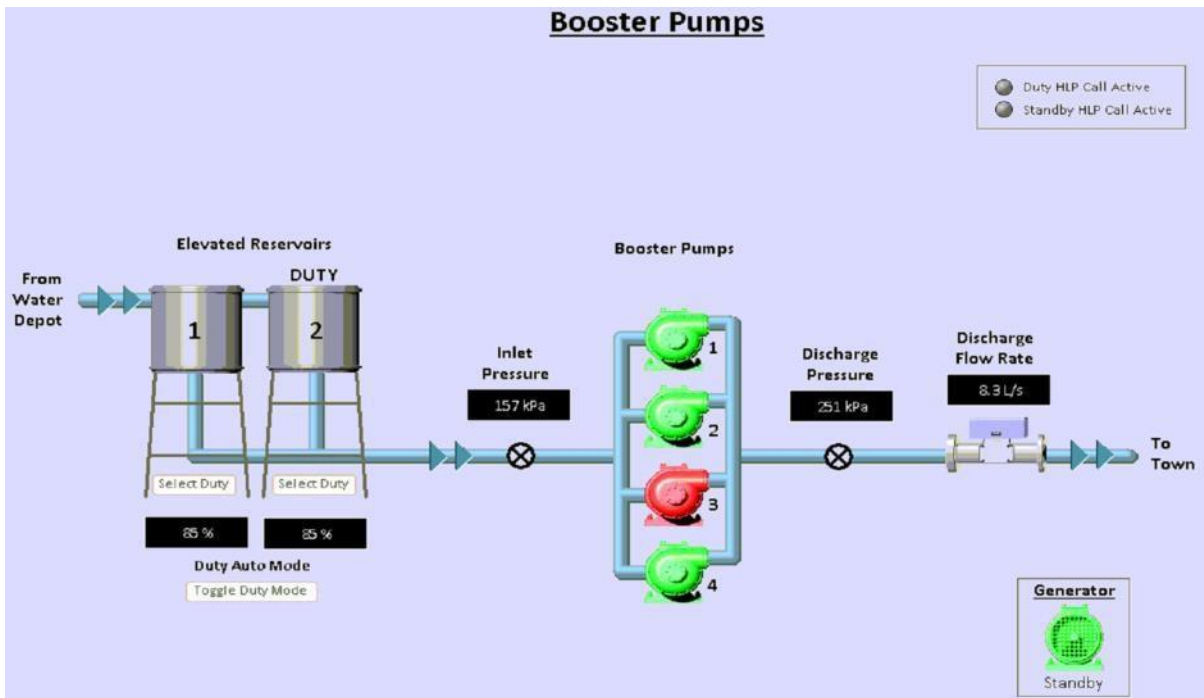


Water Depot Schematic

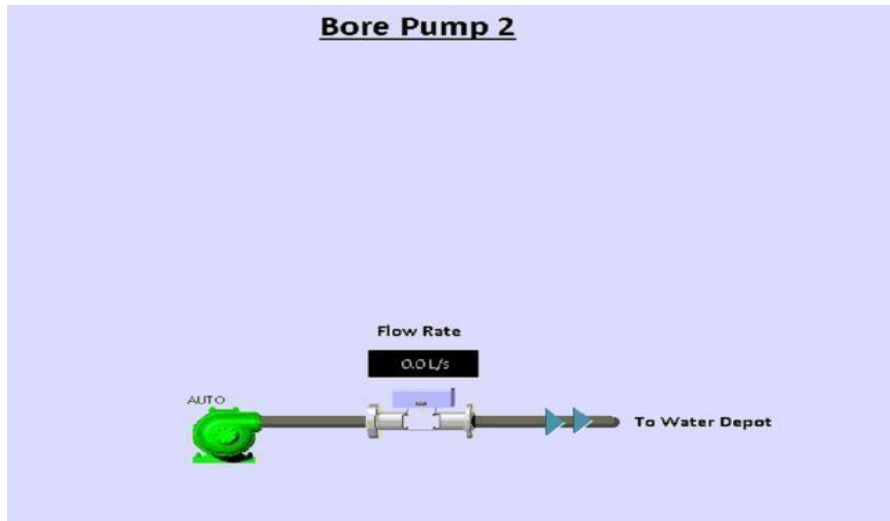




Booster Pump Station Schematic



Bore Pump No 2 Schematic



Current Water Sources

Potable Water Source		
	Bore 1	Bore 2
Located	1.0km North East of Community	1.5km North East of Community
Bore ID	92960	92959
Longitude/Latitude	14°53' .40S 141°37'48E	14°53'15S 141°37'42E
Aquifer	Sub – Artesian Deep Wyaaba Bed Hosted Aquifer	Sub – Artesian Deep Wyaaba Bed Hosted Aquifer
% of Supply	100%	100%
Reliability	Good	Good
Pump Type	Grundfos Centrifugal 3 phase Submersible	Grundfos Centrifugal 3 phase Submersible
Capacity Tested 7/08/2015	8.6 l/s pumped	12.6 l/s pumped
Bore Depth metres	62.3 metres	64.5 metres
Bore Pump Depth	40 metres	40 metres
Bore Drilled	1998	1998
Bore Head Details	Raised Head, Qld. Gov. Approved Design	Raised Head, Qld. Gov. Approved Design
Bore Casing and Materials	224mm Cased PVC Grout from 0-38m,Cement plug, 38-41m Screens 48.6 – 50.6m and 58.1 - 60.1 m	224mm Cased PVC Grout from 0-38m Screens 46-48m, and 57-59m
Water Quality Issues	High Levels of Calcium Total Hardness High	High Levels of Calcium Total Hardness High

Bore 1 at Water Treatment Compound

Bore 2 at Remote Site



Non-Potable Water Source		
	Bore 3	Bore 4
Located	Near Kindergarten	Near Kindergarten
Bore ID	45010	45011
Aquifer	Sub – Artesian Deep Wyaaba Bed Hosted Aquifer	Sub – Artesian Deep Wyaaba Bed Hosted Aquifer
% of Supply	0% for Drinking Water. Used for Irrigation Purposes only	NOT Connected at this time
Reliability	Untreated Water	Untreated Water
Pump Type	Grundfos Centrifugal 3 phase Submersible	Grundfos Centrifugal 3 phase Submersible
Capacity Tested 1975	7.0 l/s pumped	7.0 l/s pumped
Bore Depth metres	75 metres	59 metres
Bore Pump Depth	20 metres	20 metres
Bore Drilled	1975	1975
Bore Head Details	Raised Head,	Raised Head,
Bore Casing and Materials	117mm Cased PVC	117mm Cased PVC
Water Quality Issues	It is possible to connect to the community water supply, however, a boil water alert would be required as water would not be chlorinated	It is possible to connect to the community water supply, however, a boil water alert would be required as water would not be chlorinated

Note: As there is no physical connection of bore 3 and 4 to the drinking water system. IT IS IMPOSSIBLE to accidentally have flow from these bores into the main water reticulation system.

To utilise water from these bores:

SPECIAL WRITTEN PERMISSION MUST BE OBTAINED TO CONNECT PIPEWORK.

Approval only from the Executive Manager Environment and the Chief Executive Manager can be given.

Treatment/Disinfection

Normal Operation

Source Water:

The Source water is from 3 bores, protected from potential surface water microbiological contamination. In addition, historical water quality also shows that having disinfection only is suitable as a protective measure against reticulation contamination.

A submersible pump is attached to each bore. The pump capacities are listed in the tables mentioned earlier. These were measured in August 2015.

No Bore in Pormpuraaw is free-flowing.

Sulphuric Acid Dosing:

This unit was installed and commissioned at the WTP in September 2020 and commissioned in November 2020. Appendix K – Acid Dosing System Details and Operations and Maintenance Procedures includes information on the pump and associated instrumentation assets, plus operational use, maintenance requirements and calibration procedures. The operator's "Daily Reading Sheet" includes the sulphuric acid unit daily checks required. This is provided in Appendix G – Operational Procedures and Monitoring.

Any spillage of Sulfuric Acid (50%), either from the IBC container, or the 300L 'day tank', would be entirely contained in a polyethylene storage bund that has at least 2000L capacity. For safety reasons, the acid is decanted daily from the IBC tank into the smaller day tank, where the dosing pump withdrawals the liquid from.

The unit was installed to address community concerns of hard water build-up and corrosion in public and private infrastructure including pipework, valving, hot water services etc., which may lead to ongoing maintenance and early replacement.

The bore water is typically delivered to the WTP at around pH 7.8. The sulfuric acid (50%) is used to make a small adjustment to the water to achieve a pH of approximately 7.4 (operational target). The lower pH enables calcium and other similar compounds to remain in solution.

The monitoring and dosing system is monitored by the plumbing team. A local screen displays real-time monitoring instrumentation and equipment operating status. Alarms are populated on the local SCADA screen.

Bore water pH fluctuates by only a small amount. The council operator is responsible for daily inspection of the dosing system and if required, adjusts the dose rate to ensure a downstream pH of <7.4. The system is set up with automatic (PLC controlled) shutdown of the dosing pump in the unlikely event overdosing occurs. If the downstream pH drops to 7.0 (critical limit), dosing stops immediately and a local alarm is generated.

The acid dose rate based on commissioning data is between 30 – 40 mL/min. This lowered the bore water pH from 7.8 to 7.3.

The acid dosing system is not connected to the wider Council SCADA network. This integration work will be completed at a later date.

In addition to controlling and minimising hard water accumulation in the Council's network, the lower pH improves chlorine disinfection effectiveness.

Chlorine Gas:

Due to the high degradation of Sodium Hypochlorite, it was decided in the community water upgrade to change from Sodium Hypochlorite to Chlorine Gas in the 70 Kg Cylinders. This occurred before the 2018 review of this plan.

The current disinfection stage is to inject chlorine gas via a vacuum system as the bore water enters into the 500Kl clear water storage tank. This provides an adequate holding period for the chlorine.

The initial chlorine dosage is controlled according to the flow rates into the clear water tank.

As the chlorine is dosed on bore usage it is easily maintained during peak water usage times and also minimum usage times.

Chlorine is further added to the new 2.0ML storage tank via a recirculation system. The chlorine level in the reservoir is sampled via a chlorine analyser and automatically dosed to maintain the chlorine level to a programmable setpoint.

Bypassing the chlorination stage is extremely difficult to achieve either deliberately or by accident.

There are no locations within the entire reticulation system that does not undergo chlorination under the normal operating layout.

Initial Flow-Paced Treatment	
Location	Chlorine injection unit, after bores, before entering clear water tank.
Type	Chlorine gas 70 Kg cylinders.
Dose Rate	<ul style="list-style-type: none"> ▪ Chlorine gas volume 59.66%; ▪ Chlorine gas control valve 3.24%.
Target Free Cl ₂	Chlorination at dosing point 2.4mg/L – 2.6mg/L
Duty/Standby	Cylinders in usage with automatic change over.
Dosing Arrangement	Flow-based on bore use (e.g. bore 2 turns on so does Chlorination).
Alarms	<ul style="list-style-type: none"> ▪ Chlorine Leak Detection; ▪ High Volume; ▪ Low Volume. Alarms all active through SCADA and phone text messaging.
Chemical Added, Storage and Turnover	Chlorine gas 70kg cylinders stored in shed compliant with Australian Standards for storage of chlorine cylinders.

Chlorine Gas System



Chlorine Gas Room



Chlorine Gas Spare Cylinders



Chlorine Gas Injection Point



Secondary Automatic Chlorine Trimming System	
Location	Chlorine Injection unit, on recirculation line in 2MK reservoir.
Type	Chlorine Gas 70 Kg Cylinders (shared).
Dose Rate	Automatically controlled
Target Free Cl ₂	Adjustable - currently set to 1.2 mg/L
Duty/Standby	Cylinders in usage with automatic change over (shared).
Dosing Arrangement	Automatically controlled via chlorine analyser and motorised flow control.
Alarms	Chlorine Leak Detection (shared), High and low Vacuum, low and high chlorine level, Alarms all active through SCADA and Phone Text Messaging.
Chemical Added, Storage and Turnover	Chlorine Gas 70kg Cylinders stored in shed compliant with Australian Standards for storage of chlorine cylinders (shared).

Chlorine trimming system



Abnormal Operation

THE ONLY EXCEPTION, which has never been implemented, is if the water from bores #3 and #4 were to be connected and allowed to enter the community drinking water supply. If this was permitted a BOIL WATER ALERT would be required as water from bores #3 and #4 bypasses all chlorination.

Storage

Name	Clear Water Storage Reservoir	Elevated Water Storage Reservoir	New Water Storage Reservoir
Capacity	500 Kilolitres	2 X 120 Kilolitres	2 ML
Type	Concrete	Plastic Lined Steel	Concrete
Roof	Fully Sealed	Roofing Iron & Steel	Concrete
Vermin Proof	Yes	Yes	Yes
Runoff from Roof	Sloping Roof Directs Runoff to Ground, then out to swamp at rear	Sloping Roof Directs Runoff to Ground,	Sloping Roof Directs Runoff to Ground, then out to swamp at rear
Cleaning Schedule	No Indication of Sedimentation, Annual Check Completed May 2015	No Indication of Sedimentation, Annual Check Completed May 2015	New tank with no sedimentation.
Inspection Schedule	Daily Reading and operational monitoring and inspections, Recorded on daily Work Schedule	Daily Reading and operational monitoring and inspections, Physical Inspection of float level indicators completed daily	Daily Reading and operational monitoring and inspections, Recorded on daily Work Schedule

2 Elevated Water Tanks (Chlorinated)(2 x 120KL)



Main Clear Water Reservoir (Chlorinated) (1 x 500KL)



New 2 ML Concrete Water Reservoir



Distribution and Reticulation

The following table shows the distribution and reticulation details.

Pump Capacity	Initially 150 kPa Approximately 19 L/s to the 15metre Elevated Water Storage Tanks. Elevated Water Storage Tanks Feed a 4 Stage Grundfos System Boosting Water Pressure to Community from 150kPa to 250kPa
Duty / Standby	Both high lift pumps and booster pumps rotate through an automatic change over and have an automatic Diesel Generator Back up system
Pipe Materials	UPVC – All Asbestos has been removed from reticulation
Age Range	No More than 5 years
Lengths of Mains	Approximately 35 Kilometres
Issues with Long Detention & Dead Ends	Most dead ends have been Eliminated. Where there is still a dead-end regular water flushing undertaken.
High-Pressure Issues	Not applicable
Low-Pressure Issues	Any Issues with low pressure are investigated as it is usually a blockage
No. of Pump Stations	Bore 1 and Bore 2 only used for reticulation system
Flushing	As required or once a month.

Hi-Lift Pumps



Grundfos Booster Pumps



Flushing Water Mains



Appendix B: Water Quality Analysis

See Excel worksheet for CRC verification results.

Operational Daily Results

Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
min	0.93	7.79	0.89	1.0	0.97	0.96	0.93	0.95	0.93	0.98	0.94	0.92	0.94	0.9	0.0
max	0.52	6.92	0.46	0.42	0.51	0.45	0.0	0.39	0.42	0.2	0.4	0.37	0.39	0.4	0.0
ave	0.8	7.21	0.72	0.75	0.77	0.77	0.73	0.78	0.74	0.75	0.74	0.75	0.75	0.7	0.0
01/07/2021	0.83	7.31	0.86	0.91	0.85	0.94	0.83	0.82	0.8	0.81	0.81	0.8	0.83	0.73	0.0
02/07/2021	0.83	7.3		0.92	0.9	0.7	0.83	0.78	0.88	0.89	0.92	0.77	0.93	0.75	
05/07/2021	0.79	7.33	0.86	0.88	0.87	0.92	0.0	0.91	0.88	0.89	0.94	0.88	0.87	0.84	0.0
06/07/2021	0.78	7.35	0.89	0.9	0.95	0.88	0.89	0.93	0.88	0.89	0.89	0.88	0.87	0.88	0.0
07/07/2021	0.69	7.34	0.81	0.7	0.71	0.83	0.89	0.85	0.86	0.82	0.78	0.81	0.81	0.8	0.0
08/07/2021	0.78	7.33	0.85	0.86	0.97	0.91	0.78	0.91	0.91	0.84	0.81	0.76	0.83	0.74	0.0
09/07/2021	0.85	7.33	0.76	0.89	0.9	0.93	0.79	0.92	0.74	0.9	0.77	0.84	0.86	0.76	0.0
10/07/2021	0.85	7.33													
12/07/2021	0.8	7.33	0.85	0.92	0.79	0.91	0.93	0.95	0.85	0.85	0.9	0.89	0.9	0.85	0.0
13/07/2021	0.82	7.33	0.87	0.83		0.78	0.76	0.74	0.71	0.79	0.76	0.74	0.77	0.7	0.0
14/07/2021	0.82	7.3	0.69	0.76	0.77	0.78	0.79	0.73	0.74	0.71	0.76	0.76	0.73	0.73	0.0
15/07/2021	0.87	7.26	0.85	0.7	0.73	0.8	0.81	0.87	0.8	0.72	0.73	0.71	0.71	0.69	0.0
16/07/2021	0.84	7.25	0.69	0.71	0.75	0.71	0.75	0.71	0.75	0.73	0.74	0.75	0.73	0.7	0.0
17/07/2021	0.79	7.22											0.39		
19/07/2021	0.79	7.22	0.48	0.47	0.54	0.45	0.48	0.39	0.45	0.4	0.46	0.37	0.39	0.45	0.0
20/07/2021	0.79	7.21	0.56	0.9	0.61	0.68	0.55	0.62	0.44	0.35	0.5	0.5	0.56	0.47	0.0

Pormpuraaw Aboriginal Shire Council DWQMP – Amended 2023

Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
21/07/2021	0.85	7.23	0.59	0.64	0.63	0.9	0.51	0.64	0.81	0.65	0.44	0.51	0.41	0.61	0.0
22/07/2021	0.76	7.25	0.65	0.62	0.62	0.58	0.57	0.65	0.59	0.6	0.44	0.51	0.65	0.64	0.0
23/07/2021				0.42											
26/07/2021	0.76	7.23	0.48	0.42	0.51	0.93	0.51	0.61	0.45	0.46	0.4	0.42	0.4	0.51	0.0
27/07/2021	0.75	7.24	0.65	0.75	0.75	0.74	0.42	0.76	0.74	0.75	0.74	0.74	0.54	0.68	0.0
28/07/2021	0.82	7.26	0.8	0.64	0.83	0.89	0.47	0.87	0.69	0.65	0.64	0.67	0.8	0.63	0.0
29/07/2021	0.82	7.3	0.82	0.83	0.94	0.85	0.67	0.82	0.89	0.82	0.83	0.8	0.81	0.82	0.0
30/07/2021	0.75	7.31	0.46	1.0	0.76	0.83	0.76	0.76	0.73	0.44	0.8	0.78	0.77	0.73	0.0
03/08/2021	0.73	7.37	0.67	0.87	0.69	0.69	0.77	0.69	0.74	0.74	0.87	0.75	0.75	0.83	0.0
04/08/2021	0.82	7.38	0.57	0.82	0.72	0.75	0.93	0.5	0.74	0.71	0.46	0.72	0.69	0.69	0.0
05/08/2021	0.84	7.38	0.74	0.78	0.82	0.79	0.6	0.79	0.77	0.79	0.8	0.7	0.72	0.68	0.0
06/08/2021			0.69												0.0
09/08/2021	0.79	7.79		0.61	0.62	0.61		0.59	0.58	0.58	0.63	0.61	0.61	0.58	
10/08/2021	0.79	7.27		0.55	0.81	0.78		0.69	0.42	0.75	0.7	0.7		0.62	
12/08/2021					0.81	0.96			0.75		0.75	0.69			
13/08/2021	0.79	7.26	0.75	0.75	0.72	0.75	0.76	0.71	0.77	0.67	0.73	0.67	0.77	0.65	0.0
16/08/2021	0.76	7.29	0.51	0.81		0.52	0.92	0.62	0.7	0.62	0.75	0.74	0.79	0.69	0.0
17/08/2021	0.77	7.3	0.63	0.82	0.8	0.84	0.84	0.93	0.83	0.69	0.72	0.71	0.94	0.88	0.0
18/08/2021	0.82	7.31	0.7	0.67	0.74	0.74	0.72	0.62	0.85	0.73	0.72	0.6	0.69	0.8	0.0
19/08/2021	0.84	7.31	0.84	0.81	0.95	0.83	0.77	0.85	0.79	0.82	0.83	0.92	0.83	0.79	0.0
20/08/2021	0.84	7.32	0.68	0.74	0.66	0.78	0.71	0.72	0.63	0.65	0.61	0.71	0.7	0.7	0.0
23/08/2021				0.75											
25/08/2021	0.78	7.27	0.8	0.75		0.67	0.62	0.84	0.72	0.71	0.75	0.68	0.67	0.68	0.0
26/08/2021	0.82	7.31	0.61	0.64		0.59	0.61	0.61	0.64	0.58	0.61	0.65	0.6	0.58	0.0
27/08/2021	0.82	7.31	0.65	0.64		0.67	0.58	0.69	0.74	0.77	0.67	0.65	0.59	0.6	0.0

Pormpuraaw Aboriginal Shire Council DWQMP – Amended 2023

Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
31/08/2021	0.82	7.31	0.6	0.56	0.88	0.77	0.71	0.63	0.61	0.59	0.66	0.68	0.65	0.6	0.0
01/09/2021	0.79	7.31	0.59	0.65	0.81	0.61	0.68	0.55	0.7	0.77	0.68	0.65	0.63	0.62	
06/09/2021	0.79	7.33	0.5	0.6	0.63	0.64	0.62	0.57	0.68	0.64	0.66	0.6	0.72	0.65	
10/09/2021	0.81	7.31	0.69	0.73	0.84	0.66	0.75	0.69	0.68	0.8	0.75	0.76	0.78	0.66	
13/09/2021	0.79	7.31	0.63	0.7		0.6	0.64	0.52	0.78	0.78	0.69	0.7	0.74	0.5	
14/09/2021	0.81	7.31				0.82	0.75	0.79							
16/09/2021	0.81	7.31	0.67	0.78	0.81	0.69	0.78	0.81	0.74	0.75	0.77	0.73	0.74	0.68	
20/09/2021			0.69	0.92	0.67	0.91	0.67	0.84	0.65	0.98	0.71	0.63	0.84	0.76	
21/09/2021	0.79	7.31	0.63			0.64		0.72		0.77				0.56	
23/09/2021	0.84	7.33	0.76	0.75	0.79	0.84	0.76	0.84	0.75	0.77	0.74	0.77	0.76	0.71	
24/09/2021	0.83	7.33	0.81	0.89	0.77	0.84	0.76	0.83	0.79	0.76	0.79	0.74	0.75	0.77	
27/09/2021	0.81	7.31	0.67	0.65	0.67	0.63	0.67	0.65	0.64	0.65	0.62	0.55	0.64	0.52	
28/09/2021	0.81	7.31	0.58	0.61	0.64	0.57	0.62	0.62	0.62	0.63	0.6	0.6	0.59	0.48	
29/09/2021	0.82	7.31	0.66	0.5	0.68	0.61	0.64	0.66	0.62	0.64	0.61	0.57	0.63	0.6	
30/09/2021	0.8	7.31	0.56	0.57	0.65	0.64	0.61	0.62	0.58	0.6	0.58	0.55	0.55	0.45	
01/10/2021	0.82	7.31	0.62	0.64	0.66	0.64	0.58	0.61	0.59	0.6	0.72	0.56	0.56	0.54	
05/10/2021	0.82	7.31	0.63	0.46	0.63	0.68	0.58	0.63	0.46	0.55	0.67	0.59	0.45	0.43	
06/10/2021	0.81	7.32	0.8	0.77	0.74	0.81	0.7	0.8	0.77	0.74	0.76	0.86	0.754	0.72	
07/10/2021	0.76	7.31	0.74	0.73	0.76	0.75	0.74	0.72	0.74	0.73	0.71	0.74	0.72	0.68	
08/10/2021	0.76	7.31	0.71	0.75	0.78	0.73	0.74	0.71	0.74	0.73	0.78	0.74	0.77	0.65	
11/10/2021	0.81	7.31	0.67	0.76	0.71	0.76	0.71	0.76	0.72	0.72	0.72	0.73	0.72	0.66	
12/10/2021	0.81	7.31	0.73	0.6	0.58	0.72	0.69	0.73	0.68	0.71	0.47	0.65	0.66	0.66	
13/10/2021	0.79	7.32	0.71	0.73	0.68	0.79	0.82	0.73	0.72	0.71	0.72	0.7	0.68	0.67	
14/10/2021	0.79	7.33	0.57	0.71	0.76	0.66	0.68	0.68	0.65	0.71	0.69	0.65	0.7	0.64	
15/10/2021	0.79	7.33	0.66	0.7	0.72	0.72	0.71	0.7	0.69	0.68	0.72	0.7	0.68	0.63	

Pormpuraaw Aboriginal Shire Council DWQMP – Amended 2023

Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
18/10/2021	0.76	7.31	0.81		0.71	0.66	0.65	0.81	0.72	0.73	0.65	0.68	0.72	0.59	
19/10/2021	0.81	7.31	0.62	0.7	0.71	0.69	0.7	0.81	0.72	0.7	0.71	0.69	0.72	0.63	
20/10/2021	0.79	7.31	0.62	0.7	0.72	0.75	0.71	0.69	0.72	0.71	0.68	0.74	0.7	0.68	
21/10/2021	0.81	7.31	0.68	0.66	0.77	0.71	0.7	0.75	0.73	0.73	0.74	0.7	0.78	0.45	
22/10/2021	0.79	7.13	0.67	0.7	0.72	0.74	0.75	0.72	0.7	0.7	0.66	0.7	0.71	0.52	
25/10/2021	0.81	7.22	0.69	0.68	0.7	0.75	0.72	0.75	0.71	0.66	0.64	0.7	0.69	0.63	
26/10/2021	0.81	7.21	0.62	0.64	0.67	0.76	0.69	0.68	0.71	0.7	0.65	0.7	0.69	0.64	
27/10/2021	0.81	7.2	0.63	0.69	0.72	0.71	0.73	0.74	0.71	0.68	0.69	0.73	0.62	0.44	
28/10/2021	0.8	7.19	0.63	0.72	0.64	0.76	0.68	0.74	0.68	0.68	0.67	0.68	0.59	0.67	
29/10/2021	0.79	7.17	0.6	0.57	0.68	0.63	0.68	0.76	0.67	0.68	0.63	0.64	0.61	0.69	
01/11/2021	0.81	7.15	0.67	0.6	0.67	0.61	0.62	0.73	0.63	0.66	0.67	0.66	0.68	0.63	
02/11/2021			0.64	0.68	0.65	0.62	0.62	0.61	0.69	0.63	0.68	0.67	0.65	0.59	
03/11/2021	0.77	7.14	0.71	0.88	0.84	0.73	0.7	0.8	0.9	0.83	0.73	0.81	0.85	0.63	
04/11/2021	0.74	7.19	0.75	0.87	0.87	0.82	0.83	0.78	0.89	0.86	0.88	0.87	0.86	0.83	
05/11/2021	0.82	7.24	0.76	0.87	0.78	0.89	0.83	0.9	0.89	0.88	0.85	0.86	0.88	0.77	
08/11/2021	0.81	7.29	0.85	0.85	0.88	0.89	0.86	0.9	0.83	0.91	0.85	0.85	0.87	0.77	
09/11/2021	0.81	7.17	0.81	0.86	0.89	0.86		0.88	0.93	0.77	0.89	0.86	0.87	0.61	
10/11/2021	0.8	7.1	0.73	0.8	0.82	0.75	0.78	0.77	0.8	0.79	0.75	0.77	0.79	0.64	
11/11/2021	0.84	7.05	0.74	0.76	0.78	0.78	0.76	0.77	0.74	0.8	0.75	0.84	0.79	0.75	
12/11/2021	0.83	7.05	0.66	0.75	0.76	0.79	0.67	0.78	0.78	0.72	0.73	0.75	0.75	0.65	
15/11/2021	0.81	7.26	0.77	0.8	0.78	0.81	0.76	0.82	0.84	0.8	0.8	0.81	0.82	0.9	
16/11/2021	0.79	7.28	0.64	0.78	0.78	0.8	0.8	0.76	0.74	0.74	0.74	0.78	0.77	0.71	
17/11/2021	0.83	7.3	0.77	0.81	0.8	0.75	0.76	0.8	0.8	0.81	0.72	0.77	0.77	0.61	
18/11/2021	0.8	7.31	0.76	0.77	0.79	0.77	0.79	0.78	0.79	0.79	0.78	0.79	0.81	0.68	
19/11/2021	0.74	7.31	0.72	0.73	0.77	0.73	0.73	0.73	0.74	0.76	0.7	0.79	0.75	0.7	

Pormpuraaw Aboriginal Shire Council DWQMP – Amended 2023

Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
22/11/2021	0.82	7.3	0.73	0.77	0.79	0.77	0.77	0.82	0.77	0.79	0.75	0.74	0.75	0.75	
23/11/2021	0.8	7.3	0.75	0.74	0.81	0.78	0.78	0.77	0.81	0.8	0.79	0.79	0.82	0.66	
24/11/2021	0.81	7.29	0.71	0.79	0.75	0.82	0.77	0.84	0.73	0.84	0.74	0.76	0.79	0.73	
25/11/2021	0.79	7.28	0.71	0.77	0.81	0.77	0.76	0.82	0.81	0.8	0.77	0.79	0.79	0.63	
26/11/2021	0.79	7.3	0.65	0.77	0.74	0.77	0.79	0.76	0.75	0.78		0.78	0.78	0.6	
29/11/2021	0.78	7.32	0.76	0.78	0.72	0.75	0.71	0.8	0.76	0.76	0.76	0.76	0.75	0.53	
30/11/2021	0.79	7.32	0.7	0.8	0.83	0.81	0.7	0.82	0.78	0.76	0.74	0.75	0.76	0.67	
01/12/2021	0.81	7.33	0.64	0.78	0.78	0.79	0.8	0.8	0.8	0.7	0.78	0.71	0.77	0.7	
02/12/2021	0.8	7.33	0.7	0.75	0.75	0.82	0.7	0.77	0.77	0.76	0.76	0.75	0.76	0.72	
03/12/2021	0.78	7.33	0.62	0.72	0.67	0.77	0.77	0.79	0.76	0.74		0.77	0.7	0.61	
06/12/2021	0.81	7.33	0.73	0.74	0.79	0.76	0.82	0.81	0.79	0.75	0.82	0.74	0.74	0.7	
07/12/2021	0.81	7.26	0.71	0.78	0.8	0.72	0.83	0.81	0.67	0.77	0.78	0.77	0.79	0.69	
08/12/2021	0.78	7.16	0.69	0.75	0.74	0.71	0.69	0.76	0.74	0.72	0.76	0.73	0.76	0.46	
09/12/2021	0.83	7.13	0.69	0.75	0.78	0.77	0.74	0.81	0.75	0.79	0.7	0.75	0.76	0.4	
10/12/2021	0.83	7.12	0.52	0.65	0.75	0.79	0.7	0.8	0.78	0.64	0.66	0.7	0.75	0.67	
13/12/2021	0.78	7.09	0.67	0.72	0.73	0.72	0.71	0.74	0.73	0.72	0.72	0.75	0.71	0.57	
14/12/2021	0.8	7.09	0.73	0.76	0.76	0.75	0.67	0.82	0.72	0.75	0.7	0.75	0.74	0.64	
15/12/2021	0.83	7.1	0.77	0.71	0.85	0.77	0.61	0.78	0.75	0.77	0.76	0.75	0.75	0.52	
16/12/2021	0.78	7.13	0.73	0.72	0.78	0.8	0.71	0.82	0.76	0.73	0.75	0.76	0.77	0.68	
17/12/2021	0.8	7.14	0.65	0.71	0.77	0.73	0.74	0.8	0.69	0.65	0.63	0.77	0.72	0.66	
20/12/2021	0.81	7.14	0.71	0.77	0.75	0.75	0.61	0.82	0.77	0.75	0.75	0.76	0.78	0.7	
21/12/2021	0.84	7.15	0.64	0.75	0.75	0.75	0.75	0.81	0.76	0.75	0.66	0.72	0.73	0.62	
22/12/2021	0.8	7.15	0.56	0.75	0.74	0.77	0.77	0.74	0.69	0.72	0.71	0.73	0.7	0.69	
23/12/2021	0.8	7.14	0.69	0.69	0.68	0.74	0.65	0.77	0.72	0.72	0.76	0.73	0.68	0.64	
24/12/2021	0.81	7.14	0.64	0.71	0.71	0.72	0.65	0.77	0.68	0.73	0.68	0.68	0.7	0.59	

Pormpuraaw Aboriginal Shire Council DWQMP – Amended 2023

Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
27/12/2021	0.81	7.16	0.64	0.74	0.78	0.77	0.69	0.77	0.72	0.73	0.76	0.66	0.77	0.81	
28/12/2021	0.76	7.18	0.72	0.72	0.78	0.72	0.71	0.72	0.72	0.77	0.86	0.72	0.74	0.72	
29/12/2021	0.83	7.18	0.68	0.74	0.75	0.75	0.81	0.76	0.66	0.67	0.69	0.73	0.76	0.54	
30/12/2021	0.79	7.2	0.65	0.71	0.75	0.76	0.71	0.75	0.72	0.74	0.7	0.77	0.75	0.72	
31/12/2021	0.83	7.19	0.68	0.7	0.78	0.81	0.72	0.8	0.72	0.7	0.67	0.78	0.74	0.72	
03/01/2022	0.86	7.16	0.63	0.78	0.78	0.78	0.71	0.8	0.76	0.7	0.73	0.78	0.75	0.52	
04/01/2022	0.78	7.17	0.7	0.75	0.68	0.69	0.84	0.7	0.74	0.54	0.72	0.7	0.7	0.86	
05/01/2022	0.8	7.18	0.67	0.69	0.69	0.71	0.66	0.84	0.64	0.66	0.68	0.72	0.71	0.67	
06/01/2022	0.75	7.19	0.68	0.7	0.7	0.67	0.72	0.74	0.65	0.77	0.64	0.78	0.7	0.67	
07/01/2022	0.81	7.2	0.69	0.76	0.77	0.72	0.7	0.72	0.66	0.75	0.71	0.72	0.75	0.69	
10/01/2022	0.81	7.2	0.69	0.74	0.75	0.75	0.67	0.77	0.68	0.72	0.73	0.7	0.71	0.68	
11/01/2022	0.81	7.2	0.72	0.73	0.67	0.75	0.77	0.76	0.66	0.76	0.67	0.7	0.76	0.72	
12/01/2022	0.8	7.21	0.69	0.73	0.8	0.75	0.71	0.77	0.69	0.73	0.75	0.78	0.75	0.7	
13/01/2022	0.78	7.22	0.7	0.73	0.72	0.74	0.72	0.8	0.66	0.64	0.77	0.75	0.74	0.69	
14/01/2022	0.81	7.21	0.53	0.71	0.72	0.75	0.69	0.76	0.67	0.69	0.71	0.65	0.7	0.67	
17/01/2022	0.81	7.24	0.73	0.77	0.95	0.82	0.71	0.76	0.68	0.73	0.73	0.79	0.79	0.72	
18/01/2022	0.81	7.24	0.72	0.74	0.73	0.76	0.63	0.77	0.7	0.65	0.7	0.73	0.75	0.75	
19/01/2022	0.79	7.22	0.67	0.71	0.69	0.75	0.64	0.75	0.68	0.71	0.65	0.77	0.74	0.69	
20/01/2022	0.8	7.22	0.59	0.65	0.75	0.76	0.65	0.8	0.72	0.68	0.76	0.7	0.73	0.66	
21/01/2022	0.81	7.24	0.7	0.74	0.72	0.75	0.73	0.79	0.72	0.71	0.63	0.75	0.75	0.71	
24/01/2022	0.81	7.24	0.61	0.67	0.71	0.75	0.73	0.79	0.72	0.71	0.73	0.73	0.68	0.69	
25/01/2022	0.78	7.24	0.65	0.67	0.69	0.73	0.74	0.73	0.65	0.68	0.72	0.72	0.72	0.65	
26/01/2022	0.8	7.25	0.59	0.66	0.72	0.75	0.69	0.76	0.6	0.72	0.7	0.67	0.66	0.6	
27/01/2022	0.81	7.26	0.64	0.68	0.7	0.73	0.71	0.76	0.68	0.63	0.72	0.68	0.52	0.75	
28/01/2022	0.79	7.27	0.61	0.67	0.7	0.75	0.72	0.75	0.65	0.68	0.69	0.72	0.67	0.73	

Pormpuraaw Aboriginal Shire Council DWQMP – Amended 2023

Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
31/01/2022	0.81	7.29	0.65	0.71	0.67	0.72	0.68	0.74	0.7	0.69	0.53	0.68	0.71	0.6	
01/02/2022	0.81	7.28	0.69	0.66	0.66	0.71	0.71	0.68	0.65	0.67	0.55	0.66	0.7	0.62	
02/02/2022	0.78	7.27	0.66	0.66	0.64	0.63	0.63	0.67	0.66	0.63	0.67	0.67	0.66	0.62	
03/02/2022	0.8	7.27	0.56	0.79	0.71	0.74	0.7	0.74	0.62	0.69	0.71	0.65	0.72	0.79	
04/02/2022	0.77	7.29	0.79	0.86	0.72	0.75	0.74	0.79	0.76	0.75	0.76	0.8	0.78	0.54	
07/02/2022	0.83	7.3	0.68	0.77	0.74	0.81	0.79	0.8	0.78	0.74	0.78	0.8	0.78	0.66	
08/02/2022	0.76	7.29	0.79	0.78	0.75	0.72	0.71	0.72	0.72	0.73	0.72	0.74	0.75	0.73	
09/02/2022	0.83	7.27	0.72	0.76	0.76	0.78	0.72	0.78	0.69	0.72	0.72	0.75	0.72	0.65	
10/02/2022	0.81	7.25	0.78	0.75	0.75	0.75	0.51	0.79	0.69	0.75	0.75	0.77	0.75	0.72	
11/02/2022	0.76	7.24	0.74	0.76	0.79	0.78	0.72	0.74	0.76	0.76	0.76	0.78	0.76	0.7	
14/02/2022	0.77	7.25	0.76	0.74	0.57	0.8	0.76	0.79	0.74	0.74	0.74	0.75	0.78	0.75	
15/02/2022	0.81	7.25	0.75	0.77	0.76	0.81	0.76	0.83	0.78	0.79	0.79	0.77	0.56	0.57	
16/02/2022	0.82	7.24	0.73	0.81	0.8	0.84	0.63	0.81	0.72	0.81	0.81	0.79	0.79	0.77	
17/02/2022	0.77	7.22	0.74	0.71	0.78	0.79	0.68	0.77	0.76	0.77	0.77	0.79	0.78	0.7	
18/02/2022	0.78	7.21	0.71	0.73	0.7	0.79	0.66	0.74	0.81	0.79	0.69	0.77	0.8	0.78	
21/02/2022	0.77	7.22	0.75	0.77	0.81	0.75	0.69	0.79	0.69	0.83	0.7	0.8	0.78	0.53	
22/02/2022	0.8	7.2	0.77	0.81	0.79	0.81	0.76	0.86	0.75	0.82	0.81	0.82	0.79	0.73	
23/02/2022	0.8	7.2	0.78	0.82	0.83	0.81	0.78	0.81	0.71	0.82	0.81	0.75	0.79	0.75	
24/02/2022	0.76	7.2	0.77	0.8	0.86	0.8	0.74	0.76	0.79	0.81	0.74	0.8	0.81	0.7	
25/02/2022	0.8	7.22	0.76	0.83	0.77	0.84	0.8	0.82	0.67	0.81	0.77	0.81	0.78	0.79	
28/02/2022	0.8	7.21	0.68	0.76	0.85	0.81	0.73	0.8	0.79	0.82	0.79	0.85	0.85	0.75	
01/03/2022	0.81	7.2	0.79	0.58	0.84	0.83	0.76	0.84	0.75	0.86	0.85	0.78	0.87	0.78	
02/03/2022	0.81	7.2	0.87	0.82	0.78	0.82	0.76	0.81	0.77	0.79	0.88	0.87	0.84	0.77	
03/03/2022	0.65	7.22	0.63	0.69	0.76	0.66	0.84	0.7	0.76	0.79	0.8	0.78	0.8	0.69	
04/03/2022	0.52	7.22	0.64	0.7	0.74	0.63	0.73	0.64	0.76	0.72	0.73	0.75	0.74	0.73	

Pormpuraaw Aboriginal Shire Council DWQMP – Amended 2023

Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
07/03/2022	0.93	7.2	0.67	0.88	0.86	0.81		0.94	0.76	0.85	0.86	0.9	0.89	0.77	
08/03/2022	0.81	7.19	0.81	0.87	0.87	0.95	0.75	0.9	0.82	0.74	0.85	0.83	0.73	0.76	
09/03/2022	0.88	7.25	0.84	0.83	0.9		0.74	0.95	0.8	0.8	0.82	0.87	0.88	0.8	
10/03/2022	0.75	7.31	0.84	0.85	0.89	0.9	0.77	0.82	0.85	0.81	0.91	0.9	0.88	0.81	
11/03/2022	0.79	7.29	0.71	0.76	0.79	0.79	0.68	0.76	0.84	0.74	0.77	0.71	0.78	0.75	
14/03/2022	0.75	7.31	0.59	0.61	0.64	0.73	0.62	0.88	0.62	0.63	0.66	0.64	0.61	0.61	
15/03/2022	0.75	7.29	0.6	0.58	0.64	0.61	0.63	0.61	0.54	0.6	0.61	0.55	0.6	0.55	
16/03/2022	0.72	7.25	0.63	0.61	0.62	0.7	0.63	0.71	0.52	0.62	0.57	0.64	0.59	0.54	
17/03/2022	0.78	7.22	0.75	0.77	0.77	0.79	0.61	0.78	0.54	0.76	0.75	0.76	0.78	0.77	
18/03/2022	0.77	7.22		0.76	0.62	0.75	0.51	0.72	0.6	0.7	0.75	0.75	0.74	0.63	
21/03/2022	0.77	7.2	0.73	0.81	0.8	0.77	0.51	0.76	0.67	0.75	0.77	0.74	0.74	0.76	
22/03/2022	0.86	7.19	0.72	0.79	0.74	0.9	0.54	0.82	0.7	0.73	0.75	0.77	0.76	0.69	
23/03/2022	0.74	7.18	0.73	0.76	0.76	0.71	0.62	0.75	0.65	0.77	0.7	0.76	0.76	0.66	
24/03/2022	0.82	7.19	0.71	0.72	0.78	0.81	0.65	0.75	0.64	0.73	0.73	0.72	0.76	0.67	
25/03/2022	0.78	7.19	0.72	0.81	0.83	0.76	0.68	0.78	0.61	0.83	0.82	0.83	0.83	0.8	
28/03/2022	0.82	7.2	0.75	0.75	0.77	0.89	0.7	0.71	0.71	0.76	0.77	0.76	0.75	0.73	
29/03/2022	0.81	7.19	0.81	0.8	0.8	0.83	0.73	0.82	0.8	0.75	0.83	0.82	0.79	0.76	
30/03/2022	0.82	7.19	0.84	0.81	0.81	0.8	0.73	0.83	0.8	0.8	0.78	0.8	0.82	0.8	
31/03/2022	0.82	7.18	0.82	0.8	0.8	0.82	0.74	0.84	0.8	0.8	0.8	0.82	0.8	0.8	
01/04/2022	0.81	7.17	0.78	0.83	0.77	0.81	0.7	0.84	0.78	0.79	0.78	0.78	0.76	0.78	
04/04/2022	0.83	7.18	0.8	0.88	0.78	0.83	0.7	0.8	0.77	0.85	0.76	0.77	0.75	0.75	
05/04/2022	0.81	7.19	0.72	0.7	0.75	0.74	0.72	0.77	0.7	0.71	0.73	0.74	0.84	0.7	
06/04/2022	0.82	7.2	0.7	0.72	0.77	0.73	0.68	0.79	0.7	0.74	0.7	0.76	0.85	0.75	
07/04/2022	0.81	7.26	0.73	0.7	0.74	0.74	0.69	0.75	0.72	0.72	0.72	0.71	0.75	0.68	
11/04/2022	0.74	6.92	0.76	0.68	0.79	0.75	0.68	0.76	0.7	0.75	0.77	0.78	0.77	0.72	

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Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
12/04/2022	0.83	6.92	0.78	0.81	0.76	0.87	0.78	0.85	0.69	0.81	0.75	0.8	0.82	0.8	
13/04/2022	0.82	6.95	0.77	0.85	0.85	0.84	0.78	0.85	0.78	0.86	0.84	0.81	0.8	0.77	
14/04/2022	0.8	6.92	0.82	0.82	0.82	0.84	0.81	0.84	0.81	0.82	0.86	0.82	0.83	0.78	
19/04/2022	0.78	6.99	0.68	0.76	0.77	0.76	0.77	0.86	0.71	0.78	0.71	0.8	0.78	0.72	
20/04/2022	0.8	6.99	0.72	0.79	0.74	0.78	0.75	0.83	0.68	0.78	0.76	0.76	0.79	0.73	
21/04/2022	0.82	7.04	0.7	0.89	0.85	0.85	0.79	0.86	0.89	0.89	0.83	0.7	0.89	0.77	
22/04/2022	0.8	7.07	0.81	0.82	0.82	0.84	0.81	0.85	0.8	0.79	0.81	0.83	0.75	0.7	
27/04/2022	0.78	7.17	0.8	0.83	0.85	0.86	0.84	0.86	0.8	0.83	0.82	0.8	0.82	0.81	
28/04/2022	0.81	7.1	0.79	0.82	0.81	0.87	0.79	0.87	0.75	0.83	0.82	0.84	0.82	0.78	
29/04/2022	0.79	7.04	0.76	0.81	0.82	0.81	0.8	0.81	0.83	0.82	0.81	0.83	0.83	0.79	
03/05/2022	0.78	6.97	0.84	0.78	0.85	0.85	0.81	0.86	0.78	0.83	0.73	0.78	0.81	0.79	
04/05/2022	0.8	6.96	0.78	0.84	0.81	0.84	0.77	0.83	0.78	0.82	0.81	0.82	0.81	0.79	
05/05/2022	0.8	6.99	0.78	0.84	0.87	0.86	0.8	0.86	0.79	0.84	0.8	0.8	0.81	0.78	
06/05/2022	0.82	7.03	0.77	0.83	0.85	0.87	0.77	0.87	0.8	0.84	0.82	0.84	0.81	0.8	
09/05/2022	0.79	7.03	0.74	0.8	0.85	0.83	0.77	0.8	0.81	0.81	0.83	0.85	0.79	0.8	
10/05/2022	0.8	7.07	0.69	0.8	0.85	0.86	0.79	0.86	0.78	0.82	0.82	0.8	0.79	0.76	
11/05/2022	0.81	7.1	0.8	0.84	0.84	0.88	0.82	0.87	0.8	0.85	0.82	0.81	0.82	0.79	
12/05/2022	0.78	7.12	0.83	0.82	0.84	0.82	0.86	0.83	0.77	0.83	0.83	0.84	0.85	0.78	
13/05/2022	0.79	7.12	0.74	0.8	0.79	0.82	0.79	0.76	0.79	0.8	0.79	0.79	0.79	0.78	
16/05/2022	0.78	7.12	0.76	0.79	0.78	0.8	0.78	0.82	0.75	0.77	0.82	0.79	0.79	0.74	
17/05/2022	0.8	7.05	0.75	0.86	0.82	0.87	0.88	0.86	0.78	0.83	0.8	0.81	0.79	0.76	
18/05/2022	0.8	7.02	0.78	0.81	0.85	0.86	0.9	0.86	0.79	0.85	0.82	0.82	0.81	0.81	
19/05/2022	0.79	7.02	0.79	0.84	0.78	0.8	0.85	0.74	0.83	0.75	0.75	0.78	0.87	0.78	
20/05/2022	0.81	7.04	0.72	0.73	0.82	0.86	0.87	0.89	0.77	0.8	0.8	0.82	0.8	0.77	
23/05/2022	0.78	7.16	0.79	0.74	0.83	0.83	0.8	0.84	0.84	0.82	0.79	0.8	0.8	0.79	

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Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
24/05/2022	0.78	7.07	0.86	0.82	0.84	0.87	0.69	0.78	0.79	0.8	0.85	0.81	0.8	0.78	
25/05/2022	0.8	6.99	0.79	0.82	0.78	0.82	0.78	0.81	0.78	0.75	0.8	0.82	0.82	0.8	
26/05/2022	0.8	6.96	0.78	0.8	0.82	0.81	0.82	0.83	0.81	0.84	0.79	0.82	0.82	0.78	
27/05/2022	0.79	6.95	0.79	0.81	0.81	0.83	0.81	0.85	0.75	0.8	0.82	0.82	0.82	0.81	
30/05/2022	0.79	7.11	0.79	0.82	0.83	0.83	0.84	0.84	0.78	0.81	0.82	0.83	0.83	0.76	
31/05/2022	0.79	7.05	0.84	0.79	0.81	0.8	0.83	0.82	0.78	0.78	0.8	0.81	0.76	0.72	
01/06/2022	0.82	6.95	0.72	0.81	0.83	0.86	0.81	0.85	0.77	0.81	0.85	0.83	0.78	0.79	
02/06/2022	0.79	6.99	0.77	0.79	0.78	0.83	0.8	0.85	0.83	0.79	0.83	0.78	0.79	0.78	
06/06/2022	0.79	7.17	0.76	0.83	0.82	0.82	0.8	0.82	0.82	0.83	0.83	0.84	0.85	0.77	
07/06/2022	0.77	7.19	0.76	0.77	0.82	0.8	0.8	0.78	0.81	0.85	0.81	0.82	0.79	0.78	
08/06/2022	0.8	7.17	0.75	0.7	0.79	0.79	0.76	0.85		0.78	0.76	0.79	0.79	0.77	
09/06/2022	0.8	7.21	0.78	0.74	0.81	0.77	0.81	0.78	0.83	0.85	0.83	0.83	0.86	0.78	
10/06/2022	0.78	7.21	0.85	0.8	0.76	0.79	0.81	0.86	0.78	0.77	0.8	0.81	0.78	0.77	
13/06/2022	0.81	7.23	0.88	0.91	0.9	0.92	0.84	0.9	0.8	0.91	0.87	0.86	0.89	0.8	
14/06/2022	0.8	7.23	0.83			0.85	0.84	0.85							
15/06/2022	0.8	7.22	0.78	0.84	0.8	0.74	0.79	0.75	0.76	0.2	0.76	0.75	0.78	0.65	
16/06/2022	0.81	7.19	0.8	0.83	0.81	0.86	0.8	0.81	0.82	0.86	0.67	0.85	0.83	0.78	
17/06/2022	0.8	7.12	0.77	0.86	0.81	0.85	0.82	0.79	0.83	0.67	0.85	0.87	0.87	0.79	
20/06/2022	0.79	7.21	0.76	0.8	0.81	0.82	0.69	0.78	0.78	0.78	0.82	0.79	0.82	0.75	
21/06/2022	0.76	7.18	0.85	0.83	0.83	0.85	0.76	0.87	0.8	0.84	0.82	0.82	0.84	0.75	
22/06/2022	0.79	7.21	0.83	0.87	0.86	0.83	0.82	0.84	0.83	0.85	0.85	0.83	0.84	0.78	
23/06/2022	0.77	7.22	0.81	0.83	0.79	0.84	0.79	0.81	0.84	0.8	0.8	0.79	0.8	0.75	
24/06/2022	0.79	7.16	0.76	0.82	0.82	0.81	0.77	0.81	0.78	0.84	0.8	0.85	0.84	0.74	
27/06/2022	0.81	6.96	0.74	0.81	0.81	0.84	0.81	0.82	0.78	0.77	0.79	0.82	0.82	0.68	
28/06/2022	0.81	7.02	0.79	0.79	0.8	0.81	0.78	0.84	0.79	0.82	0.78	0.8	0.78	0.77	

Day	Chlorine	PH Level	Chlorine												Rainfall
	Analyser Display Reading	Analyser Display Reading PH	T/P 1	T/P 2	T/P 3	T/P 4	T/P 5	T/P 6	T/P 7	T/P 8	T/P 9	T/P 10	T/P 11	T/P 12	T/P 1
29/06/2022	0.81	7.08	0.79	0.75	0.74	0.76	0.74	0.78	0.73	0.75	0.72	0.71	0.73	0.58	
30/06/2022	0.79	7.14	0.7	0.76	0.72	0.71	0.67	0.74	0.77	0.76	0.77	0.77	0.76	0.74	

Appendix C: Health Based Target Assessment

Sub-Scheme	Comments	Scheme
Catchment Characteristics		Pormpuraaw
Human Faecal Waste/ Campers	Is human waste able to seep into the catchment from toilets, or are there other related issues? Provide details of wastewater collection, storage, treatment and disposal systems.	No, Reticulated sewerage, WWTP away from catchment
Recreation	Is there recreation next to or on the river or dam? Are there water source pollution reduction strategies.	No
Animals in the Catchment (e.g. cattle)	Describe any strategies to remove dead animals from water sources, and to control large numbers.	Ranger controls animals such as pigs, removal is undertaken.
Landfill	Is there a landfill either currently being used or a dis-used one in the catchment?	No
Mining Activity and Mineral Deposits	A search of mining activities has returned the below sites. Please check for accuracy and add additional information that may impact the catchment.	No
Nearby major transport routes	A search of transport routes has returned the below sites. Please check for accuracy and add additional information that may impact the catchment.	No
Chemicals stored in catchment	Are chemicals stored in the catchment? If so, please describe and what management is in place.	No
Dryland salinity risk (national dryland salinity risk mapping)		No
Storms and floods	Is there a flood risk to water supply and if so what is the management of this risk?	No - deep aquifer
Drought, variable rainfall and overuse of water	Assume yes to all sites. Offer any additional information such as resource monitoring practices such as backup supplies and water restrictions.	No - deep aquifer
Free Living Organisms	Is there a noticeable population of birds, fish, or organisms in the water supply? Please describe what these are.	No
Bushfire	Is there a bush fire risk? Do you undertake backburning and how frequent? Do you protect the water supply infrastructure?	No - deep aquifer

Storage stagnation	Is the water supply susceptible to blue-green algal blooms or stratification? Please provide details, and what inspections and actions are undertaken.	No
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Health Based Targets- Catchment Type and Hazard Cataloguing

Surface Water Assessment Only -Undertake Bore Pre-assessment prior to using this information.

Land use challenge/ pathogen sources	Intensity	Proximity	Protection	Category
Permanent human	Negligible No STPs Minimal, well-managed on-site sewage management systems	Human settlements and recreation excluded from the whole area of influence, typically the whole hydrological catchment and reservoir	Natural bushland Protection enforced by policed regulation Low intensity/low risk activities may be allowed in the outer catchment but active source protection (e.g. ranger patrols) is practiced to ensure negligible contamination risk Supply is from a large reservoir	1.Protected catchment
Permanent human	Minimal No STPs Low density rural developments with well managed on-site sewage management systems	Human settlements excluded from inner catchment (typical 2-3km from full supply)	Bushland inner catchment, low density rural outer catchment Stock fully fenced out of main feeder streams behind vegetated buffer zones. Protection enforced by policed regulation Low level and low intensity activities may be allowed within the outer catchment but active source protection (e.g. ranger patrols) is practiced to minimise contamination risk.	2.Moderately protected catchment
Permanent human	Moderate May include limited sewerage urban areas and STPs within outer catchment	Human settlements excluded from inner catchment	Medium density rural outer catchment possibly including some limited areas of urban development. Any STP effluent is filtered and disinfected and sewer spills are actively minimised. Major sewer overflows or STP failures would lead to a downstream water treatment shut down or boil water alert. Stock may have access to main feeder streams in the outer catchment. Protection enforced by policed regulation within inner catchment	3. Poorly protected catchment
Permanent human	High Includes sewerage urban areas and STPs	No exclusion zone	Although there are urban inputs, the total quantity of treated sewage or stormwater effluent flowing into the catchment is sufficiently limited that the Phase 2 AGWR are not applicable. Reasonable upper limits are 10% treated sewage effluent and 30% stormwater runoff. Any sewage or intensive agricultural effluent is treated (filtered and disinfected) and spills are actively minimised. Major spills would lead to a downstream water treatment shut down or boil water alert.	4. Unprotected catchment
Itinerant human	Negligible Minimal essential entry for rangers, pest controllers, fire managers Minimal illegal entry	Human settlements and recreation excluded from the whole area of influence, typically the whole hydrological catchment and reservoir	Natural bushland Protection enforced by policed regulation Low intensity/low risk activities may be allowed in the outer catchment but active source protection (e.g. ranger patrols) is practiced to ensure negligible contamination risk Supply is from a large reservoir	1. Protected catchment

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Itinerant human	Low level, low intensity recreation	No recreation on the main water body	Bushland inner catchment, low density rural outer catchment Stock fully fenced out of main feeder streams behind vegetated buffer zones. Protection enforced by policed regulation Low level and low intensity activities may be allowed within the outer catchment but active source protection (e.g. ranger patrols) is practiced to minimise contamination risk.	2. Moderately protected catchment
Itinerant human	Moderate level of land-based recreation	No recreation on the main water body	Medium density rural outer catchment possibly including some limited areas of urban development. Any STP effluent is filtered and disinfected and sewer spills are actively minimised. Major sewer overflows or STP failures would lead to a downstream water treatment shut down or boil water alert. Stock may have access to main feeder streams in the outer catchment. Protection enforced by policed regulation within inner catchment.	3. Poorly protected catchment
Itinerant human	High Intense land-based recreation May include water based recreation on reservoirs/rivers	No exclusion zone	Although there are urban inputs, the total quantity of treated sewage or stormwater effluent flowing into the catchment is sufficiently limited that the Phase 2 AGWR are not applicable. Reasonable upper limits are 10% treated sewage effluent and 30% stormwater runoff. Any sewage or intensive agricultural effluent is treated (filtered and disinfected) and spills are actively minimised. Major spills would lead to a downstream water treatment shut down or boil water alert.	4. Unprotected catchment
Stock animals	Negligible No farms Limited (controlled) populations of feral animals	Human settlements and recreation excluded from the whole area of influence, typically the whole hydrological catchment and reservoir	Natural bushland Protection enforced by policed regulation Low intensity/low risk activities may be allowed in the outer catchment but active source protection (e.g. ranger patrols) is practiced to ensure negligible contamination risk Supply is from a large reservoir	1. Protected catchment
Stock animals	Low density No dairies, feedlots, etc.	Farming excluded from inner catchment	Bushland inner catchment, low density rural outer catchment Stock fully fenced out of main feeder streams behind vegetated buffer zones. Protection enforced by policed regulation Low level and low intensity activities may be allowed within the outer catchment but active source protection (e.g. ranger patrols) is practiced to minimise contamination risk.	2. Moderately protected catchment
Stock animals	Medium density o No dairies, feedlots, etc.	Farming excluded from inner catchment	Medium density rural outer catchment possibly including some limited areas of urban development. Any STP effluent is filtered and disinfected and sewer spills are actively minimised. Major sewer overflows or STP failures would lead to a downstream water treatment shut down or boil water alert. Stock may have access to main feeder streams in the outer catchment. Protection enforced by policed regulation within inner catchment.	3. Poorly protected catchment
Stock animals	Intensive Includes dairies, feedlots, etc.	No exclusion zone	Although there are urban inputs, the total quantity of treated sewage or stormwater effluent flowing into the catchment is sufficiently limited that the Phase 2 AGWR are not applicable. Reasonable upper limits are 10% treated sewage effluent and 30% stormwater runoff. Any sewage or intensive agricultural effluent is treated (filtered and disinfected) and spills are actively minimised. Major spills would lead to a downstream water treatment shut down or boil water alert.	4. Unprotected catchment

Microbial Indicator Assessment Table

Band	Description of Faecal Contamination	E. coli number per 100 mL (maximum value in dataset)
1	Negligible	≤ 20
2	Moderate	20 to 2,000
3	Heavy	2,000 to 20,000
4	Gross	>20,000*
Not Available		

Combining vulnerability and microbial assessments to confirm source water category

	Bands of maximum <i>E. coli</i> result per 100 mL			
Preliminary source water category based on vulnerability assessment	<20 (Band 1)	20 to 2000 (Band 2)	2000 to 20,000 (Band 3)	>20,000 (Band 4: not recommended for use)
	1	2	3	4
1. Protected catchment	Category 1	Category 2	Anomalous	Not suitable
2. Moderately protected catchment	Category 2	Category 2	Anomalous	Not suitable
3. Poorly protected catchment	Anomalous	Category 3	Category 4	Not suitable
4. Unprotected catchment	Anomalous	Category 4	Category 4	Not suitable

Table 5.7.1. Bin classification and minimum treatment requirements, based on source water characteristics and E. coli monitoring data

Bin classification	Source water type	Typical <i>E. coli</i> results from raw water monitoring (number/100mL)#	Minimum treatment requirements expressed as LRV target^		
			Cryptosporidium	Bacteria	Viruses
Category 1	Fully protected surface water	<20	0	-4	0
Category 2	Groundwater or surface water with moderate levels of protection	20 to 2000	-2.5	-5	-3
Category 3	Groundwater or surface water with poor levels of protection	20 to 2000	-3.5	-5	-4
Category 4	Unprotected surface water	2000 to 20,000*	-5.5	-6	-6
Fully protected groundwater	Fully protected groundwater	<1	0	0	0

Health Based Targets Assessment

Scheme Name	Pormpuraaw
<i>Sub-Catchment Name</i>	<i>Pormpuraaw</i>
LRV Required Assessment	
Catchment Details	
Catchment/ river basin	
Rivers and water bodies	
Map Reference	
Population	750
Connections	207
Water Source	Bore
Water Source Type	Bores
Usage	Primary
Vulnerability Assessment	

Bores (determination if the bore is under the influence of surface water)	
Protected wellhead works (fenced, above flood level)?	Yes – fenced and above flood level
Bore sealed from ingress (including flood events)?	Yes
Depth to groundwater >10 metres?	Yes
Depth to bore pump >15 metres?	Yes
A confining layer above the aquifer from which the groundwater is being drawn, or the overlying material is homogenous, either homogenous sand or gravel?	Yes
The electrical conductivity of the groundwater does not decrease following rainfall, high flow or floods?	no
The turbidity of the groundwater does not increase following rainfall or floods?	no
E.coli an issue? (see below assessment of category)	No – no e.coli detected
Treat as a surface water source? (if no, treatment is generally not required, however confirm there is no E.coli or other contaminants present)	No
Resulting Category (Manual Entry)	1. Protected catchment
Microbial Indicator Assessment (from samples taken close to the intake)	
Band	1
Combining vulnerability and microbial assessments to confirm source water category	
confirm source water category	Category 1
Chosen source water category (Manual Entry)	Category 1
Log Reduction Value Deficit	
Cryptosporidium	0
Bacteria	-4
Viruses	0
LRV Credits Assessment	
Existing System Setup	
Filtration	
Type	Not required - Protected Catchment
Cryptosporidium treatment ability	0
Bacteria treatment ability	0
Viruses treatment ability	0
Score	
Cryptosporidium	0

Bacteria	-4
Viruses	0
Disinfection	
Type	Chlorination 7
Cryptosporidium treatment ability	0
Bacteria treatment ability	4
Viruses treatment ability	4
Score	
Cryptosporidium	0
Bacteria	0
Viruses	4
Other Disinfection (cannot be the previous disinfection type)	
Type	
Cryptosporidium treatment ability	0
Bacteria treatment ability	0
Viruses treatment ability	0
Score	
Cryptosporidium	0.0
Bacteria	0.0
Viruses	4.0
Additional Treatment Costs	
Filtration	Not required
Disinfection or relocation of unit	Not required
Other Disinfection (cannot be the previous disinfection type)	Not required
Other requirements such as raw pipeline re-direction	Not required
Total	-

Appendix D: Risk Assessment

Process Step	Item No.	Hazard	Type	Hazardous Event	Maximum Risk			Residual Risk			Reasons for Selection of Likelihood and Consequence Scores	Existing Controls					Future Controls												
					R	C	Medium	R	C	Confident		CCP Ref	HACCP Ref	Ops Procedure	Verify Procedure	Corrective Action	Target Critical	Breach Critical	Actions / Master Controls / Master Actions	Infrastructure	Ri	New CC	Assigned	Priority	Budget				
Process Step: Catchment (s)																													
Catchment	CMT1	Bacteria/ Virus	Biological	Animals in catchment	C	2	Medium	C	2	Medium	Confident	Alternative water sources are available (bores) however no management procedure exists to choose to switch over during poor water quality periods.	Catchment	Catchment	NIL	NIL	NIL	NIL	NIL	Add procedure for alternative water supply switch over.	C	2	Medium	No	Senior Plumber	2023	Internal Wages		
Catchment	CMT3	Protozoa	Biological	Animals in catchment	C	2	Medium	C	2	Medium	Confident	There is a catchment management plan in place. Controls in place.								See CMT1. Action assigned in CMT1.	C	2	Medium						
Catchment	CMT4	Amoeba (Naegleria, Acanthamoeba)	Biological	Animals in catchment	C	2	Medium	C	2	Medium	Confident	There is a catchment management plan in place. Controls in place.								See CMT1. Action assigned in CMT1.	C	2	Medium						
Catchment	CMT9	Iron	Chemical	Natural geology, sediment	A	1	Low	A	1	Low	Certain	3 years of WQ result reviewed.								Investigate potential starchy water sources. Investigate the WQ results they were significantly different. Check future risk score.	C	2	Medium		Senior Plumber	2024	Internal Wages		
Catchment	CMT15	Scaling	Chemical	TDS or organics in raw water	D	3	High	D	3	High	Certain	3 years of WQ result reviewed. Aesthetically risk.								Continue to monitor this parameter. Consider a filtration unit.	D	3	High		Senior Plumber	Ongoing	Internal Wages		
Catchment	CMT16	Alkalinity	Chemical	Potential change in ratio of surface runoff to storage	D	3	High	D	3	High	Certain	3 years of WQ result reviewed. Aesthetically risk.								Continue to monitor this parameter. Consider a dosing unit.	D	3	High		Senior Plumber	Ongoing	Internal Wages		
Catchment	CMT19	Colour	Physical	Naturally occurring	C	2	Medium	C	2	Medium	Certain	Likely related to TDS. No known complaints recorded for colour.								See CMT16. Action assigned in CMT16.	C	2	Medium						
Catchment	CMT23	Various Contaminants	Physical/Chemical etc.	Bushfires followed by runoff event	C	2	Medium	C	2	Medium	Confident	Bushfires common in the catchment, however monitoring result have not shown responses change in parameters.								No further action at this moment.	C	2	Medium						
Process Step: Bore																													
Intake	CMT1	Bacteria/ Virus	Biological	Animals in catchment	C	2	Medium	C	2	Medium	Confident	Fencing around the bore head area. Alternative between sources.	Intakes	Intakes	Source water management plan	Daily testing procedure	Source water management plan			NIL		C	2	Medium					
Intake	CMT3	Protozoa	Biological	Animals in catchment	C	2	Medium	C	2	Medium	Confident	See above CMT1.								NIL		C	2	Medium					
Intake	CMT4	Amoeba (Naegleria, Acanthamoeba)	Biological	Animals in catchment	C	2	Medium	C	2	Medium	Confident	See above CMT1.								NIL		C	2	Medium					
Intake	CMT15	Scaling	Chemical	TDS or organics in raw water	D	3	High	D	3	High	Confident	See above CMT15.								See filtration option discussed in CMT15. Action assigned in CMT15.	B	2	Low						
Intake	CMT16	Alkalinity	Chemical	Potential change in ratio of surface runoff to storage	D	3	High	D	3	High	Confident	See above CMT16.								See filtration option discussed in CMT15. Action assigned in CMT15.	B	2	Low						
Intake	CMT19	Colour	Physical	Naturally occurring	C	2	Medium	C	2	Medium	Confident	See above CMT1.								See filtration option discussed in CMT15. Action assigned in CMT15.	B	2	Low						
Intake	INT4	Various Contaminants	Physical/Chemical etc.	Intake damaged, local pooling around bore head causing ingress	C	5	Very High	A	2	Low	Confident	Bore head raised and sealed to Australian and Queensland Government standards/								Inspection occur that review the state of the bore head.									
Intake	INT7	Bore Blockage	Whole of System	Clogged Intake - Natural Iron/Oxidising Bacteria causing blockage or	C	2	Medium	C	1	Low	Certain	Natural aeration drops from ~5m down inlet into reservoir								Bore chlorination and flow monitoring upgraded in 2018. No Further Action Required									
Intake	INT8	Temperature	Physical	Natural bore temperature.	C	2	Medium	C	2	Medium	Certain	Bore water is warm but ok.								NIL, existing system temperatures are tolerable.	C	2	Medium						
Intake	INT10	Various Contaminants	Whole of System	Sabotage/ Terrorism	A	5	High	A	1	Low	Certain	Alternative supply.			Daily Checklist	Daily testing procedure													

Process Step: Storage Reservoirs																					N/A				
Reservoirs	CMT3	Prot ozone	Biological	animals cat chment	C	2	Medium	Roof ed St orages	C	2	Medium	Conf ident	Daily inspect ionsin place. Risk not increased, however cannot reduce.							N/A					
Reservoirs	CMT15	Scaling	Chemical	TDS or organicsn raw water	C	2	Medium	NI	C	2	Medium	Conf ident	No change to st atus.	Addresswit h CMT1Filt er. Act ion assigned earlier.				B	1	Low					
Reservoirs	CMT16	Alkalinit y	Chemical	Pot ent ial change in ratio of surf ace runoff f t o storage	D	3	High	NI	D	3	High	Est imat e	No change to st atus.							N/A					
Reservoirs	CMT17	pH	Chemical	pHreact ing wit h walls	C	2	Medium	All Reservoirshave Inspect ionsannually	A	1	Low	Conf ident		Reservoir inspect ionsto be held mid year & document ed				A	1	Low	Senior Plumber	Ongoing	Internal Wages		
Reservoirs	CMT19	Colour	Physical	Nat urally occuring	C	2	Medium	NI	C	2	Medium	Conf ident	No change to st atus.	Addresswit h CMT1Filt er. Act ion assigned earlier.				B	1	Low					
Reservoirs	CMT20	Turbidit y	Physical	Turbidit y, Iron deposit s	C	3	High	All Reservoirsdrained and cleaned every 5 years	B	2	Low	Conf ident								N/A					
Reservoirs	INT6	Failure of supply	Whole of System	lossof power or no water	C	2	Medium	Monit ored by SCADA. Daily Inspect ionsdat a Collect ion, water pumped it resand hoursumping	A	1	Low	Conf ident		Cont inuedtraining of all st aff. Act ion assigned above in DS1					A	1	Low				
Reservoirs	INT8	Temperat ure	Physical	Nat ural bore temperat ure	C	2	Medium	pot ent ially a long ret ent ion time.	B	2	Low	Conf ident	pot ent ially a long ret ent ion time.							N/A					
Reservoirs	WTP1	Various Cont aminant s	Physical/ Chemica l etc.	telemet ry failure allowing unt reat ed or semi-treat ed water	B	4	High		B	4	High	Est imat e	No reduct ion ast he backup syst emsor failure management syst emsare not properly underst ood.	Investgat e SCADA management during failures				B	4	High	Yes	Senior Plumber	2024	Internal Wages	
Reservoirs	RES1	Bact eria/ Virus	Biological	Animalsn reservoir	C	3	High	Reservoir cleaning and scouring	A	3	Medium	Conf ident	All Reservoirsare roof ed, wat er proof ed and vermin proof ed. Inspect ion carried out annually	Reservoir cleaning procedure iscurrentl y being developed. Inspect ionsto be held mid year						N/A	Yes	Senior Plumber	2024	Internal Wages	
Reservoirs	RES2	Bact eria/ Virus	Biological	Poor Tank t umover	C	3	High	Operat iona l set t ingsin place.	B	3	Medium	Est imat e	Lower frequency of pot ent ial issuesdue to daily inspect ions.	Procedure required f or tank turnover						N/A	Yes	Senior Plumber	2023	Internal Wages	
Process Step: Reticulation System																					N/A				
Reticulation	CMT3	Prot ozone	Biological	animals cat chment	C	2	Medium		C	2	Medium	Conf ident	See CMT1.							N/A					
Reticulation	CMT15	Scaling	Chemical	TDS or organicsn raw water	C	2	Medium	NI	C	2	Medium	Conf ident	No change to st atus.	Addresswit h CMT1Filt er. Act ion assigned earlier.				B	1	Low					
Reticulation	CMT16	Alkalinit y	Chemical	Pot ent ial change in ratio of surf ace runoff f t o storage	D	3	High	NI	D	3	High	Conf ident	No change to st atus.	Addresswit h CMT1Filt er. Act ion assigned earlier.				B	1	Low					
Reticulation	CMT19	Colour	Physical	Nat urally occuring	C	2	Medium	NI	C	2	Medium	Conf ident	No change to st atus.	Addresswit h CMT1Filt er. Act ion assigned earlier.				B	1	Low					
Reticulation	INT6	Failure of supply	Whole of System	lossof power or no water	C	3	High		B	2	Low	Conf ident	Bores# 3 and Bore # 4 can be connect ed directl y to t he wat er supply, HOWEVEr a bol wat er alert must be issued. THIS HAS NEVER HAPPENED.							N/A					
Reticulation	WTP1	Various Cont aminant s	Physical/ Chemica l etc.	telemet ry failure allowing unt reat ed or semi-treat ed water through.	C	3	High	Daily checks	B	3	Medium	Conf ident	The backup syst emsor failure management syst emsare not properly underst ood. Only relevant f or pressure and flow values.	Investgat e SCADA management during failures. Assessfut ure risk.				B	3	Medium	Yes	Senior Plumber	2024	Internal Wages	
Reticulation	RES1	Bact eria/ Virus	Biological	Animalsn reservoir	A	3	Medium	NI	A	3	Medium	Conf ident	No change to st atus.	Act ion assigned earlier.				A	3	Medium					
Reticulation	RES2	Bact eria/ Virus	Biological	Poor Tank t umover	B	3	Medium	NI	B	3	Medium	Conf ident	No change to st atus.	Act ion assigned earlier.				A	3	Medium					
Reticulation	RET1	Bact eria/ Virus	Biological	Ingressof cont aminat ed water - Pipe Breaks/ MainsBreak	C	4	Very High	Mainsbreak procedure based on Aust ralian St andards/ or wat er main break repairs, disinfect ion	C	2	Medium	Conf ident	Procedure in place. Breakage repairs undertaken under Plumbing Code.	Flushing water Mains	Testing For Free Chlorine in Sit u						N/A				
Reticulation	RET4	Turbidit y	Physical	resuspension of sediment in reservoirs/ mains, or Pipe Breaks/ Mains breaks	C	2	Medium	Disinfect ion and Mains Flushing	B	2	Low	Conf ident	Procedure in place.	Flushing water Mains	Testing For Free Chlorine in Sit u						N/A				
Reticulation	RET5	Prot ozone	Biological	Backf low f rom ret iculat ion sit es	A	4	High	Plumbing and drainage lows. NRVson all met ers. High Level tanksprovide wat er st orage to	A	3	Medium	Conf ident	Cont rolsin place.		Nil - procedure in place.				A	3	Medium				

Process Step: Whole of system																				N/A		
Whole of System	WOS1	Human Error	Competency	Undertrained staff (formal) No or poor worker treatment leading to the presence of hand or foot or water or poor aesthetic quality.	C	5	Very High	On The Job training, Experience, Supervision and Guidance	C	2	Medium	Confident	Contain place.									
Whole of System	WOS2	Human Error	Information Management	Water quality data storage and summary	C	3	High	Not recorded in paper and on computer. Includes external source of verification testing	C	2	Medium	Confident	Contain place.									
Whole of System	WOS3	Failure of supply	Sabotage	Vandalism and terrorism - introduction of harmful bacteria or toxic chemicals	A	4	High	Well Fenced and secure infrastructure. Daily site visits and checks	A	2	Low	Estimate	Contain place.								N/A	
Whole of System	WOS4	Failure of supply	Power Loss	Electricity outage - No water or significant flooding causing no electricity	A	3	Medium	Standby Generators are available	A	2	Low	Confident	Contain place.								N/A	
Whole of System	WOS5	Resources	Supplies	Lack of transport availability to conduct operational checks and water quality testing	C	3	High	Back up vehicles available for water operational staff	A	2	Low	Confident	Contain place. Local testing equipment								N/A	
Whole of System	WOS6	Governance	Cybersecurity	Lack of asset management	C	5	Very High	Our SCADA provider has developed and implemented a governance framework with responsibilities/policies/procedures or information technology security. These include: - Information Systems (IS) Policy. - Computer System and Equipment Use Standard. - Information Systems Management Guidelines	A	3	Medium	Confident	Contain place.									
Whole of System	WOS7	Governance	Cybersecurity	Inability to detect critical Assets	C	5	Very High	As above	A	3	Medium	Confident										
Whole of System	WOS8	Intentional Interference	Cybersecurity	Disruption of Cyber information (CI)	C	5	Very High	As above	A	3	Medium	Confident	IT antivirus software currently installed. OT SCADA machines will not have anti-virus installed as it can interfere with SCADA installed software. Cybersecurity of OT SCADA machines controlled by restricting internet access and eliminating the use of external USB drives and fire wall settings.									
Whole of System	WOS9	Intentional Interference	Cybersecurity	Disruption of Systems (DS)	C	5	Very High	As above	A	3	Medium	Confident	As above									
Whole of System	WOS10	Intentional Interference	Cybersecurity	Disruption of Cyber information (CI)	C	5	Very High	As above	A	3	Medium	Confident	As above									

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Whole of System	2511	Intentional Interference	Cybersecurity	Disruption of Systems (OT)	C	5	Very High	Asabove	A	3	Medium	Confident	Asabove							Asabove			N/A							
Whole of System	WOS12	Unintentional Interference	Cybersecurity	Disruption of Cyber information (IT)	C	5	Very High	Asabove	A	3	Medium	Confident	Asabove							MA - 01 Implement private SCADA network - requires testing and cut over for all water facilities, sites & equipment MA - 02 Build single point of access and authentication method Under take after MA-01. A single point access should be built as a mechanism to enter the ethernet network. MA - 03 Implement rules to prevent cross network access - After MA-01 & MA-02, SCADA provider to create and document a procedure for secure entry to the IT/OT network. MA - 04 Disallow open internet access - To be actioned with MA-01 & MA-02. Address vulnerability scenarios but also allows for system updates (e.g. allowing Windows Updates).				A	2	Low		SCADA Maintainer	2024	10,000
Whole of System	WOS13	Unintentional Interference	Cybersecurity	Disruption of Systems (IT)	C	5	Very High	Asabove	A	3	Medium	Confident	Asabove							Asabove			N/A							
Whole of System	WOS14	Unintentional Interference	Cybersecurity	Disruption of Cyber information (OT)	C	5	Very High	Asabove. Only qualified and trained personnel are assigned the responsibility of implementing and maintaining cybersecurity for OT systems	A	3	Medium	Confident	Asabove								Asabove			N/A						
Whole of System	WOS15	Unintentional Interference	Cybersecurity	Disruption of Systems (IT)	C	5	Very High	Asabove. Only qualified and trained personnel are assigned the responsibility of implementing and maintaining cybersecurity for OT systems	A	3	Medium	Confident	Asabove								Asabove			N/A						
Whole of System	WOS16	Physical security Breach	Cybersecurity	Unauthorized access	C	5	Very High	Security Key system, induction and procurement procedures, contractor controls.	A	3	Medium	Confident											N/A							
Whole of System	WOS17	Abuse of Cyber Information	Cybersecurity	Systems Configuration and data files	C	5	Very High	Asin WOS6	A	3	Medium	Confident								MA-05 Install and enable active virus scanning - OT SCADA machines will not have anti-virus installed as a control of SCADA installed software. Cybersecurity of OT SCADA machines controlled by restricting internet access and eliminating the use of external USB drives and firewalls. MA-06 Activate and set windows firewall rules - Do after MA-01 is completed MA-07 Implement maintenance and updates schedule - Maintenance will be ongoing in terms of updating SCADA software. All upgrades or changes to PLC or SCADA shall have their configuration files backed up and saved on each workstation on-site and off-site. MA-08 Certificate or key based authentication for remote access - Do after MA-01 is completed				A	2	Low		SCADA Maintainer	2024	10,000
Whole of System	WOS18	Theft of Information	Cybersecurity	System configuration and Data files	C	5	Very High	Asin WOS6	A	3	Medium	Confident								Asabove			N/A							
Whole of System	WOS19	Fraud	Cybersecurity	Access to Confidential Information	C	5	Very High	Asin WOS6	A	3	Medium	Confident								Asabove			N/A							

Whole of System	WOS20	Regulatory Breaches	Cybersecurity	Unauthorized Access/privacy	C	5	Very High	Asin WOS6	A	3	Medium	Confident							As above			N/A					
Whole of System	WOS21	Control	Cybersecurity	Lack of access control and identity management	C	5	Very High	Asin WOS6	A	3	Medium	Confident							MA-10 Implement backup schedule - To be done as part of regular maintenance of IT/OT systems. Backups of configurations to be made and stored onsite with a copy stored off-site in the secure corporate Drive, and with the SCADA provider. MA-11 Ensure validity of software licences used across machines - Ongoing as all SCADA OT software licenced and authentication is used across SCADA OT machines.			N/A	SCADA Maintainer	2024	2,000		
Whole of System	WOS22	Technical advancement	Cybersecurity	Lack of protective technology and maintenance	C	5	Very High	Asin WOS6	A	3	Medium	Confident							Perform routine manual operation of sites, and ensure documentation exist for operating procedures. Staff should be trained and deemed competent to run manual operation of sites. Training of manual mode operations for each facility ongoing			N/A	Senior Plumber	2024	Internal Wages		
Whole of System	WOS23	Detection	Cybersecurity	Inability to detect a cyber security event	C	5	Very High	Asin WOS6	A	3	Medium	Confident							Increased awareness from operations surrounding physical security access on CS sites, provided by means of training sessions. Add to the procedures			N/A	Senior Plumber	2024	Internal Wages		
Whole of System	WOS24	System failure	Cybersecurity	Loss of system control	C	5	Very High	Perform routine manual operation at site. Documentation exist for operating procedures. Staff	A	3	Medium	Confident										N/A					
Whole of System	WOS25		Cybersecurity		C	5	Very High		A	3	Medium	Confident										N/A					
Whole of System	WOS26		Cybersecurity		C	5	Very High		A	3	Medium	Confident										N/A					
Whole of System	WOS27		Cybersecurity		C	5	Very High		A	3	Medium	Confident										N/A					
Whole of System	WOS28		Cybersecurity		C	5	Very High		A	3	Medium	Confident										N/A					
Whole of System	WOS29		Cybersecurity		C	5	Very High		A	3	Medium	Confident										N/A					
Whole of System	WOS30		Cybersecurity		C	5	Very High		A	3	Medium	Confident										N/A					
Whole of System	WOS31		Cybersecurity		C	5	Very High		A	3	Medium	Confident										N/A					
Whole of System	WOS32		Cybersecurity		C	5	Very High		A	3	Medium	Confident										N/A					

Appendix E: HCCAP Summary

Target, Alert and Critical Breach Limits

CCP/Process step / location	Parameter	Associated hazard	Sampling			Target limit	Action if target limit is not met	Critical limit	Action if critical limit is exceeded
			Frequency	Method	Analysis				
All 11 sample points	Free chlorine	Bacteria (harmful) and chlorine	Daily (excl. public holidays)	HACH Pocket Colorimeter II 58700-00	In-house	>0.5 mg/L, <1.5 mg/L	Confirm correct operation at treatment plant.	<0.3mg/L and >2.0mg/L	Confirm correct calibration at plant. Re-adjust the dose rate at plant. Ensure free chlorine level is within target range. If < 0.3 mg/L report as an incident to DRDMW
Sample points 1 & 5	Turbidity	Turbidity	Weekly	HACH 2100Q Turbidimeter	In-house	As low as possible, preferably < 2NTU.	Monitor.	>5 NTU	Check system for breakage or malfunction.
	E. coli	Bacteria (harmful)	Weekly	HACH MEL /MPN	In-house	0 MPN/100ml	Re-test	0 MPN/ 100mL	Report to DRDMW within 3 hours
Bore 1 and Bore 2	E. coli	Bacteria (harmful)	Monthly	HACH MEL /MPN	In-house	0 MPN/100ml	Re-test	0 MPN/ 100mL	Ensure disinfection is working correctly and take sample of treated water.
	Turbidity	Turbidity	Monthly	HACH 2100Q Turbidimeter	In-house	As low as possible, preferably < 1NTU.	Monitor.	>1NTU	Flush the bores and retest. If retest fails, and contamination is suspected, report as an event to DRDMW.

CCP/Process step / location	Parameter	Associated hazard	Sampling			Target limit	Action if target limit is not met	Critical limit	Action if critical limit is exceeded
			Frequency	Method	Analysis				
	pH	Optimum pH	Monthly	HACH pH meter HQ11D	In-house	7.0 – 7.8	Monitor	<6.5, >8.4	Adjust acid dosing
Chlorine Analyser Display Panel	Free chlorine	Bacteria (harmful) and chlorine	Daily	Reading from Analyser Pane and verification from HACH Pocket Colorimeter II	In-house	Setpoint 0.8 mg/L+/- 0.1mg/L	Check system operation and SCADA alarms and re-adjust the dose rate if required	<0.5mg/L and >1.1mg/L	Re-calibrate if required and reset flow controllers. Ensure free chlorine level is within target range.
	pH	Optimum pH	Daily	Reading from Analyser Panel	In-house	7.0-7.8	Ensure analyser is functioning correctly (Verify using HACH pH meter HQ11D)	<6.5, >8.0	Bypass pH compensator function and repair probe.

Appendix F: Operational Procedures and Monitoring

Procedures

Procedure	Version Date	Comments	Next Review Date
Operations and Maintenance	Version 2	Procedure Manual	To Be Split into individual procedures in 2021
Flushing water Mains			
Cleaning Reservoirs			
Water Sampling			
Transportation of Samples			

Daily Reading Sheet

Daily Checklist			
Testing for Free Chlorine in Situ	HACH Instruction Manuals	To Be Finalised	2023
Testing water samples in PASC LAB	HACH Instruction Manuals	To Be Finalised	2023
Collecting Water samples	Version 1	To be updated to reflect new sampling	2023
Palin Test Instruction Procedure	Version 1	Procedure Manual	2023
Boil Water Alert Procedure	Version 1	Procedure Manual	2023
Quarterly Reporting Procedure	Version 1	Procedure Manual	2023
Calibration and setpoint adjustment procedures for SCADA controlled gas chlorination equipment	Version 1	To be finalised from data from 2017/2018 Project O&M manuals	2023
Disinfection - Gas Chlorination equipment operations manual	Version 1	Data currently in 2017/2018 Project O&M manuals. To be condensed for operator use	2023

Operational Monitoring Overview

Operational monitoring

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

Location, Monitoring Action, and Frequency

The following locations and frequency are in place.

Operational Monitoring Frequency

Operational Monitoring		Frequency
Bores		
Check Bore Operations		Daily
Inspection of Bore Flow Rates		Weekly
General Site Inspection and Fence Integrity Check		Weekly
Inspection of Switchboards (By Electrician)		Quarterly
Inspection of Bore Electrical Integrity (By Electrician)		Quarterly
Inspection of Bore Drawdown Capabilities		Annually
Treatment Plant and Reservoirs		
Check Pump Operations		Daily
Check Chlorine Levels		Daily
Check Chlorine Stock Levels		Daily
Check Chlorine Operations		Daily
Inspection of Pump Flow Rates		Weekly
General Site Inspection and Fence Integrity Check		Weekly
Check of Float Switches, sensors & Corrosion		Monthly
Inspection of Switchboards (By Electrician)		Quarterly
Inspection of Pump Electrical Integrity (By Electrician)		Quarterly
Inspection of Reservoir Cleanliness		Annually
Reticulation		
Check for Leaks		Daily(Drive Around)
Check Hydrant Operation		Quarterly
Check Valve Operations		Quarterly
Check Water Meter Readings		Half Yearly
Check Special Meters		As Required

Visual Checks

These are completed on a daily basis this includes but is not limited to:

- Fence Integrity
- All Chlorine equipment is working properly and supplied correctly
- High Lift pumps are operational
- Booster pumps are operational
- Reservoir levels both on-site and on computer (SCADA)

- Chlorine Levels both on-site and on computer (SCADA)
- Backup Generator (2) (General)

Backup Generation

These are described below:

- Backup Generators are started once a fortnight
- Backup Generators are serviced every 6 months

Sampling

Operational monitoring samples are undertaken at 11 separate locations around the community. This also allows for a snapshot average of the whole community.

All of the following test points have their own dedicated testing point that can only be accessed by an Authorised Person.

Each testing point with the exception of Testing Point 1 and testing Point 4 are immediately before the water meter.

Testing Point 1 – Is approximately 20 metres from the water meter and Testing Point 4 is after the high lift pumps (this captures the chlorine level as it leaves the clear water tank).



This marker is at every Test Point (1 – 12).

Locations of Water Testing Points

Test points are located at:

- Water Test Point 1 – Plumbers Shed
- Water Test Point 2 – Child Care Centre
- Water Test Point 3 – School
- Water Test Point 4 – Reservoir
- Water Test Point 5 – Main Roads Camp
- Water Test Point 6 – Chlorine Trickle Trim
- Water Test Point 7 – North West House
- Water Test Point 8 – North East House, 218 Maanth Street
- Water Test Point 9 – South East House, 251 Raaku Street
- Water Test Point 10 – South East House, 194A Rirranth Street
- Water Test Point 11 – Kiosk/Canteen
- Water Test Point 12 – Airport

In addition to the 12 sampling points, water is tested at:

- Bore 1

- Bore 2
- Chlorine analyser at the Water Treatment Plant

The sampling locations are shown on the map below.



Sampling Location Photos

Figure 1 Test Point 1- Plumbers Shed

Figure 2 Test Point 2- Child Care Centre



Figure 3 Test Point 3- School

Figure 4 Test Point 4- Reservoir



Figure 5 Test Point 5– Main Roads Camp

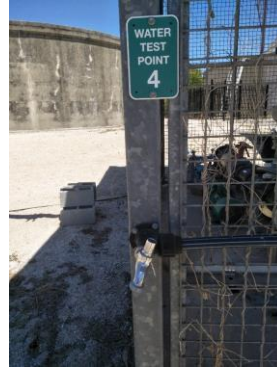


Figure 6 Test Point 6- Chlorine Trickle Trim



Figure 7 Test Point 7– North West House



Figure 8 Test Point 8–218 Maanth Street



Figure 9 Test Point 9–251 Raaku Street



Figure 10 Test Point 10–194A Rirranth St



Figure 11 Test Point 11– Canteen/Kiosk



Figure 12 Test Point 12– Airport



Parameters Tested

The following table indicates the location and parameters tested:

**PORMPURAAW ABORIGINAL SHIRE COUNCIL
DAILY READING SHEET**

DAY MARCH 2021				
ITEM	LOCATION		EXAMPLE	ACTUAL
1	SCADA Rainfall	mm	- 24 hours	
2	SCADA Usage - Computer	kl	- 24 hours	
3	Plumbers Shed	Free Chlorine	Test Point 1	
4	Plumbers Shed Test Point 1	Turbidity	Tuesday	
5	Plumbers Shed Test Point 1	Free Chlorine	Tuesday	
6	Bore 2	Daily	Meter Read	
7	Bore Pump 2	Turbidity	Tuesday	
8	Bore Pump 2	Free Chlorine	Tuesday	
9	Check Control Board NO Orange Lights	YES/NO	Meter	
10	Hi Lift Pump	Daily	Meter Read	
11	Bore 1	Daily	Meter Read	
12	Bore Pump 1	Turbidity	Tuesday	
13	Bore Pump 1	Free Chlorine	Tuesday	
14	Analyser Display Reading	Free Chlorine	Analyser	
15	Analyser Display Reading	pH	Analyser	
16	Sulphuric Acid - LIGHT ON or OFF		Analyser	
17	Sulphuric Acid - pH Reading		Analyser	
18	Sulphuric Acid Flow Detected	YES/NO	Analyser	
19	Sulphuric Acid -- Pump Dose Rate Mg/Min		Analyser	
20	Reservoir	Free Chlorine	Test Point 4	
21	Chlorine Trim Trickle	Free Chlorine	Test Point 6	
22	Main Roads Camp	Free Chlorine	Test Point 5	
23	Main Roads Camp	Mon and Thurs	Meter Read	
24	Main Roads Camp	Turbidity	Tuesday	

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25	Main Roads Camp	Free Chlorine	Tuesday	
26	School	Free Chlorine	Test Point 3	
27	School	Mon and Thurs	Meter Read	
28	Booster Pump	Daily	Meter Read	
29	Child Care Centre	Free Chlorine	Test Point 2	
30	NE House - 216 Manth	Free Chlorine	Test Point 8	
31	NW House - 204A Piithamp Street	Free Chlorine	Test Point 7	
32	Child Safe House	Mon and Thurs	Meter Read	
33	Womens Refuge	Mon and Thurs	Meter Read	
34	SE House - 251 Raaku Street	Free Chlorine	Test Point 9	
35	Rise Gardens	Mon and Thurs	Meter Read	
36	SW House - 194A Rirranth Street	Free Chlorine	Test Point 10	
37	Police Station	Mon and Thurs	Meter Read	
38	Canteen - Kiosk	Free Chlorine	Test Point 11	
39	Croc Farm	Mon and Thurs	Meter Read	
40	Airport	Free Chlorine	Test Point 12	
41	Beaches	Mon and Thurs	Meter Read	

SWIMS DATA ENTRY;-/03/2021

Appendix G: Verification Procedures and Monitoring

Verification Procedures

PASC WATER PROCEDURES

Cairns Water Lab Water Sampling

REQUIRED –

- Small Esky
- Ice Block
- Sample Bottles
- In House E.coli Detection Sample Bags
- In House E.coli Detection Sample Bottles
- Gas Burner
- Chain of Custody Form
- Key to open Taps
- Hand wash (sanitizer)
- Disposable Gloves

- Fill in Chain of Custody form as much as possible before leaving office including order number.
- Allow at least 45 minutes to complete all testing
- Ensure Daily sampling has been completed and reading are acceptable for free chlorine (that is should be 0.5 or more)

- Make sure you have spoken to Airport (Scruffy) Manager to confirm what time samples must be at airport by.
- Normally samples are undertaken 3rd Tuesday of the Month
- Normally 6 samples are taken(monthly)
 - Water Test point 6 NW House
 - Water Test Point 7 NE House
 - Water Test point 3 School
 - Water Test Point 8 SE House
 - Water Test Point 9 SW House
 - Water Test Point 10 Canteen
- Two extra samples are taken JANUARY, APRIL, JULY & OCTOBER
 - Bore 1
 - Bore 2
- Two extra samples are taken JANUARY, JULY
 - Sewer Ponds Inlet
 - Sewer Ponds Outlet

PROCEDURE

1. Turn tap full on to flush water for two minutes
2. Turn tap off
3. Burn tap for at least one minute
4. Turn tap back on – low flow
5. Wash Hands with Sanitizer (Sampler)
6. Wear gloves
7. Remove lid from sample bottle
8. Fill container, to top line, do not allow to overflow
9. Replace lid
10. Replace sample bottle in esky with ice block
11. Record time on chain of custody
12. Fill in house E.coli detection bag to line
13. Shake bag until small tablet dissolves
14. Pour bag into In house detection bottle
15. Replace bottle into secure safe location
16. Turn off water
17. Remove gloves
18. Attend next site
19. Repeat procedure

Only remove the lid of the sample bottles when you are ready to fill the sample bottles

Once you have removed the lid from the sample bottle. TRY NOT TO TOUCH anything except the outside of the bottle or the lid. Even with gloves on you might contaminate the water by touching the inside of the lid, the thread etc

20. When all samples are taken return to shed and if you have time place Cairns Water Sample bottles in Freezer until its time to take to Airport(usually after lunch)
21. In house E.coli samples can be placed in our small oven for 24 hours.
22. Sending samples to Cairns, Make sure chain of custody is with samples as well as ice block
23. Seal container and place CAIRNS WATER LAB contact and address
24. Take to airport and hand over to Airport Manager

Draft number	Draft Author	Draft Date	Comments
01	ASH	6/11/2016	

PASC WATER PROCEDURES

Positive Results

Once we receive a positive result from Cairns Water **WE MUST ACT IMMEDIATELY**.
A positive result is any E.coli reading that is **ONE or MORE THAN ONE**

REMEMBER WE DO HAVE VULNERABLE ADULTS AND CHILDREN IN OUR COMMUNITY AND WE MUST TREAT EVERY POSITIVE RESULT AS A POTENTIAL KILLER

You have 3 hours once you have been made aware. Note time you became aware.
Cairns Water Lab will email or ring you. That is dependent on your readings and their protocols.
They also contact the Water Regulator and the Department of Health

1. **Contact Water Regulator by ringing 1300 596 709**
2. **Contact Raquel Esteban, Department Energy and Water Supply and advise her (she might be that answers anyway). Raquel is our contact within the department and is always very helpful.**
3. **Advise them of your non conformance**
4. **Note time.**
5. **They will ask your intentions**
6. **First intention is always to undertake major Flushing Mains either side of non compliance**
7. **Second intention is contact of all on contact list**
8. **Third intention is to complete re test as soon as possible**
9. **They will ask what your chlorine reading at that location was that morning.**
10. **Have the answer ready.**
11. **They will ask for your opinion of what you think happened to get the result. You must be honest. If its human error or maybe it is actually a contaminant in our water supply**
12. **Contact CEO, RANGER & OPERATIONS MANAGER**
13. **We are there to assist**
14. **Ring Chris Blake or Brad Milligan QLD Health in Cairns, advise them and ask for guidance.**
15. **Flushing mains might be enough, boiled water alert or more serious actions may be required**
16. **Once you have been advised by Qld Health put an urgent email to all as per our attached contact list advising them of the non compliance and what you intend to do, (Example Attached)**
17. **If required ask for more input from CEO (refer attached Flyer)**
18. **Once you have completed everything above, then the paperwork will start.**
19. **The form, INITIAL NOTIFICATION, I have attached two, one is completed as an example and then there is a blank spare.**
20. **This must be completed with 24 hours and scanned and emailed to : dinkingwater.reporting@dews.qld.gov.au**
21. **I would also send to Raquel.esteban@dews.qld.gov.au.**
22. **You will receive a response with an incident number (example DWI-7-148-00007), please use that from then on any correspondence.**
23. **This PART 1 is only 4 pages long.**

24. When you have completed your re test and you have received your results and they pass.
You will then contact Water Regulator 1300 596 709, Raquel, Chris, Brad, CEO, Ranger, Operations Manager and advise them.
25. You can also request that any action that has been imposed be lifted (Boiled Water Alert)
26. You can now complete the paperwork, remember to quote your incident number, (write it on the paper)
27. The second set of paperwork is very important and must be completed within a reasonable timeframe. I would suggest within 10 working days.
28. This is the **INVESTIGATION REPORT** (three more pages)
29. INVESTIGATION ACTIONS
30. INVESTIGATION OUTCOMES
31. CORRECTIVE ACTIONS
32. PREVENTATIVE ACTIONS
33. Again I have supplied a sample and a blank one for you to use
34. Once Complete Scan & Email as per previous
35. Remember times and dates are very important so try to keep track of all times and dates within your non compliance

NOTE NONE OF THIS SHOULD EVER BE A FINGER POINTING EXERCISE
IT IS ALWAYS A LEARNING EXPERIENCE

IMPORTANT PHONE NUMBERS

DRINKING WATER REGULATOR	1300 596 709
RAQUEL ESTABEN	0731 994 858
CHRIS BLAKE	0447 065 112
BRAD MIILIGAN	0742 265 591
CEO	0408 155 019
RANGER	0458 001 051
OPERATIONS MANAGER	0409 211 067

Draft number	Draft Author	Draft Date	Comments
01	ASH	6/11/2016	
02	ASH	22/11/2016	

Verification Monitoring Program

The table below summaries the verification monitoring with target and critical limits and how and levels that exceed the critical limits are managed.

Parameter	ADWG or Regulation Value	Associated Hazard	Frequency Tested	Test Location (As Per 6.1.1)	Independent Analysing Authority	Response to Exceeding Limits
E.coli	<1 cfu/100mL	<ul style="list-style-type: none"> ▪ Bacteria (Harmful) ▪ System Integrity 	Monthly	<ul style="list-style-type: none"> ▪ WTP6–NW House ▪ WTP7-NE House ▪ WTP3-School ▪ WTP8-SE House ▪ WTP9-SW House ▪ WTP10-Canteen 	Cairns Region Council Water Laboratory – NATA accredited	<ul style="list-style-type: none"> ▪ Environmental Manager to report to Queensland Water Supply Regulator ▪ Senior Plumber to resample. ▪ Senior Plumber to investigate cause and rectify ▪ Senior Plumber to adjust chlorine rates at all points
Total Coliforms	<1 (additional limit added by council)	<ul style="list-style-type: none"> ▪ System Integrity. Treatment Effectiveness. Post Treatment Ingress 	Monthly	<ul style="list-style-type: none"> ▪ WTP6–NW House ▪ WTP7-NE House ▪ WTP3-School ▪ WTP8-SE House ▪ WTP9-SW House ▪ WTP10-Canteen 	Cairns Region Council Water Laboratory – NATA accredited	<ul style="list-style-type: none"> ▪ Senior Plumber to investigate cause and rectify ▪ Senior Plumber to adjust chlorine rates at all points
Heterotrophic Plate Counts	≤10 (additional limit added by council)	<ul style="list-style-type: none"> ▪ System Cleanliness. Post Treatment Ingress. ▪ Biofilm Formation. 	Monthly	<ul style="list-style-type: none"> ▪ WTP6–NW House ▪ WTP7-NE House ▪ WTP3-School ▪ WTP8-SE House ▪ WTP9-SW House ▪ WTP10-Canteen 	Cairns Region Council Water Laboratory – NATA accredited	<ul style="list-style-type: none"> ▪ Senior Plumber to investigate cause and rectify ▪ Senior Plumber to adjust chlorine rates at all points

The following table summarises the additional quarterly monitoring of the groundwater condition at the 2 bore sites to confirm supply is within Australian Drinking Water Guidelines

Parameter	ADWG or Regulation Value	Associated Hazard	Frequency Tested	Test Location	Independent Analysing Authority	Response to Exceeding Limits
E.coli	<1 cfu/100mL	Bacteria (HARMFUL) System Integrity	Quarterly	Bore # 1 and Bore # 2	Cairns Region Council Water Laboratory – NATA accredited	<ul style="list-style-type: none"> ▪ Environmental Manager to report to DRDMW. ▪ Senior Plumber to resample. ▪ Senior Plumber to investigate cause and rectify. ▪ Senior Plumber to adjust chlorine rates at all points.
pH	6.5 – 8.0 (NOT a health concern)	Corrosion.	Quarterly	Bore # 1 and Bore # 2	Cairns Region Council Water Laboratory – NATA accredited	<ul style="list-style-type: none"> ▪ Adjust acid dosing
Turbidity	1 NTU (NOT a health concern)	Aesthetic. Chlorine Demand	Quarterly	Bore # 1 and Bore # 2	Cairns Region Council Water Laboratory – NATA accredited	<ul style="list-style-type: none"> ▪ Flush and re-analyse.
Metals Nutrients and Anions TDS Alkalinity Conductance	Varies	Varies	Quarterly	Bore # 1 and Bore # 2	Cairns Region Council Water Laboratory – NATA accredited	<ul style="list-style-type: none"> ▪ Monitor and advise DRDMW if above water quality criteria.

Appendix H: Complaint Checklist and Register



Pormpuraaw Aboriginal Shire Council

C/- Post Office
PORMPURAAW QLD 4871

Ph: (07) 4060 4600
Fax: (07) 4060 4653

ABN 34 103 787 081

WATER & SEWERAGE COMPLAINTS CHECKLIST

- Complainant to contact relevant service area of Council, usually Housing Officer
- Make a Complaint in any of the following ways –
 - a) Orally, either by telephone or in person to the Housing Officer;
 - b) By email to housing@pormpuraaw.qld.gov.au or
 - c) In writing (by letter or fax) addressed to the Housing Officer
 - d) Phone call to the BAS call centre.
- All relevant documentation forwarded to Housing Officer.
- In general terms, the Council will endeavour to meet the following timeframes for dealing with Complaint –
 - a) For Urgent matters - within 12 hours.
 - b) For non-urgent – within 14 days.
- There must be opportunity for Complainant to provide further information about the Complaint.
- Housing Officer to notify Senior Plumber, Ranger and Operations Manager (and CEO if necessary) as soon as practicable about the complaint.
- The Housing Officer, Senior Plumber and the Complainant must decide on the type of complaint and its priority
- Senior plumber to register complaint in register as soon as possible
- Senior Plumber Investigate complaint as soon as possible after being notified.
- Senior Plumber to advise outcome to Housing Officer, Ranger & Operations Manager (and CEO)
- Housing Officer to notify complainant
- Housing officer to advise Senior plumber any feedback or comments from complainant.
- Senior Plumber to update Complaints Register
- Every 12 months a review on all Complaints received through the Water & sewerage Complaints process.
- The Water regulator must be advised of all complaints within 120 days of the 31st July as part of the annual report



**PORMPURAW ABORIGINAL SHIRE COUNCIL
WATER & SEWERAGE**

COMPLAINTS REGISTER

Date	Client/Complainant's Name & Address	Contact Number.	Type of Complaint	Nature/ Details of Complaint	PRIORITY (RISK)	Comments and Follow up Action. This must include name of employee responsible for follow up.	Feedback from Client Status Date Finalised
			Water, Odour		Extreme		
			Water, Taste		Very High		
			Water, Colour		High		
			Water, Other		Medium		
			Sewer		Low		
			Water, Odour		Extreme		
			Water, Taste		Very High		
			Water, Colour		High		
			Water, Other		Medium		
			Sewer		Low		
			Water, Odour		Extreme		
			Water, Taste		Very High		
			Water, Colour		High		
			Water, Other		Medium		
			Sewer		Low		
			Water, Odour		Extreme		
			Water, Taste		Very High		
			Water, Colour		High		
			Water, Other		Medium		
			Sewer		Low		

File U Drive/Plumbing/Complaints Register/Version 1

Version 1A
Next Review Due

8/04/2016
8/04/2018

Appendix I: Drinking Water Quality Management Improvement Plan

Risks					Existing Preventative Measures (Upstream of and at Current location)	Reasons for Selection of Likelihood and Consequence Scores	Future Controls			
Process Step	Item No.	Hazard	Type	Hazardous Event			Actions / Master Controls / Master Actions	Assigned to	Priority /Year	Budget
Catchment	CMT1	Bacteria/Virus	Biological	Animals in catchment	Alternative water sources are available (bores) however no management procedure exists to choose to switch over during poor water quality periods.	There is a catchment management plan in place. Controls in place.	Add procedure for alternative water supply switch over.	Senior Plumber	2023	Internal Wages
Catchment	CMT9	Iron	Chemical	Natural geology, sediment	See CMT1	3 years of WQ results reviewed.	Investigate potentially shandy water sources. Investigate the WQ results as they were significantly different. Check future risk score.	Senior Plumber	2024	Internal Wages
Catchment	CMT15	Scaling	Chemical	TDS or organics in raw water		3 years of WQ results reviewed. Aesthetic risk.	Continue to monitor this parameter. Consider a filtration unit.	Senior Plumber	Ongoing	Internal Wages
Catchment	CMT16	Alkalinity	Chemical	Potential change in ratio of surface runoff to storage		3 years of WQ results reviewed. Aesthetic risk.	Continue to monitor this parameter. Consider a dosing unit.	Senior Plumber	Ongoing	Internal Wages
Chemical Dosing	CMT15	Scaling	Chemical	TDS or organics in raw water	Oxidation	Possible partial oxidation of dissolved solids, however this may introduce THMs.	Test for THMs in the treated water. Future control risk not reduced at this time.	Senior Plumber	2023	1,000
Chemical Dosing	CMT16	Alkalinity	Chemical	Potential change in ratio of surface runoff to storage		no change	Investigate a future filtration plant which will have benefits to other risk items.	Senior Plumber	2023	25,000
Chemical Dosing	DIS1	Chlorate	Chemical	chemical breakdown	Set points and chlorine analysers, Change to Chlorine Gas always 100% strength. No degradation	This risk is for dosing performance which is adequate.	Continued Training of all staff.	Senior Plumber	Ongoing	Internal Wages
Chemical Dosing	DIS2	Chlorine	Chemical	chemical underdose, or injection or recirculation pump or gas injector equipment failure	Set points and chlorine analysers, Daily inspections, SCADA monitoring and provision of backup Systems	PASC has acquired a list of critical spare parts for system and purchase as spare parts - Spare pumps, injectors, gas valves etc. were procured in 2019.	Ensure adequate spare parts on hand including replacement pumps, ejectors and fittings	Senior Plumber	Ongoing	Internal Wages
Reservoirs	CMT17	pH	Chemical	pH reacting with walls	All Reservoirs have Inspections annually		Reservoir inspections to be held mid year & documented	Senior Plumber	Ongoing	Internal Wages
Reservoirs	WTP1	Various Contaminants	Physical/Chemical etc.	telemetry failure allowing untreated or semi-treated water through.		No reduction as the backup systems or failure management systems are not properly understood.	Investigate SCADA management during failures	Senior Plumber	2024	Internal Wages
Reservoirs	RES1	Bacteria/Virus	Biological	Animals in reservoir	Reservoir cleaning and scouring	All Reservoirs are roofed, waterproofed and vermin proofed. Inspection carried out annually	Reservoir cleaning procedure is currently being developed. Inspections to be held midyear & Documented	Senior Plumber	2024	Internal Wages
Reservoirs	RES2	Bacteria/Virus	Biological	Poor Tank turnover	Operational settings in place.	Lower frequency of potential issues due to daily inspections.	Procedure required for tank turnover	Senior Plumber	2023	Internal Wages

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Reticulation	WTP1	Various Contaminants	Physical/Chemical etc.	telemetry failure allowing untreated or semi-treated water through.	Daily checks	The backup systems or failure management systems are not properly understood. Only relevant for pressure and flow values.	Investigate SCADA management during failures. Assess future risk.	Senior Plumber	2024	Internal Wages
2ndaryDis	WTP1	Various Contaminants	Physical/Chemical etc.	telemetry failure allowing untreated or semi-treated water through.		No reduction as the backup systems or failure management systems are not properly understood. Only relevant for pressure and flow values.	Investigate SCADA management during failures	Coordinator Treatment	2023	Internal Wages
Whole of System	WOS6	Governance	Cybersecurity	Lack of asset management	Our SCADA provider has developed and implemented a governance framework with responsibilities /policies /procedures for information technology security. These include: - Information Systems (IS) Policy, - Computer Systems and Equipment Use Standard, - Information Systems Management Guidelines	Controls in place.	MC-01-Vulnerability assessment Undertake a cybersecurity audit including a penetration test: - identify critical sites, devices, and access points specific to the Supervisory Control and Data Acquisition (SCADA) for water quality management. These will include 1) pump sites 2) related operational technology systems - servers, firewalls, network switches, access points, Remote Terminal Units (RTUs) and Programmable Logic Controllers (PLCs). 3) Implement actions to maintain effective cyber security controls of SCADA and Industrial Control Systems (ICS). 4) Implement actions and integration consisting of standards and processes to manage both (IT) and (OT). 5) Implement a single point access to enter the telemetry network. 6) Implement a secure entry protocol/procedure to the IT/OT network.	SCADA Maintainer	2025	10,000
Whole of System	WOS7	Governance	Cybersecurity	Inability to detect critical Assets	As above		MC-02 -Governance structure - Framework to be in place with responsibilities - Procedures for information technology and operation technology security to be created.MC-03- Security safeguards - Create a list of permitted applications to be installed / run within Council's Standard Operating Environment (SOE)	SCADA Maintainer	2025	3,000
Whole of System	WOS8	Intentional Interference	Cybersecurity	Disruption of Cyber information (IT)	As above	IT antivirus software currently installed. OT SCADA machines will not have anti-virus installed as it can interfere with SCADA installed software. Cybersecurity of OT SCADA machines is controlled by restricting internet access and eliminating the use of external USB drives and fire wall settings.	MC - 04 Detection process - Require SOE security monitoring system that reports anomalies. e.g. high CPU use, user accounts, high network traffic MC-05 Response & Recovery - Organise routine backups / archiving for ICS equipment, servers and applications.	SCADA Maintainer	2025	3,000

Whole of System	WOS12	Unintentional Interference	Cybersecurity	Disruption of Cyber information (IT)	As above	As above	<p>MA - 01 Build out private SCADA network - requires testing and cutover for all water facilities, sites & equipment</p> <p>MA - 02 Build single point of access and authentication method - Undertake after MA-01. A single point access should be built as a mechanism to enter the telemetry network.</p> <p>MA - 03 Implement rules to prevent across network access - After MA-01 & MA-02, SCADA provider to create and document a procedure for secure entry to the IT/OT network.</p> <p>MA - 04 Disallow open internet access - To be actioned with MA-01 & MA-02. Address vulnerability scenarios but also allows for system updates (e.g. allowing Windows Update).</p>	SCADA Maintainer	2025	10,000
Whole of System	WOS17	Abuse of Cyber Information	Cybersecurity	Systems Configuration and data files	As in WOS6		<p>MA-05 Install and enable active virus scanning - OT SCADA machines will not have anti-virus installed as it can interfere with SCADA installed software. Cybersecurity of OT SCADA machines is controlled by restricting internet access and eliminating the use of external USB drives and fire wall settings</p> <p>MA-06 Activate and set windows firewall rules - Do after MA-01 is completed</p> <p>MA-07 Implement maintenance and updates schedule - Maintenance will be ongoing in terms of updating SCADA software. All upgrades or changes to a PLC or SCADA shall have their configuration files backed up and saved on each workstation on-site and off-site.</p> <p>MA-08 Certificate or key based authentication for remote access - Do after MA-01 is completed</p> <p>MA-09 Two factor authentication - Do after MA-01 is completed</p>	SCADA Maintainer	2025	10,000

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Whole of System	WOS21	Control	Cybersecurity	Lack of access control and identity management	As in WOS6		MA-10 Implement backup schedule - To be done as part of regular maintenance of IT/OT systems. Backups of configurations files to be made and stored onsite with a copy stored off-site in the secure corporate Drive, and with the SCADA provider. MA-11 Ensure validity of software licences used across machines - Ongoing as all SCADA OT software is licenced and authentication is used across SCADA OT machines.	SCADA Maintainer	2025	2,000
Whole of System	WOS22	Technical advancement	Cybersecurity	Lack of protective technology and maintenance	As in WOS6		Perform routine manual operation of sites, and ensure documentation exists for operating procedures. Staff should be trained and deemed competent to run manual operation of sites. Training of manual mode operations for each facility ongoing	Senior Plumber	2025	Internal Wages
Whole of System	WOS23	Detection	Cybersecurity	Inability to detect a cyber security event	As in WOS6		Increased awareness from operators surrounding physical security access on ICS sites, provided by means of training sessions. Add this to the procedures	Senior Plumber	2025	Internal Wages
-	E1-1	Support	Adoption	Lack of support	General support		Adopt a DWQM Policy	Senior Plumber	2023	Internal Wages
-	E2-1	Information	Information	Lack of information	Procedures		The writing of new and updated procedures which will be managed by an annual calendar	Senior Plumber	Annually	Internal Wages
-	E2-2	Information	Information	Poor information storage and retrieval.	SWIMs Database		An updated and extended data management system such as SWIMLocal which again, will be managed by an annual calendar	Senior Plumber	Annually	Internal Wages
-	E2-3	Water Quality	Water Quality	Poor water quality event	Adequate verification and monitoring program		The operational and verification monitoring plan is reviewed and clear.	Senior Plumber	Annually	Internal Wages
-	E2-4	Whole of System	Whole of System	Lack of capital and operational funding	Part of a broader management assessment.		The water capital and operational budget planning process reflect the above medium to long-term aspirations	Executive Manager Environment	Annually	Internal Wages

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-	E7-1	Personnel	Skills	Poor competency leading to a risk event.	Qualified supervisory staff		Training needs are assessed and implemented. It is important Certificate III certification is held for at least 2 personnel so that backup personnel can step into roles when needed. Certificate II qualifications should also be held by others. WIOA training will also be of benefit. Consider specific training for chlorine and pH dosing.	Senior Plumber	Annually	Internal Wages
-	E8-1	Public Health	Community	Poor water quality event	DWQM System		Website information is added for locations that have a potable water supply, including: - Description of how PASC manages water quality; - Discussion of issues on drinking water quality, public health and risk assessment, cost of treatment and levels of service; - Details of the water supply system and the drinking water quality management system; - Incident and emergency response plans, including procedures for notification when drinking water quality poses a health risk; - Consumer responsibilities beyond the tap; - The need for further treatment of water for special purposes (e.g. vulnerable persons); and, - The role and responsibility of the community in protecting water supply catchments and water conservation.	Senior Plumber	2024	Internal Wages
-	E9-1	Whole of System	Investigations	Early Warnings			Development of early warning procedures to improve the management of poor water quality in both the raw and treated systems (e.g. preparation leading up to the wet season);	Senior Plumber	2024	Internal Wages
-	E9-2	Whole of System	Whole of System	Review of water quality characteristics			A review of the selection of water quality characteristics to be analysed and provide specific requirements for individual sites	Senior Plumber	2023	Internal Wages
-	E9-3	Whole of System	Whole of System	Auditing procedures to ensure information is correct.			Auditing sampling and testing procedures, evaluation and management of results	Senior Plumber	2023	Internal Wages
-	E9-4	Whole of System	Whole of System	Review of asset condition and performance			It is intended that the existing assets and future system augmentations be included in an asset management system to ensure that poorly performing or ageing critical infrastructure is identified and replaced before failure	Senior Plumber	2025	Internal Wages
-	Audit-1	SCADA	Information	Incorrect information	Nil		Create a procedure for verifying the SCADA parameters regularly with verifiable results	Senior Plumber	2023	Internal Wages
-	Audit-2	Public Health	Contamination	Mains break and repairs			Create/update mains repair procedure to include machinery disinfection prior to use in water management situations where cross-contamination may be a risk	Senior Plumber	2023	Internal Wages
-	Audit-3	Public Health	Contamination	Purchase of unapproved materials			A procedure needs to be in place to ensure that all drinking water materials purchased are certified to Australian Standards or are WaterMark approved	Senior Plumber	2023	Internal Wages

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-	Audit-4	Whole of System	Staffing	Staff not available to attend water quality incidents or to manage the system effectively.			Implemented a roster system	Senior Plumber	2023	Internal Wages
-	Audit-5	Whole of System	Skills	Low competency to manage a critical risk event.			Add a scenario for water treatment for the next mock emergency practice	Senior Plumber	2023	Internal Wages
-	Audit-6	Water Quality	Information	Incorrect information			Create an instrument calibration program, and create a procedure for regular calibration of the various instruments	Senior Plumber	2023	Internal Wages

Appendix J: Acid Dosing System Details and Operations /Maintenance Procedures

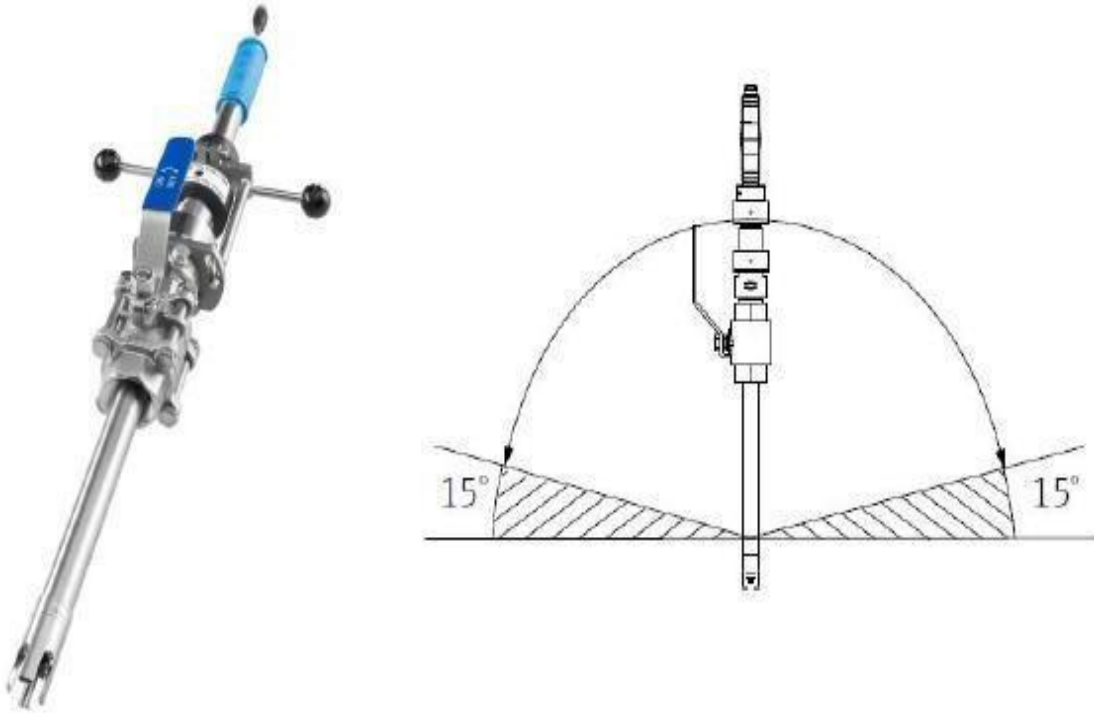
Technical Schedule CPS71D pH Probe

pH PROBE

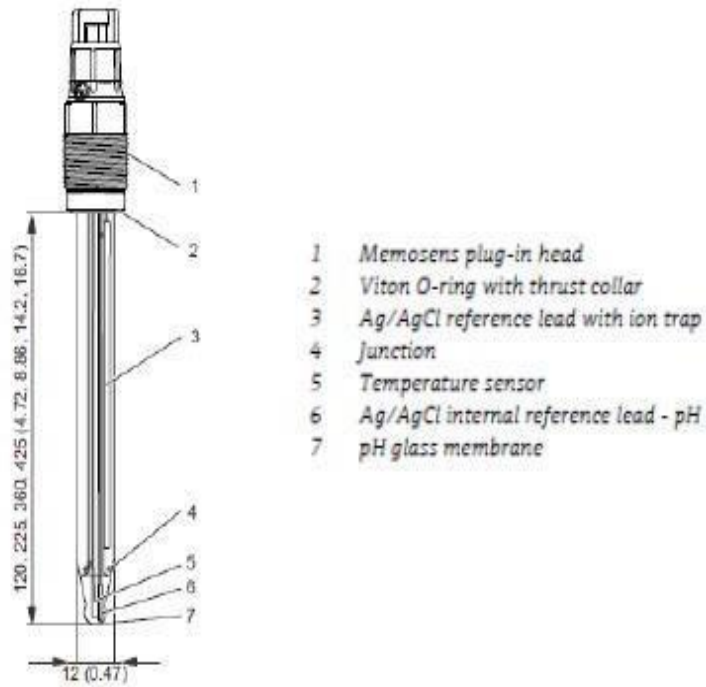
ITEM	UNIT	DESCRIPTION
Location	-	Water Treatment Plant (chlorine room)
Date Installed	-	September 2020
Manufacturer	-	Endress & Hauser 16 Griffnock Ave Macquarie Park, NSW 2113 (02) 8877 7000
Probe Model	-	CPS71D-7TB21
Cable Model	-	CYK10-A051
Retractable Assemble Model	-	CPA450-0B110
Serial Number	Probe	R3350005E00
	Cable	R5059F05KA0
	Assembly	R5001205A09
Measurement Type	-	Selective Penetration (H ⁺)
Process Diaphragm	-	Ceramic
Sensor Range	pH units	0 to 14
Process Temperature	°C	0 to 140
Minimum Conductivity	µS/cm	10
Weight	kg	0.1
Materials	-	Electrode Shaft - Glass pH Membrane Glasses - Type B Metal Lead - Ag/AgCl Diaphragm - Ceramic Reference Gel - Acrylamide-free
Degree of Protection	IP	68

A -

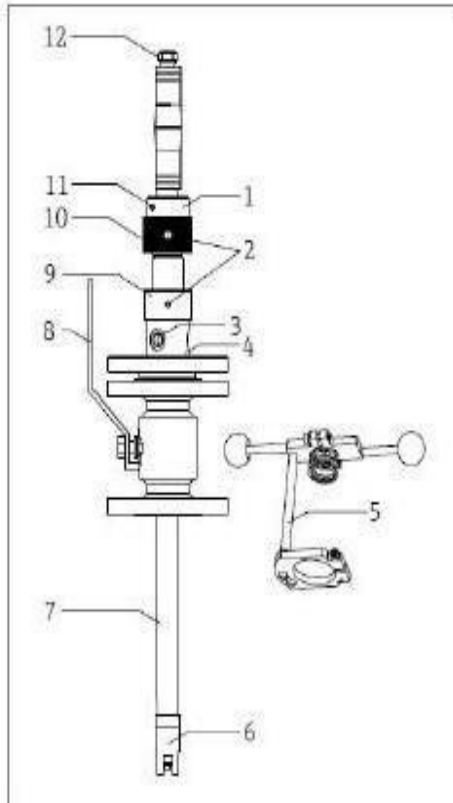
Picture 1 – Retractable Assembly



Picture 2 – Probe Details & Dimensions

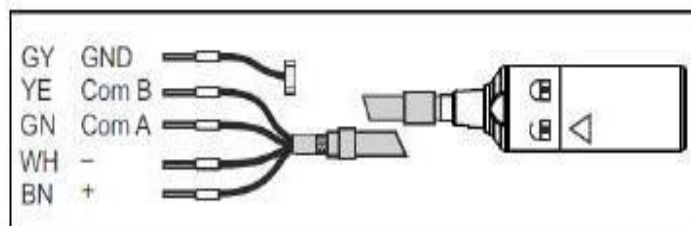


Picture 3 – Retractable Assembly Elements



- 1 Setting collar for setting the immersion depth
- 2 Bore hole for hook wrench
- 3 Rinse connection G¼ (316L) NPT ¼" (Alloy C22 or titanium)
- 4 Service chamber
- 5 Safety kit
- 6 Sensor holder with protection guard
- 7 Immersion tube
- 8 Lever for opening/closing the ball valve
- 9 Locking ring (metal)
- 10 Coupling nut (black)
- 11 Allen screw M5 / AF4
- 12 Cable protector/cable gland

Picture 4 – Electrical Connections



MAINTENANCE

Required maintenance for the equipment is summarised below. Each and every detail or step has not been noted as review of the user manual is required before undertaking required maintenance work. If unsure contact Factor UTB on (08) 8271 6044 or the supplier prior to undertaking maintenance work.



There is a risk of infection when servicing equipment. Rinse the equipment thoroughly with clean water before working on it. While undertaking the work wear protective gloves and do not touch parts of your body specifically orifices such as your mouth, nose or eyes. Wash hands in warm soapy water once the work is complete and launder clothes that day.

Weekly the Operators are to remove the probes from the process and wash in a bucket of clean water before returning them to the tanks. The glass electrode is fragile, careful handling is required.

The Ceragel measuring cell to be replaced yearly. It is not recommended that the cell be calibrated on site as the solutions required to complete the calibration cost more than a new cell and decay over time. The Ceragel electrode is factory calibrated.

Clean away fouling on the sensor as follows depending on the type of fouling:

For Oily and Greasy films - Clean with grease remover, e.g. alcohol, as well as hot water and (alkaline) agents containing surfactants (e.g. dishwashing detergent).

For Lime or metal hydroxide Buildup and Low Solubility Organic Buildup - Dissolve buildup with diluted hydrochloric acid (3%) and then rinse thoroughly with clear water.

For buildup Containing Proteins - Use a mixture of hydrochloric acid (0.5%) and pepsin and then rinse with clear water.

For readily Soluble Biological Buildup - Rinse with pressurised water.

Refer to the enclosed manual for use of the retractable assemble. Failure to follow the procedures described in the manual when removing or returning the pH probe to the process may cause irreparable damage to the assembly or the pH probe. If unsure contact Factor UTB on (08) 8271 6044.

Technical Schedule Rev A - Acid Pump

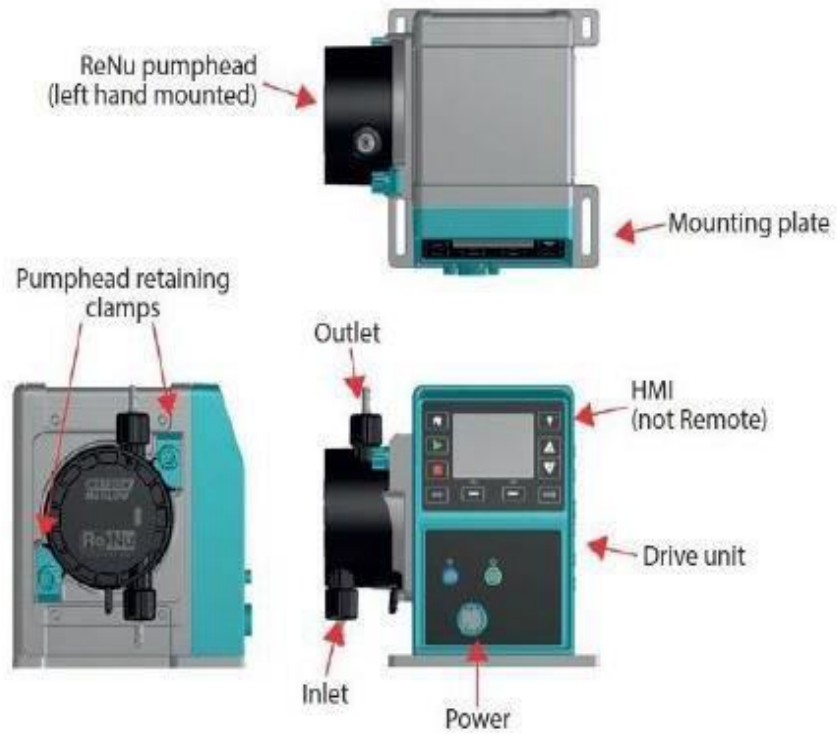
SULFURIC ACID (50%) DOSING PUMP

ITEM	UNIT	DESCRIPTION
Location	-	Water Treatment Plant (chlorine room)
Date Installed	-	September 2020
Manufacturer	-	Watson Marlow 15/19-26 Durian Place Wetheril Park, NSW 2164 (02) 8787 1400
Pump Model	-	QDos30 Univ
Pump Item Number	-	0M0.284L.GRK
Head	-	Sebs PFPE
Head Item Number	-	0M3.2800.PFP
Type	-	Peristaltic
Serial Number		200518-299031
Voltage	VAC	240
Manually Control Capability	-	Yes
Enclosure	IP	66
Control Inputs	mA	4 - 20
Maximum Discharge Flow Rate	mL/min	400
Maximum Discharge Pressure	bar	7
Weight	kg	5.1

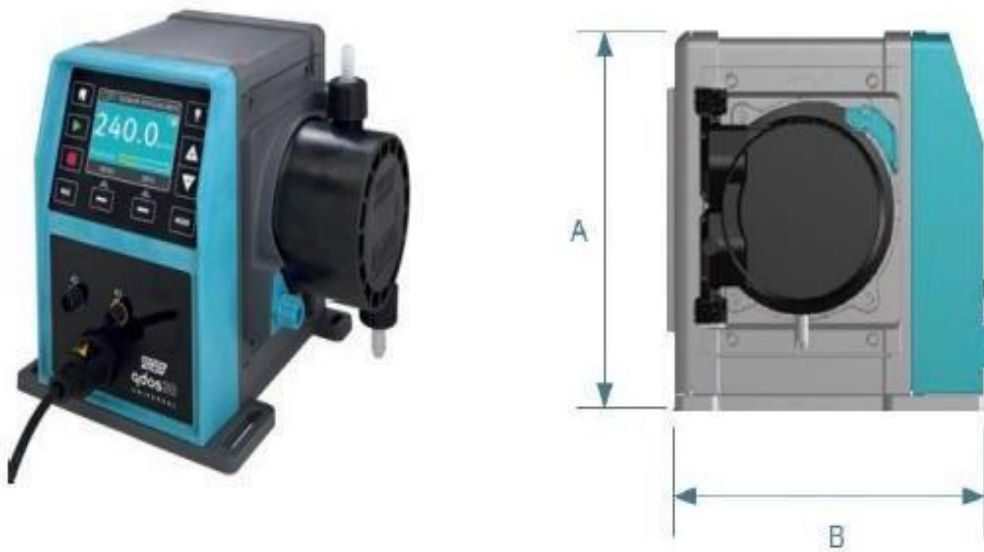


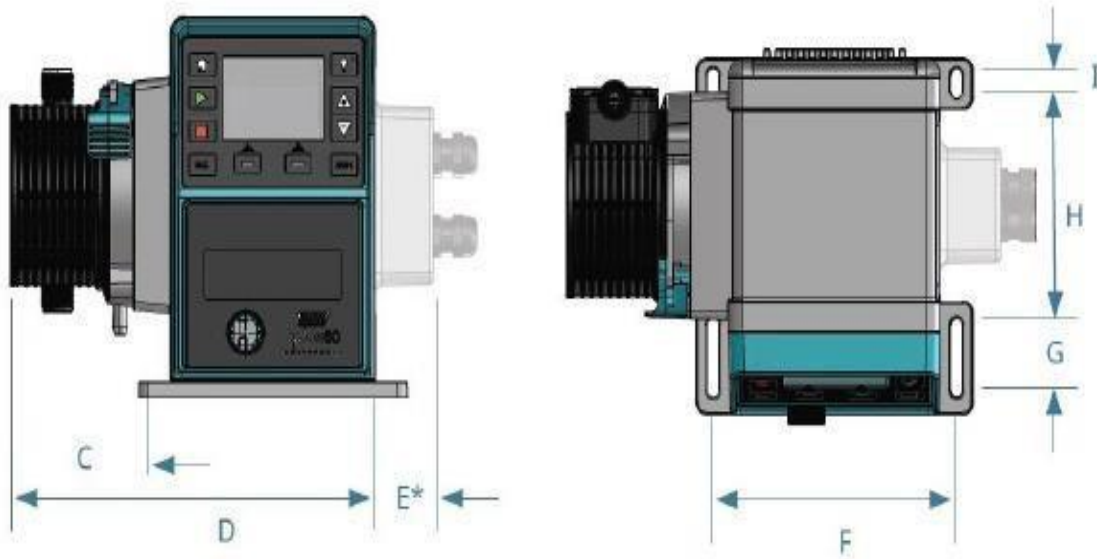
UNDER NO CIRCUMSTANCE SHOULD WATER BE ADDED TO SULFURIC ACID – DOING SO MAY CAUSE INJURY TO YOURSELF OR OTHERS NEARBY. Refer to the Maintenance Section (page 6) of this document for other important information.

Picture 1 – QDos30 Components



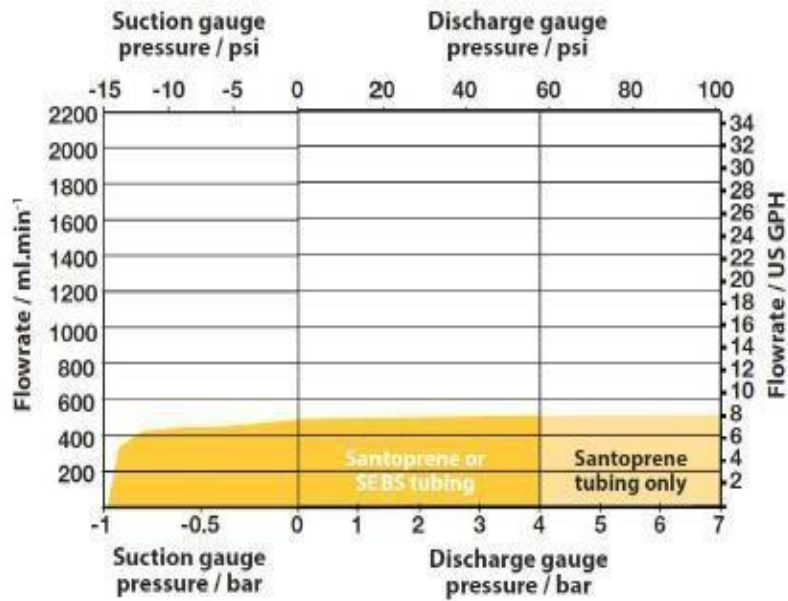
Picture 2 – QDos30 Dimensions



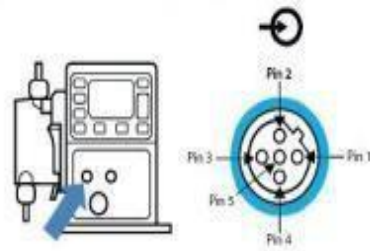


Model	A	B	C	D	E—Optional relay modules (H or R)	F	G	H	I
qdos 30	234mm (9.2")	214mm (8.4")	71.5mm (2.8")	233mm (9.2")	43mm (1.7")	173mm (6.8")	40mm (1.6")	140mm (5.5")	10mm (0.4")

Picture 3 – Pump Duty

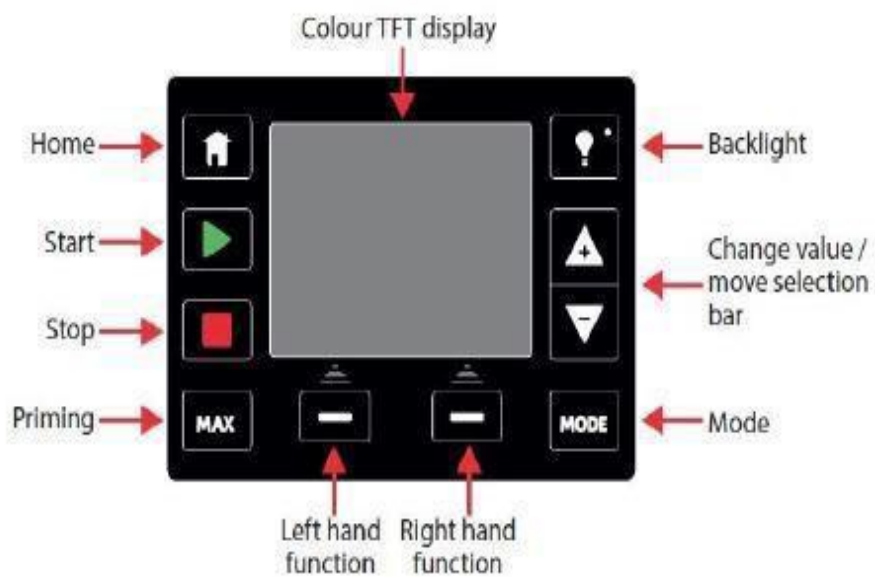





Picture 4 - Input Connection



Pin No.	Function	Specification	Referenced to	Input lead colour
1	Run/stop	Min. 5V, max. 30V	Connect 5-24V DC supply to stop (referenced to pin 4). Alternatively, connect pin 5 of the output connector to this pin via normally open switch.	Brown
2	External Contact Reserved	Min. 5V, max. 30V	Pulse 5-24V 40ms minimum pulse length (referenced to pin 4). Alternatively, connect pin 5 of the output to this pin via normally open switch.	White
3	4-20mA	250Ω input impedance 40mA max. current 250Ω load resistance 40mA max. current	Referenced to GND	Blue
4	GND	Ground (0V)		Black
5	Remote fluid recovery	Min. 5V, max. 30V	Connect 5-24V DC supply to reverse the pump in analog mode	Grey

Picture 5 – Keypad Functions



	<p>The pump displays a RED stop icon when it is in a manually stopped condition. In this state the pump will not start unless the START key is pressed.</p>
	<p>The pump displays a RED PAUSE icon when it is receiving a remote stop input whilst in a standby condition. The pump is placed in a standby condition by pressing the START key in manual mode, or by selecting Analogue mode.</p> <p>In this state the pump will respond to a change in state of the start/stop input, and may start automatically when a control signal is received.</p>
	<p>When the pump is running it displays a turning icon to indicate a pumping state.</p>

MAINTENANCE

Required maintenance for the equipment is summarised below. Each and every detail or step has not been noted as review of the user manual is required before undertaking required maintenance work.

If unsure contact Factor UTB on (08) 8271 6044 or the supplier prior to undertaking maintenance work.

DANGER / WARNING:

Rotating elements of the peristaltic pump are sealed as such the risk of entanglement or crush is mostly eliminated. Always disconnect and lock out power before serving to prevent unexpected start up. Failure to do so could result in serious injury or death. Equipment operates automatically.



There is a risk of chemical burn when servicing equipment. Ensure appropriate PPE is use before commencing any service work. This includes rubber apron, elbow length rubber gloves, safety eye goggles equipped with side shields **and** full face shield. This safety equipment has been supplied to site. **DO NOT PROCEED UNTIL YOU HAVE READ AND UNDERSTAND THE SAFE HANDLING METHODS AND RESPONSES** as detailed in the Safety Data Sheet (SDS) enclosed. If unsure contact Factor UTB on (08) 8271 6044 or 0434 2300 71 before proceeding.

UNDER NO CIRCUMSTANCE SHOULD WATER BE ADDED TO SULFURIC ACID – DOING SO MAY CAUSE INJURY TO YOURSELF OR OTHERS NEARBY.

Adding water to acid will cause the solution to rapidly boil and cause splashing. If a dilution is required then acid **MUST** be added to a larger volume of water slowly and then mixed. We do not recommend that dilutions be prepared on site. There is no foreseeable reason for this to be undertaken at Pormpuraaw.

Sulfuric acid mixing with water reacts vigorously in a highly exothermic reaction. If you add 100mL of sulfuric acid to 100mL of water the temperature increase of the solution is more than 110° Celsius in less than a minute.

Ensure that all hoses, valves and pipelines are no longer under pressure and empty prior to removal or replacement of the pump head. While undertaking service work wear the minimum PPE as described above. Do not take shortcuts. **If you do not have the correct PPE do not undertake the work.** Wash hands in warm soapy water once the work is complete and launder clothes that day.

There are no serviceable parts inside the pump. The unit should be returned to Watson-Marlow for service. Both chemical dosing pumps utilise the same hose pump heads.

First Aid Measure (extracted from SDS). Refer to SDS for additional information.

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm. Keep at rest until fully recovered. If patient finds breathing difficult and develops a bluish discolouration of the skin (which suggests a lack of oxygen in the blood - cyanosis), ensure airways are clear of any obstruction and have a qualified person give oxygen through a face mask. Apply artificial respiration if patient is not breathing. Seek immediate medical advice.

Skin Contact:

If spilt on large areas of skin or hair, immediately drench with running water and remove clothing. Continue to wash skin and hair with plenty of water (and soap if material is insoluble) until advised to stop by the Poisons Information Centre or a doctor.

Eye Contact:

SPEED IS ESSENTIAL. Immediately wash in and around the eye area with large amounts of water for at least 15 minutes. Eyelids to be held apart. Remove clothing if contaminated and wash skin. Urgently seek medical assistance. Transport promptly to hospital or medical centre.

Ingestion:

Immediately rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically. Can cause corneal burns.

Calibration – To be completed 6 monthly or after replacement of the pump head. Record in log book.

Select **MODE**



Using the +/- keys, scroll to Flow calibration and press **SELECT**.

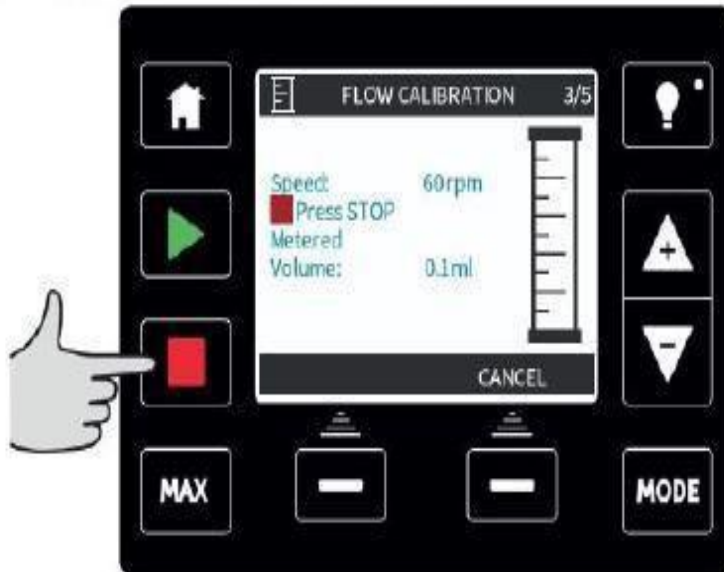


Using the +/- keys enter the maximum flow rate limit and press **ENTER**.

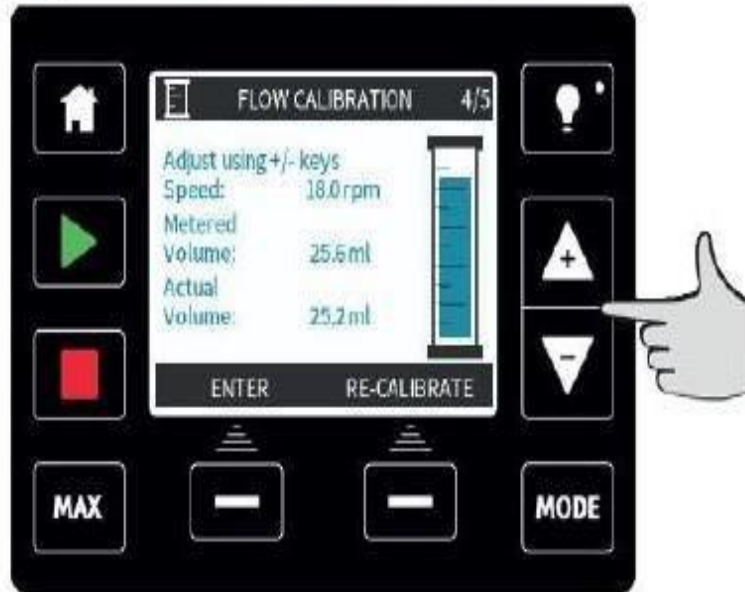
Press **START** to begin pumping a volume of fluid for calibration.



Press **STOP** to stop pumping fluid for the calibration.



Using the +/- keys enter the actual volume of fluid pumped.



To accept the new calibration press **ACCEPT** or **RECALIBRATE** to repeat the procedure. Press **HOME** or **MODE** to abort.



The pump is now calibrated.

Pump Head Replacement

The pump head is a consumable part and cannot be serviced. Spare pump head were supplied to site. The pump head at both the Water Treatment Plant and Irrigation Site located adjacent the wastewater treatment lagoons are identical and suit each of the two chemical to be pumped (sodium hypo-chlorite and sulfuric acid).

- Ensure contaminated pump heads are not shipped but disposed of locally accordingly to regulations for contaminated items and health and safety procedures. Additional caution to be used when disposing of spent pump heads that were used at the Water Treatment Plant (sulfuric acid).
- Always isolate the pump from mains power before changing the pump head, suction or discharge lines.
- It is only possible to fit the pump head in one orientation with the arrow pointing upwards.
- Only lock / unlock the retaining clamps by hand. Do not use tools.

1. Drain down.
2. Ensure that there is no pressure in the pipeline.
3. Isolate the pump from the mains power supply.
4. Ensure that protective clothing and eye protection are worn if hazardous products have been pumped.
5. Remove input and output connections from the pumphead (protecting the pump from any process fluid spillages).



6. Fully loosen the two pumphead retaining clamps.



7. To disengage the pumphead from the retaining clamps, carefully detach the pumphead from the pump housing and rotate it in an anti-clockwise direction by approximately 15°.



8. Remove the pumphead from the pump housing.



9. Safely dispose of the used pumphead according to your own health and safety regulations. Take care to comply with any safety requirements of the chemical being pumped.

10. Check that the leak detect sensor is clean and free from process chemical



Fitting a new pumphead

Fitting a new pumphead is a reverse procedure of the pumphead removal.

1. Remove the new pumphead from its packaging.
2. Align the new pumphead with the pump drive shaft and slide into position on the pump housing.
3. Rotate the pumphead in a clockwise direction by approximately 15° to engage the retaining clamps.
4. Tighten the retaining simultaneously clamps to secure the pumphead into position.
5. Connect the input and output connections to the pumphead.
6. Apply mains power to the pump, press start and run the pumphead for a few revolutions.
7. Stop the pump and isolate it from the mains power supply, then tighten the clamps further if necessary.

Appendix K: Draft Drinking Water Policy

Draft Drinking Water Quality Policy

Water Supply (Safety and Reliability) Act 2008

1. POLICY STATEMENT

Pormpuraaw Aboriginal Shire Council is committed to promoting and protecting public health by managing its water supply to provide safe, high-quality drinking water.

2. PRINCIPLES

Council wishes to ensure that it supplies high quality drinking water that meets or exceeds our DWQMP and the ADWG standards.

3. SCOPE

This policy applies to all workers responsible for the provision of drinking water to the declared water service areas of Pormpuraaw

PASC supplies both potable and non-potable water and this policy applies to potable water only.

4. RESPONSIBILITY

Managers are responsible for ensuring the policy is understood and adhered to all workers.

5. DEFINITIONS

ADWG - Australian Drinking Water Guidelines (2011 Version 3.4 Updated October 2017).

DWQMP - Drinking Water Quality Management Plan as referred to in the *Water Supply (Safety and Reliability) Act 2008*

Declared water service area – means the area to which council is able to offer a potable water service to properties. Not all properties within a local government area will have access to a potable water service.

Manager – includes persons appointed to positions with the title, Team Manager, General Manager, Principal, Director and Chief.

Potable water – Water that is safe to drink or to use in food preparation

Workers – includes employees, contractors, volunteers and all others who perform work on behalf of council

6. POLICY

The council wishes to provide safe, high quality drinking water, and will:

- a. manage water quality at all points along the delivery chain from “catchment to meter” by using a risk-based approach in which potential threats to water quality are identified, assessed and mitigated;
- b. integrate the needs and expectations of consumers, stakeholders, regulators and employees into its planning to provide and maintain a safe water supply;
- c. establish and maintain regular and effective drinking water quality monitoring and reporting mechanisms to provide relevant and timely information, that promotes confidence in the management of its water supply systems;
- d. develop appropriate contingency planning and incident response capabilities to manage incidents and other emergent events potentially affecting water quality;
- e. participate in appropriate research and development activities (including employee training) to ensure continued understanding of drinking water quality issues and performance;
- f. contribute to setting industry regulations and guidelines, and other standards relevant to

- public health and the water cycle;
- g. continually improve its practices by assessing performance against corporate commitments and stakeholder expectations; and
- h. openly communicate this policy to the community to encourage public awareness.

7. LEGAL PARAMETERS

Local Government Act 2009

Local Government Regulations 2012

Water Supply (Safety

and Reliability) Act

2008 Public Health

Act 2005

8. ASSOCIATED DOCUMENTS

Pormpuraaw Water Drinking Water Quality Management Plan 2021

Australian Drinking Water Guidelines (2011 Version 3.4 Updated October 2017)