



Drinking Water Quality Management Plan (DWQMP) Annual Report

1 July 2018 to 30 June 2019

Central Highlands Regional Council

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Glossary of terms

ADWG	Australian Drinking Water Guidelines (2018). Published by the National Health and Medical Research Council of Australia
CCP	Critical Control Point
CFU/100mL	Colony Forming Units per 100 millilitres
CHRC	Central Highlands Regional Council
DWQMP	Drinking Water Quality Management Plan
<i>E. coli</i>	<i>Escherichia coli</i> , a bacterium that is considered to indicate the presence of faecal contamination and is a potential health risk
LOR	Limit of Reporting
mg/L	Milligrams per litre
ML	Megalitre
µg/L	Micrograms per litre
NTU	Nephelometric Turbidity Units
ND	Not Detected
PFAS	Per-fluoroalkyl and poly-fluoroalkyl substances
pH	Power of Hydrogen
QHFSS	Queensland Health Forensic and Scientific Services
R. raciborskii and Cylindro	<i>Raphidiopsis (formerly Cylindrospermopsis) raciborskii</i> , a freshwater cyanobacteria known to produce the toxin cylindrospermopsin and a potential health risk
RMIP	Risk Management Improvement Program
THM	Trihalomethanes
WTP	Water Treatment Plant
>	Greater than
≥	Greater than or equal to
<	Less than

1 Introduction

This report documents the performance of Central Highlands Regional Council's drinking water service.

It details performance of the water quality and the implementation of actions detailed in the Drinking Water Quality Management Plan (DWQMP) required under the *Water Supply (Safety and Reliability) Act 2008* (the Act).

The report assists the regulator to determine compliance with the current approved DWQMP and provides a public report on the council's management of drinking water.

2 Summary of Schemes Operated

This report relates to the drinking water supply schemes that the Central Highlands Regional Council owned and operated from 1 July 2018 to 30 June 2019.

Table 1 lists the water supply scheme, water source, water treatment process, population and drinking water treatment capacity for the water supply schemes covered in this report.

Table 1 – Summary of water supply schemes

Scheme Name	Communities Supplied	Water Source	Treatment Processes	Population Served [#]	Treatment Capacity*
Anakie	Anakie	May Creek Bore	Disinfection	100	0.4
Bauhinia	Bauhinia Downs	Artesian Bore	Disinfection	25	0.1
Blackwater	Blackwater	Mackenzie River	Coagulation, Filtration, pH correction, Fluoridation and Disinfection	4799	15
	Bluff			265	
Capella	Capella	Capella Creek / Mackenzie River	Coagulation, Filtration, pH correction and Disinfection	988	0.9
Comet	Comet	Comet River	Coagulation, Filtration, pH correction and Disinfection	147	0.3
Dingo	Dingo	Springton Creek / Dingo Creek	Coagulation, Filtration, and Disinfection	145	0.4
Duaringa	Duaringa	Dawson River	Coagulation, Filtration and Disinfection	197	0.7
Emerald	Emerald	Nogoa River	Coagulation, Filtration, pH correction, Fluoridation and Disinfection	14,119	38
Rolleston	Rolleston	Comet River / Sub-artesian Bores	Coagulation, Filtration, and Disinfection	255	0.3
Sapphire / Rubyvale	Sapphire / Rubyvale	Retreat Creek Bores	Fluoridation and Disinfection	1,183	2.1
Springsure	Springsure	Shallow Basalt / Deeper Sandstone Bores	Aeration and Disinfection	849	2
Tieri	Tieri	Mackenzie River	Coagulation, Filtration, pH correction, Fluoridation and Disinfection	1,086	3.6

[#] Available populations as at July 2019 sourced @

<https://www.qgso.qld.gov.au/statistics/theme/population/population-estimates/regions>.

* Treatment capacity is in ML/day

3 DWQMP Implementation

The DWQMP describes the operating strategies, operating limits and approaches to water quality monitoring and the overall management of risks to water quality.

Specific changes or improvements to the drinking water services provided by council have occurred with the implementation of a risk management improvement program (RMIP).

3.1 Progress in implementing the risk management improvement program

A summary of that progress and descriptions of the progress made towards the completion of specific tasks can be found in Appendix C. As per section 13 of the overarching volume of the DWQMP the items have been prioritised as short, medium and long-term actions. Short-term actions will be undertaken as soon as possible (and completed within 6-12 months), medium-term actions are intended to be completed in the current financial year or within 12-18 months, and long-term actions follow on from short/medium items and will be introduced as items in future council budgets to secure funding.

3.2 Revisions made to the operational monitoring program to maintain compliance with the water quality criteria in verification monitoring

The operational monitoring program was not updated this reporting period. Previously critical limits were reviewed for consistency where possible and as stated in the plan “the critical limits generally do not change, other than to improve processes” and their associated risks.

3.3 Amendments made to the DWQMP

No amendments were made to the DWQMP in 2018/2019 however following the completion of our plan review we anticipate making an amendment application.

4 Verification Monitoring - Water Quality Information and Summary

Appendix A provides an overview of the results from the water quality monitoring program for the reporting period of 1 July 2018 to 30 June 2019. The water quality monitoring program was generally carried out as per Section 12 of the approved Central Highlands Regional Council overarching volume of the DWQMP. A small number of missed samples are attributed to the Queensland Government Forensic and Scientific Services laboratory closing during the Christmas and New Year break. At least one missed sample was due to wet weather when sampling runs had to be cancelled for safety of our staff. In addition, a courier error resulted in resampling at a number of locations attributing to 13 samples for the year as opposed to 12. In these cases, other parameters like chlorine residual continued to be monitored and the verification monitoring was resumed as soon as possible. This year the internal database and results in Appendix A are considered complete in so much as all the sample results have been recorded and included. This continues the maturing of our data management as identified in the risk management improvement program (items CHR 1 and CHR2 which are now completed).

The drinking water results were compared against the water quality criteria, i.e. the health guideline values in the current Australian Drinking Water Guidelines (ADWG), as well as the standards in the former *Public Health Regulation 2005 and the current Public Health Regulation 2018*. Appendix A (Tables 4.1 to 4.12) contain a summary of the results of the water quality monitoring program for all of council's water supply schemes. Most physicochemical drinking water quality results from the standard monitoring program met the recommended values in the ADWG. An exception was the total Trihalomethanes (THM) value in the surface water sourced schemes Dingo and Tieri. The details of this are discussed in the next section of this report. Other aesthetic exceedances like pH in Capella, Rolleston, Springsure and Tieri, sodium and dissolved solids in Springsure and Rolleston, total hardness in Anakie, Sapphire and Rubyvale and Aluminium in Tieri were recorded with actions and projects implemented or being considered to make improvements in those areas.

Appendix B (Tables 5.1 to 5.12) contain a summary of the results of the reticulation *E. coli* verification monitoring program for all council water supply schemes. While all samples taken tested negative for *E. coli*, a number of schemes did have recorded result/s for coliforms.

R. raciborskii levels were seasonally monitored in surface water schemes with a recognised risk. The DWQMP trigger level for cylindrospermopsin toxin testing was reached for the Capella and Rolleston schemes. Monitoring showed that while levels of the toxin varied in the raw water no detection of cylindrospermopsin was made in the treated water throughout the blue green algae bloom.

5 Incidents Reported to the Regulator

This financial year there were two instances where the regulator was notified under sections 102 or 102A of the Act. This notification did not involve the detection of *E. coli* – an organism that may not directly represent a hazard to human health but indicates the presence of recent faecal contamination.

As shown in table 2 the notifications were a non-compliance with the water quality criteria related to total Trihalomethanes (THM).

These incidents did not require the council to issue a ‘boil water alert’ or ‘do not drink notice’ to the public and subsequent retesting results indicated the water quality was back in compliance.

5.1 Non-compliances with the water quality criteria and corrective and preventive actions undertaken

Table 2 – Non-compliance reported to the regulator

Incident date	Scheme	Parameter	Level reported µg/L	Health Value* µg/L	Corrective and Preventive actions
07/01/2019	Tieri	THM	290	250	Flushed network, reviewed coagulation and retested. Reviewed chlorine dosing while not compromising effective disinfection. No subsequent exceedances recorded in the scheme monitoring to date.
20/03/2019	Dingo	THM	280	250	Retested and reviewed chlorine dosing while not compromising effective disinfection. No subsequent exceedances recorded in the scheme monitoring to date.

* Health Value is from the ADWG.

5.2 Prescribed incidents or events reported to the regulator and corrective and preventive actions undertaken

No prescribed incidents or events were required to be reported to the regulator during this reporting period

6 Customer Complaints

The council is required to report on the number of complaints, general details of complaints, and the responses undertaken. Table 3 provides an overview of the customer complaints relating to drinking water quality during this period plus adds some context by including the complaints per 1000 customers.

Table 3 – Customer complaints about water quality (including per 1000 customers)

Scheme	Health Concern	Dirty water	Taste and Odour	Other	Total
Anakie					0
Bauhinia					0
Blackwater/Bluff		3 (0.6)		1 (0.2)	4 (0.8)
Capella		1 (1)			1 (1)
Comet			2 (14)		2 (14)
Dingo					0
Duaringa					0
Emerald	2 (0.14)	3 (0.2)		2 (0.14)	7 (0.5)
Rolleston					0
Sapphire/Rubyvale					0
Springsure		6 (7)			6 (7)
Tieri		0			0
Total	2	13	2	3	20

* Complaints with multiple categories or multiple complaints for a same event in the system have all been counted as individual complaints for this report. Within the system there are 20 applicable records that total the 20 complaints.

The two graphs overleaf show the breakdown of customer complaints by month in Figure 1 and by scheme in Figure 2. Other than the Springsure event that is discussed in the dirty water section there is a general spread of water quality complaints through the whole reporting period. As expected, there is a higher frequency of complaints for the schemes that service larger communities.

Figure 1 – Monthly complaints about water quality

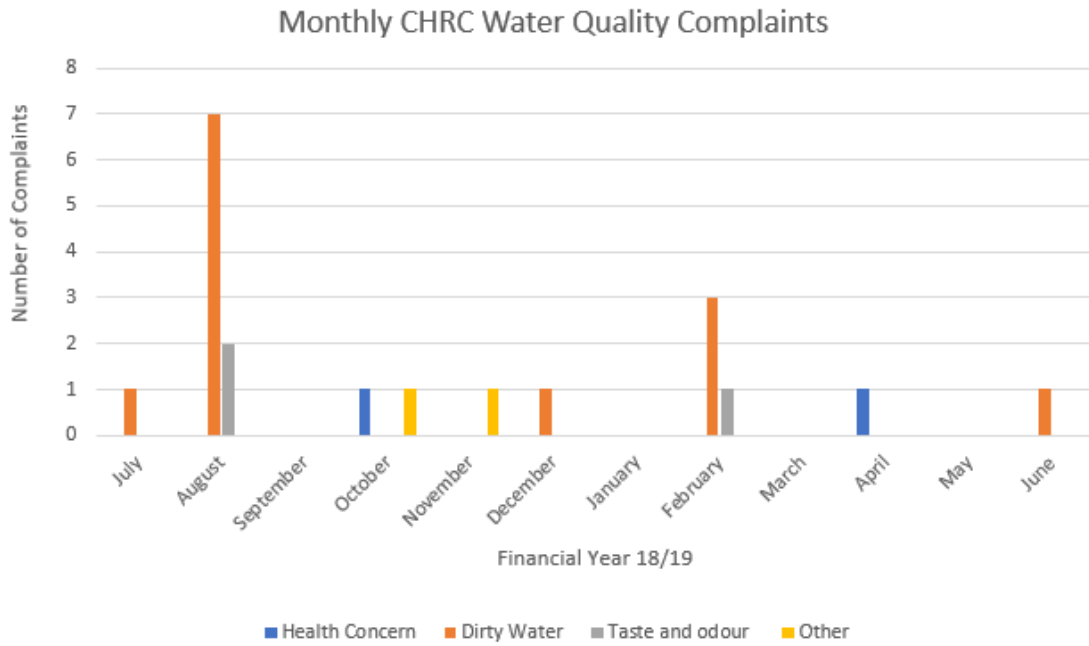
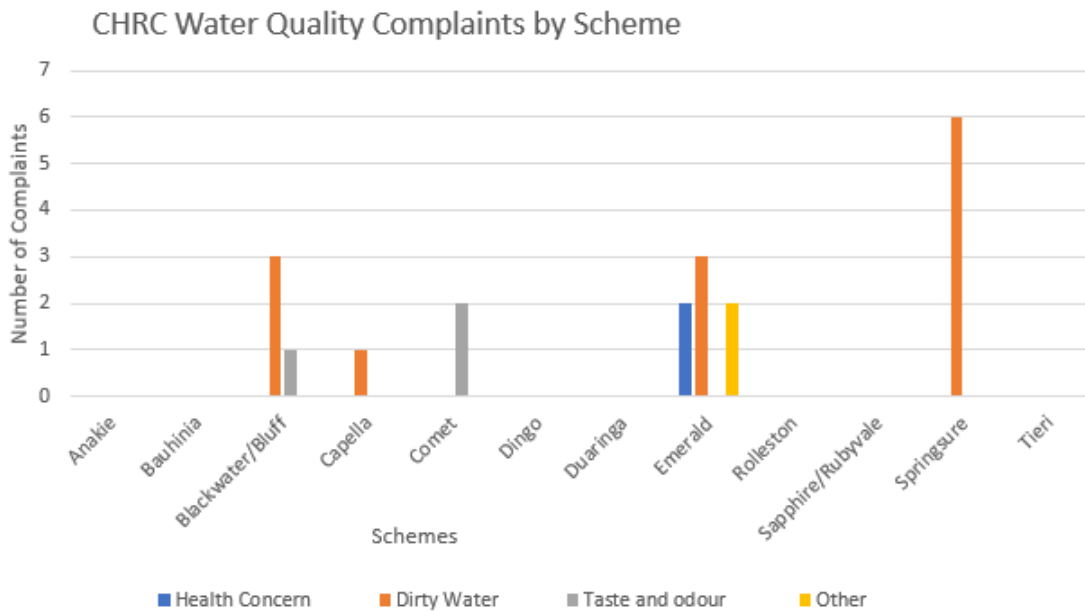


Figure 2 – Complaints about water quality by scheme



6.1 Health Concern

Complaints or enquiries are sometimes received from customers who suspect their water may be associated with an illness they are experiencing. Council investigates each complaint relating to alleged illness from its water quality, typically by testing the customer's tap and other sampling points close by for general water quality indicators, for the presence of *E. coli*. and/or getting a standard water analysis as required.

During the 2018-19 financial year council is not aware of any confirmed cases of illness arising from the water supply system. Two complaints were received between July 2018 and June 2019 regarding illness. Both were investigated by council, testing results showed compliance with the ADWG and no sign of poor quality water that was suggested as attributing to the customer's fish dying in one instance.

6.2 Dirty Water

A total of 13 customer complaints associated with dirty water were received between July 2018 and June 2019.

The community of Springsure reported 6 of these complaints during one week in August 2018. Council investigated the situation and found low reservoir levels to be the cause resulting in increased sediment in the water. Inflow from bores was increased to raise the reservoir water levels and stir up the sediment. The network was flushed for 1.5 days and grab samples from complainant households were tested. Whilst the water was aesthetically unpleasant testing results showed both compliance with the ADWG and no sign of poor quality. A digital radar sensor was also installed to accurately monitor future reservoir levels.

Each complaint relating to discoloured water or unusual water appearance is investigated by Council. Testing the water quality, typically by testing the customer's tap and other sampling points close by for turbidity, chlorine levels and/or getting a standard water analysis as required. Most of the complaints received are usually associated with a water main break, presence of air in the water or sedentary water at the extremities of the supply zone. When dealing with water main breaks staff conduct the repairs while ensuring the water quality is maintained, as well as managing storage levels in the affected reservoirs to ensure no one was without water. The area is then flushed to remove the dirty water and to achieve detectable chlorine residual results. The flushing targets specific areas such as dead-end mains, where it was anticipated the dirty water would not be flushed through normal use. Customers that report a complaint in this context are advised of the reasons for the dirty or unusual water appearance and are requested to allow the main a short period of time to settle.

6.3 Taste and Odour

Of the three complaints received for the year, two customers in Comet reported unfavourable taste and/or odour in August 2018. Upon investigation council identified the activated carbon in the carbon filter was nearing the end of its lifespan. All carbon was removed and replaced and the filter media in all filters changed. Testing results at the time indicated no parameters exceeded the ADWG guidelines.

6.4 Other

During the 2018-19 financial year council received 2 complaints about other water quality issues – both related to black or white flecks found in the customers water. While these

complaints were investigated and no parameters were recorded as exceeding the ADWG guidelines, no conclusions have been made as to the sources of the issues.

7 DWQMP Review Outcomes

The first regular review of CHRC's DWQMP was undertaken from July 2018 with the assistance of Viridis Consultants Pty Ltd. The process consisted of:

- desktop review of the approved DWQMP and associated documents
- water quality data analysis from approximately November 2014 to July 2018
- meetings and review discussions with relevant staff
- preparation of the final review report

Review findings and recommendations are detailed in Table 4 below.

8 DWQMP Audit Findings

No audit was conducted during the reporting period of 01/07/2018 to 30/06/2019.

Table 4 – DWQMP review findings and recommendations

Review component	Findings	Outcomes/Actions	Status of Actions	Responsible Position
Service description	<ul style="list-style-type: none"> There has been no change to the registered service details. The population figures were sourced from the QLD Government Statisticians Office. Population details have changed slightly since the DWQMP was last reviewed and were used to review the verification program. http://www.qgso.qld.gov.au/products/tables/erp-ucl-qld/index.php Plant Capacity current and projected demands and populations will need to be updated. 	<ul style="list-style-type: none"> Update the population and demand values in the plan. 	<ul style="list-style-type: none"> Refer to CHRC overarching DWQMP for population projections to 2031. Plant capacity deemed sufficient as projected populations are generally consistent with current levels over the next 10+ years. 	Planning Engineer
Details of infrastructure	<p>The schematics in the approved plan generally reflect the scheme characteristics however some minor changes were noted during the review workshop.</p> <p>For example:</p> <ul style="list-style-type: none"> Reservoirs have been taken offline or changed (Dingo, Bauhinia) Dosing points need to be confirmed and updated where necessary (Rolleston, Dingo, Springsure, Opal Street, Capella, Tieri, Duaringa, Comet) Treatment chemicals need to be reviewed and confirmed, for example any changes from Alum to Aluminium Chlorohydrate (ACH) need to be captured in the scheme descriptions. Monitoring points need to be updated (Rolleston, Springsure, Opal Street, Blackwater, Tieri, Anakie, Sapphire and Rubyvale, Duaringa) 	<ul style="list-style-type: none"> Update the minor details in the schematics. Update the associated body text. 	<ul style="list-style-type: none"> Schematics have all been updated. Treatment chemicals, dosing and monitoring points, reviewed and confirmed. 	Treatment Supervisor

Review component	Findings	Outcomes/Actions	Status of Actions	Responsible Position
	<ul style="list-style-type: none"> Supply arrangements need to be updated (East Nogoa, Comet) Chemical dosing needs to be updated (Blackwater) Supernatant return and bypass arrangements need to be confirmed <p>Additionally, the flow diagrams are not currently in a form that allows easy editing and updating.</p>			
Water quality and catchment characteristics	<p>The source water quality has not changed, although a broader suite of chemicals/metals were not tested.</p> <p>Whilst changes to source water quality have not been identified, pesticide and blue green algae risk is better understood due to specific sampling.</p> <p>In addition, risk assessments have been undertaken for potential source water hazards such as microplastics and PFAS.</p> <p>Operational Data Analysis</p> <p>Approximately 4 years of operational data was analysed for each scheme:</p> <ul style="list-style-type: none"> There have been instances of high filtered and final water turbidity of greater than 1 NTU (Dingo, Capella, Tieri, Duaringa, however recent filter refurbishment has improved filtered water turbidity (Duaringa only)). This indicates that for the identified schemes, filter breakthrough is an issue. 	<ul style="list-style-type: none"> Include the 2018 Review Data Analysis as a supporting document to the DWMQP CCP procedures Review limits in 6 and 12 months and reduce where possible 	<ul style="list-style-type: none"> Algae and Toxin sampling of Raw Water continues to occur in schemes historically prone to such occurrences. Water Quality Data has been added as an Appendix to each individual schemes DWQMP. PFAS and Microplastics have been added to Risk Register and Verification Monitoring where applicable. <p>Final CCP procedure drafts to be checked, rolled out and reinforced.</p>	<p>Planning Engineer</p> <p>Manager Water Utilities</p>

Review component	Findings	Outcomes/Actions	Status of Actions	Responsible Position
	<ul style="list-style-type: none"> Isolated high turbidity event at Rolleston in April 2018 Highly variable free chlorine (Dingo, Springsure) Instances of low chlorine (Bauhinia) <p>Verification Data Analysis</p> <p>There have been no E. coli detections in any of the drinking water schemes in the past (approx.) 4 years. There have been 5 schemes with exceedances in total trihalomethanes (THMs).</p> <ul style="list-style-type: none"> Lions Park Tieri, 4 exceedances out of 46 samples Blackwater Hunter St 2 exceedances out of 28 samples Bluff Tennis Courts, 10 exceedances out of 48 samples Capella Showground, 1 exceedance out of 40 samples Comet Shop, 3 exceedances out of 38 samples Dingo Park, 1 exceedance out of 18 samples Duaringa BP, 1 exceedance out of 20 samples Rolleston Library, 4 exceedances out of 30 samples <p>There were no water quality related customer complaints relating to suspected illnesses from the water supply received in the past two years.</p>	<ul style="list-style-type: none"> Filter capital works Chlorine capital works 	<p>Regular updates on filter and chlorine capital works</p> <p>Consider incident readiness for mentioned schemes</p> <p>THM exceedances were reported to the regulator as required. Refer section 5 of this report. Monitoring continues to occur seasonally and in schemes historically prone to higher levels.</p>	

Review component	Findings	Outcomes/Actions	Status of Actions	Responsible Position
<p>Risk assessment</p>	<p>The Manager is the same and the risk assessment team is largely the same team members.</p> <p>The risk assessment methodology is considered appropriate for the assessment of water quality risk.</p> <p>Risk assessments were undertaken in 2015. As part of this review the currency of the risk assessments was reviewed. The risk assessment is documented in a number of risk registers. The review identified the following observations:</p> <ul style="list-style-type: none"> • Duaringa – Storm events managed by filtration may have a lower frequency (mitigated risk) than assessed due to the filter refurbishment. • Dingo - the scheme risk assessment identifies mitigated filter breakthrough risk as high (this is consistent with the data). <p>New risks that were identified during the review workshop include:</p> <ul style="list-style-type: none"> • Assessment of Naegleria fowleri and Legionella risk • Assessment of cyber security (upon advice from DNRME) • New and emerging hazards such as PFAS and microplastics • Loss of a sole operators in a small or remote town. It may be difficult to replace sole operators if they move on. 	<ul style="list-style-type: none"> • Review the risk register in detail to ensure currency. 	<ul style="list-style-type: none"> • Risk Register updated to include the newly identified risks and potential source water hazards. • Items added to RMIP where applicable i.e. standpipe backflow protection, options for alternative cooling systems, cyber security etc. • Reviewed 	<p>Treatment Engineer</p>

Review component	Findings	Outcomes/Actions	Status of Actions	Responsible Position
	<ul style="list-style-type: none"> Use of standpipes by external customers, risk of backflow etc. <p>The risk register needs to be updated to capture the new risks and any changes to the risk levels. It was also an audit finding to review and update the preventive measures in the risk assessment to clarify and detail the actions that must be implemented. Additionally, including a lock-out in the SCADA system has been identified as an important preventive measure to consider reducing the potential for alarms and shutdowns to be changed or disabled.</p>	<ul style="list-style-type: none"> Review descriptions of preventative measures Restrict SCADA profile access to change/disable alarms and shutdown 	<ul style="list-style-type: none"> Reviewed, with ongoing review Initial phase complete – ongoing review 	<p>Planning Engineer</p> <p>Treatment Engineer</p>
Operations and maintenance procedures	<p>The risk assessment identified a number of procedures that need to be developed and implemented. These have been captured on the improvement program. The procedures for critical control points have been developed but not yet finalised and implemented. These have more stringent critical limits and are more protective of public health however there is a need to review and update the CCPs and ensure that they are monitored in the correct location and that the critical limits are consistent with the recommendations of the ADWG and Water Services Association of Australia (WSAA) Good Practice Guideline. It was discussed that there are challenges with the smaller plants in implementing more stringent limits.</p>	<ul style="list-style-type: none"> Review and update the CCP procedures to reflect ADWG and WSAA good practice guideline. Implement the critical control point procedures and the associated critical limits. Undertake training on SOP implementation. Continue to prepare and implement standards operational 	<ul style="list-style-type: none"> Procedures are under development as part of the RMIP. The initial group of procedures developed include: <ul style="list-style-type: none"> Coagulation Filtration Chlorination Fluoridation External consultant engaged to prepare a mechanical maintenance contract for all schemes. 	Treatment Engineer

Review component	Findings	Outcomes/Actions	Status of Actions	Responsible Position
	<p>Additional procedures have been identified in the risk assessment and have been captured in the improvement program.</p> <p>As a part of the review, it was recognised that operational procedures for drinking water networks need to be established, as currently this relies on operator knowledge. Procedures for network include:</p> <ul style="list-style-type: none"> • Reservoir inspection (Rubyvale, Sapphire and Anakie are currently being used as a trial for a procedure) • Main break repairs (including procedure to reduce ingress of contaminants) • Reactive flushing • Procedure or guide on general drinking water network hygiene including decontamination of tools, working between sewer and potable networks. • Procedures should include acceptance criteria such as testing of free chlorine after flushing, mains breaks etc, to ensure there is a disinfection residual. Record keeping processes to document actions taken should be included in the procedures. 	<p>procedures as identified.</p> <p>New procedures include:</p> <ul style="list-style-type: none"> • Mains break procedure • Hygiene procedure • Reactive flushing procedure 	<ul style="list-style-type: none"> • To be developed 	<p>Network Engineer</p>
<p>Management of incidents and emergencies</p>	<p>The IERP process is documented in the overarching DWQMP. The process has not changed.</p>	<ul style="list-style-type: none"> • Schedule regular (annual) scenario training for incident management. 	<ul style="list-style-type: none"> • Stand Alone Incident and Emergency Response Plan is currently under development. • Stakeholder register updated. 	<p>Manager Water Utilities</p>

Review component	Findings	Outcomes/Actions	Status of Actions	Responsible Position
	<p>CHRC is developing a standalone Incident Management Protocol which contains scenarios and examples of incidents and emergencies.</p> <p>Key stakeholders are detailed in Section 5 of the DWQMP and includes government departments, community groups, catchment and emergency management stakeholders and vulnerable customers. This list needs to be reviewed and updated for currency.</p>	<ul style="list-style-type: none"> Review and update the stakeholder register. Development of a standalone Incident Management 	<ul style="list-style-type: none"> Scenario training is yet to occur. 	
Risk management improvement program	<p>The improvement program was reviewed during the workshop and it was noted that there are a lot of repetitions across schemes. At present there are over 370 items in the Risk Management Improvement Program (RMIP). A number of items have been progressed, for example:</p> <ul style="list-style-type: none"> Filter media replaced at Duaringa and Blackwater Filter ripen to waste has been completed for Duaringa and Comet Filter to waste 4 of 6 filters at Blackwater Install capability for standby generator at Sapphire Bore, Blackwater reservoir, Comet, Duaringa Monitoring of THMs Decommissioning of tanks at Dingo <p>There had been a delay in progressing improvements, due to availability of resources to develop procedures or due to project planning and funding however there is a commitment to continuous improvement.</p>	<ul style="list-style-type: none"> Update and review the Improvement Program Consider consolidating the items to make it more workable. 	<ul style="list-style-type: none"> Risk Management Improvement Program has been reviewed and consolidated. Completed items removed. Status updated for remaining items including priorities and estimated timeframes for completion. New items added as a result of the Risk Assessment review. 	Manager Water Utilities

Review component	Findings	Outcomes/Actions	Status of Actions	Responsible Position
Service wide information management	Operational and verification data is collected in SWIM local and this was extracted for the data analysis. Documents are retained in CHRC's document management system. Gaps in procedures are being progressed through the improvement program.	N/A	<ul style="list-style-type: none"> SWIM data is up to date. Documents stored in CHRC's Enterprise Content Management (ECM) system. 	Manager Water Utilities
Operational monitoring	<p>The current DWQMP (scheme plans) identifies operational monitoring and the associated limits and corrective actions.</p> <p>It was discussed that CCP procedures have been developed but are not yet implemented.</p> <p>Operational monitoring for each scheme was discussed at the review workshop and the following findings were made:</p> <ul style="list-style-type: none"> CCPs and critical limits need to be set for filtered water turbidity on individual filters, to reflect best practice. Some schemes have established a critical limit on final water, which is appropriate for assessing effectiveness of disinfection processes but is not reflective of filter performance. In the first instance daily grab sampling from individual filters (or combined if it's not possible to sample each filter). Establishment of continuous online filters water turbidity should be established for scheme that relies on filtration to manage protozoa and/or high turbidity. Additionally, ADWG identifies filtered water turbidity should be 0.2 NTU, at most 	<ul style="list-style-type: none"> Ensure CCPs are implemented. Establish CCPs for all schemes with filtration with critical limits for filtered water turbidity. At a minimum formalise daily grab sampling from each filter and work to establish online continuous sampling with alarms and automatic shutdowns. 	<ul style="list-style-type: none"> Critical limits have been reviewed as part of the CCP procedure implementation process. Filter turbidity critical limits are still under review and noted in the RMIP. There are operational challenges with the smaller plants implementing more stringent limits i.e. 0.5, as suggested in the recent audit. Free Chlorine target in the at the extremities of the reticulation network for all schemes is >0.2 mg/L (with the exception of Bauhinia 0.1 mg/L). 	Treatment Engineer

Review component	Findings	Outcomes/Actions	Status of Actions	Responsible Position
	<p>times and never above 0.5 NTU for schemes with protozoa risk.</p> <ul style="list-style-type: none"> • Dingo, Rolleston, Duaringa are schemes that require filtered water turbidity CCPs and limits. • Schemes with filtered water turbidity CCP but need the limit revised include Tieri, Capella, Blackwater and Opal Street. • Disinfection critical limits need to reflect the disinfection contact time (C.t.) required to achieve primary disinfection and secondly to achieve free chlorine residual within the distribution network. The WSSA Good Practice Guide recommends 0.2 mg/L of free chlorine measured at the extremities of the network. <p>Monitoring results are captured in SWIM Local.</p>	<ul style="list-style-type: none"> • Calculate C.t. (as required for schemes with low free chlorine at the extremities,) review and revise critical limits to ensure the minimum C.t. is achieved. 	<ul style="list-style-type: none"> • Priority order of schemes to have C.t calculated as required by low chlorine residual at the extremities. 	

<p>Verification monitoring</p>	<p>At present CHRC is currently investigating the options for external contractor sampling or internal sampling. Internal sampling may require the establishment of a new position and recruitment of a suitable candidate.</p> <p>The verification monitoring program was reviewed against the requirements of the Public Health Regulation 2018 (PH Reg) for E. coli sampling based on population for each scheme. The population is based on the QLD Statistician Office as at 31/07/18 or recalculated based on nearby towns or previous year, provided by CHRC.</p> <p>http://www.qgso.qld.gov.au/products/tables/erp-ucl-qld/index.php</p> <p>The E. coli monitoring program is consistent with the PH Reg requirements for E. coli testing for all schemes except for Capella, which has now exceeded a population of 1000, and now requires weekly E. coli testing.</p> <p>Table 9-5 of the ADWG provides guidance on the frequency of verification sampling for non-microbiological parameters.</p> <p>At present the non-microbiological verification testing program includes:</p> <ul style="list-style-type: none"> • standard water analysis is undertaken monthly for all schemes • seasonal testing of algae, THMs and pesticides • five yearly or event testing for heavy metals, pesticides and THMs. 	<p>Update the verification program to include:</p> <ul style="list-style-type: none"> • Weekly E. coli testing at Capella • Review the frequency of the standard water analysis testing (quarterly or six monthly) • Add the sourcing of a suitable internal or external person to undertake verification sampling. 	<ul style="list-style-type: none"> • External contract sampler engaged. • Capella has been added to weekly E.coli testing a few years ago and will continue for now. (Even though population has now dropped to 988) • Verification monitoring frequencies are currently under review. • The intent is to commence SWA quarterly in 2020 for larger schemes and bi-annually for smaller schemes. 	<p>Planning Engineer</p>
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	<p>Based on the results of the data analysis, the Standard water analysis frequency may be able to be reduced to quarterly for larger schemes and six monthly for the smaller schemes. Any detection of a parameters about an ADWG Health guideline limit should trigger an increase in sampling frequency.</p> <p>In addition, CHRC has an improved understanding of pesticide risk and algal toxins and may consider moving these to a risk-based frequency.</p>			
Other Areas	<p>A new version of the PH Reg has been released in 2018. This has been taken into consideration in this review.</p> <p>A new version of the ADWG has been released in 2018 and includes a new Chemical Fact Sheet: Per-fluoroalkyl and poly-fluoroalkyl substances (PFAS). This has been taken into consideration in this review.</p> <p>The regulator has indicated that cyber security must be assessed in the drinking water risk assessment. This has been taken into consideration in this review.</p> <p>There was an external DWQMP audit undertaken in 2018. The audit outcomes have been discussed and addressed in the 2017/2018 Annual Report.</p>	<ul style="list-style-type: none"> • Use the same as the 2005 version of the PH Reg or current DWQMP • Include assessment of PFAS and cyber security in the DWQMP risk assessment. 	<ul style="list-style-type: none"> • E.coli schedule matches or exceeds the 2005 version of the PH Reg – moving to weekly sampling at all schemes is not justified. • PFAS and Cyber Security have been added to the updated Risk Register. • Initial PFAS testing was undertaken in mid 2019. 	Manager Water Utilities

Appendix A – Summary of Compliance with Water Quality Criteria

The drinking water results were compared against the water quality criteria, i.e. the health guideline values in the current Australian Drinking Water Guidelines (ADWG), as well as the standards in the former *Public Health Regulation 2005 and the current Public Health Regulation 2018*. While all samples taken tested negative for *E. coli*, a number of schemes did have recorded result/s for coliforms. Most physicochemical drinking water quality results from the standard monitoring program met the recommended health value ranges in the ADWG. The exception was the total Trihalomethanes (THM) value in two schemes sourced from surface water namely Tieri and Dingo.

Other aesthetic exceedances like pH in Capella, Rolleston, Springsure and Tieri, sodium and dissolved solids in Springsure and Rolleston, total hardness in Anakie, Sapphire and Rubyvale and Aluminium in Tieri were recorded with actions and projects implemented or being considered to make improvements in those areas.

Table 5.1 to 5.14 – Verification monitoring results

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Anakie	Reticulation	Chlorine (Free)	mg/L	Monthly	12	0	0.04	1.3	0.85	0.01
		Ecoli	CFU/100mL	Monthly	12	0	0	0	0	0
		Coliforms	CFU/100mL	Monthly	12	0	0	0	0	0
		Conductivity	µs/cm	Monthly	13	No value	690	700	694	1
		pH	at 22°C	Monthly	13	0	7.24	7.8	7.55	0.01
		Total Hardness	mg CaCO ₃ /L	Monthly	13	13	226	229	227	1
		Alkalinity	mg CaCO ₃ /L	Monthly	13	No value	279	286	281	1
		Silica	mg/L	Monthly	13	0	47	49	48	1
		Dissolved Solids	mg/L	Monthly	13	0	419	425	421	1
		True Colour	hazen	Monthly	13	0	<1	3	1.15	1
		Turbidity	NTU	Monthly	13	0	<1	1	1	1
		Sodium	mg/L	Monthly	13	0	63	67	65	1
		Potassium	mg/L	Monthly	13	No value	1.2	1.3	1.27	0.1
		Calcium	mg/L	Monthly	13	No value	40	41	40	0.1
		Magnesium	mg/L	Monthly	13	No value	31	31	31	0.1
		Chloride	mg/L	Monthly	13	0	46	49	47	1
		Fluoride	mg/L	Monthly	13	0	0.22	0.3	0.2	0.01
		Nitrate	mg/L	Monthly	13	0	<0.5	<0.5	<0.5	0.5
		Sulphate	mg/L	Monthly	13	0	19	21	20	0.1
		Iron	mg/L	Monthly	13	0	<0.01	<0.01	<0.01	0.01
Manganese	mg/L	Monthly	13	0	<0.01	<0.01	<0.01	0.01		
Zinc	mg/L	Monthly	13	0	0.01	0.36	0.09	0.01		
Aluminium	mg/L	Monthly	13	0	<0.5	<0.5	<0.5	0.05		
Boron	mg/L	Monthly	13	0	0.04	0.05	0.05	0.01		
Copper	mg/L	Monthly	13	0	<0.03	0.52	0.14	0.03		

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Bauhinia	Reticulation	Chlorine (Free)	mg/L	Monthly	12	0	0.03	2.08	0.67	0.01
		Coliforms	CFU/100mL	Monthly	12	1	0	1	0.08	0
		Ecoli	CFU/100mL	Monthly	12	0	0	0	0	0
		Conductivity	µs/cm	Monthly	11	No value	450	461	455	1
		pH	mg/L	Monthly	11	0	7.72	8.1	7.92	0.01
		Total Hardness	mg CaCO ₃ /L	Monthly	11	0	53	62	58	1
		Alkalinity	mg CaCO ₃ /L	Monthly	11	No value	150	452	180	1
		Silica	mg/L	Monthly	11	0	18	18	18	1
		Dissolved Solids	mg/L	Monthly	11	0	258	266	261	1
		True Colour	hazen	Monthly	11	0	<1	4	1.36	1
		Turbidity	NTU	Monthly	11	0	<1	3	1.18	1
		Sodium	mg/L	Monthly	11	0	60	68	63	1
		Potassium	mg/L	Monthly	11	No value	20	23	21	0.1
		Calcium	mg/L	Monthly	11	No value	9.8	12	11.16	0.1
		Magnesium	mg/L	Monthly	11	No value	7	7.8	7.41	0.1
		Chloride	mg/L	Monthly	11	0	46	50	48	1
		Fluoride	mg/L	Monthly	11	0	0.16	0.22	0.18	0.01
		Nitrate	mg/L	Monthly	11	0	<0.5	0.5	0.5	0.5
		Sulphate	mg/L	Monthly	11	0	<1	<1	<1	0.1
		Iron	mg/l	Monthly	11	0	0.01	0.17	0.04	0.01
Manganese	mg/L	Monthly	11	0	<0.01	<0.01	<0.01	0.01		
Zinc	mg/L	Monthly	11	0	0.01	0.01	0.01	0.01		
Aluminium	mg/L	Monthly	11	0	<0.5	<0.5	<0.5	0.05		
Boron	mg/L	Monthly	11	0	0.04	0.04	0.04	0.01		
Copper	mg/L	Monthly	11	0	<0.03	<0.03	<0.03	0.03		

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Blackwater	Reticulation	Chlorine (Free)	mg/L	Weekly	48	0	0.02	1.67	0.35	0.01
		Coliforms	CFU/100mL	Weekly	49	0	0	0	0	0
		Ecoli	CFU/100mL	Weekly	49	0	0	0	0	0
		Trihalomethanes	µg/L	Seasonal/Event	8	0	120	200	161	1
		Conductivity	us/cm	Monthly	12	No value	277	630	446	1
		pH	mg/L	Monthly	12	0	7.47	8.15	7.85	0.01
		Total Hardness	mg CaCO3/L	Monthly	12	0	75	145	113	1
		Alkalinity	mg CaCO3/L	Monthly	12	No value	6	130	100	1
		Silica	mg/L	Monthly	12	0	6	13	9	1
		Dissolved Solids	mg/L	Monthly	12	0	155	330	238	1
		True Colour	hazen	Monthly	12	0	<1	4	1.33	1
		Turbidity	NTU	Monthly	12	0	<1	1	1	1
		Sodium	mg/L	Monthly	12	0	23	69	42	1
		Potassium	mg/L	Monthly	12	No value	4.5	6.9	6.1	0.1
		Calcium	mg/L	Monthly	12	No value	19	32	26	0.1
		Magnesium	mg/L	Monthly	12	No value	6.8	16	11.75	0.1
		Chloride	mg/L	Monthly	12	0	28	110	61	1
		Fluoride	mg/L	Monthly	12	0	0.05	0.78	0.64	0.01
		Nitrate	mg/L	Monthly	12	0	<0.5	1.1	0.59	0.5
		Sulphate	mg/L	Monthly	12	0	14	20	17.75	0.1
	Iron	mg/l	Monthly	12	0	<0.01	<0.01	<0.01	0.01	
	Manganese	mg/L	Monthly	12	0	<0.01	<0.01	<0.01	0.01	
	Zinc	mg/L	Monthly	12	0	<0.01	0.03	0.01	0.01	
	Aluminium	mg/L	Monthly	12	0	<0.5	0.1	0.07	0.05	
	Boron	mg/L	Monthly	12	0	0.04	0.06	0.05	0.01	
	Copper	mg/L	Monthly	12	0	<0.03	<0.03	<0.03	0.03	
	Raw Water	Atrazine	µg/L	Seasonally	2	NA	0.14	0.15	0.14	0.01
		Desethyl Atrazine	µg/L	Seasonally	2	NA	0.03	0.03	0.03	0.01
Simazine		µg/L	Seasonally	2	NA	0.03	0.03	0.03	0.01	
Tebuthiuron		µg/L	Seasonally	2	NA	0.41	0.44	0.425	0.01	
Metolachlor		µg/L	Seasonally	2	NA	0.02	0.02	0.02	0.01	

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Bluff	Reticulation	Chlorine (Free)	mg/L	Monthly	12	0	0.33	1.07	0.837	0.01
		Coliforms	CFU/100mL	Monthly	12	0	0	0	0	0
		Ecoli	CFU/100mL	Monthly	12	0	0	0	0	0
		Trihalomethanes	µg/L	Seasonal/Event	8	0	130	250	186	1

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Capella	Reticulation	Chlorine (Free)	mg/L	Monthly	37	0	0.06	0.97	0.37	0.01
		Coliforms	CFU/100mL	Monthly	37	4	0	53	1.68	0
		Ecoli	CFU/100mL	Monthly	37	0	0	0	0	0
		Trihalomethanes	µg/L	Seasonal/Event	12	0	71	250	123	1
		Conductivity	us/cm	Monthly	15	No value	384	996	552	1
		pH	mg/L	Monthly	15	1	7.8	8.58	8.11	0.01
		Total Hardness	mg CaCO3/L	Monthly	15	0	85	174	115	1
		Alkalinity	mg CaCO3/L	Monthly	15	No value	106	250	153	1
		Silica	mg/L	Monthly	15	0	10	14	12	1
		Dissolved Solids	mg/L	Monthly	15	0	216	560	319	1
		True Colour	hazen	Monthly	15	0	<1	28	3	1
		Turbidity	NTU	Monthly	15	0	<1	32	3	1
		Sodium	mg/L	Monthly	15	0	47	150	74	1
		Potassium	mg/L	Monthly	15	No value	3	6.5	4.11	0.1
		Calcium	mg/L	Monthly	15	No value	19	28	24	0.1
		Magnesium	mg/L	Monthly	15	No value	8.9	28	14	0.1
		Chloride	mg/L	Monthly	15	0	21	130	45	1
		Fluoride	mg/L	Monthly	15	0	0.09	0.28	0.17	0.01
		Nitrate	mg/L	Monthly	15	0	<0.05	0.9	0.57	0.5
		Sulphate	mg/L	Monthly	15	0	4	66	51.2	0.1
		Iron	mg/l	Monthly	15	0	<0.01	<0.01	<0.01	0.01
		Manganese	mg/L	Monthly	15	0	<0.01	<0.01	<0.01	0.01
		Zinc	mg/L	Monthly	15	0	<0.01	<0.01	<0.01	0.01
		Aluminium	mg/L	Monthly	15	0	<0.05	0.13	0.08	0.05
	Boron	mg/L	Monthly	15	0	0.07	0.22	0.11	0.01	
	Copper	mg/L	Monthly	15	0	<0.03	<0.03	<0.03	0.03	
	Raw Water	Algae (pot. toxic)	Cells/mL	Seasonally	9	No value	270	2438	1143	1
		Toxin (cylindro)	µg/L	Seasonally	10	No value	0.2	0.2	0.2	0.2

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Comet	Reticulation	Chlorine (Free)	mg/L	Monthly	12	0	0.23	1.07	0.73	0.01
		Coliforms	CFU/100mL	Monthly	12	0	0	0	0	0
		Ecoli	CFU/100mL	Monthly	12	0	0	0	0	0
		Trihalomethanes	µg/L	Seasonal/Event	7	0	110	180	154	1
		Conductivity	us/cm	Monthly	12	No value	200	327	269	1
		pH	mg/L	Monthly	12	0	6.87	8.26	7.94	0.01
		Total Hardness	mg CaCO3/L	Monthly	12	0	12	113	73	1
		Alkalinity	mg CaCO3/L	Monthly	12	No value	61	142	102	1
		Silica	mg/L	Monthly	12	0	11	20	17	1
		Dissolved Solids	mg/L	Monthly	12	0	116	190	157	1
		True Colour	hazen	Monthly	12	0	<1	2	1.25	1
		Turbidity	NTU	Monthly	12	0	<1	1	1	1
		Sodium	mg/L	Monthly	12	0	18	29	22	1
		Potassium	mg/L	Monthly	12	No value	3.4	6.7	5.18	0.1
		Calcium	mg/L	Monthly	12	No value	11	26	19.25	0.1
		Magnesium	mg/L	Monthly	12	No value	3.9	13	8.3	0.1
		Chloride	mg/L	Monthly	12	0	16	26	21	1
		Fluoride	mg/L	Monthly	12	0	0.1	0.26	0.18	0.01
		Nitrate	mg/L	Monthly	12	0	<0.5	2	0.75	0.5
		Sulphate	mg/L	Monthly	12	0	1	5	2.33	0.1
	Iron	mg/l	Monthly	12	0	<0.01	<0.01	<0.01	0.01	
	Manganese	mg/L	Monthly	12	0	<0.01	<0.01	<0.01	0.01	
	Zinc	mg/L	Monthly	12	0	<0.01	<0.01	<0.01	0.01	
	Aluminium	mg/L	Monthly	12	0	<0.05	<0.05	<0.05	0.05	
Boron	mg/L	Monthly	12	0	0.02	0.08	0.05	0.01		
Copper	mg/L	Monthly	12	0	<0.03	<0.03	<0.03	0.03		
Raw Water	Atrazine	µg/L	Seasonally	2	NA	0.03	0.05	0.04	0.01	
	Desethyl Atrazine	µg/L	Seasonally	2	NA	0.01	0.03	0.02	0.01	
	Simazine	µg/L	Seasonally	2	NA	0.02	0.41	0.215	0.01	
	Tebuthiuron	µg/L	Seasonally	2	NA	0.27	0.35	0.31	0.01	
	Metolachlor	µg/L	Seasonally	2	NA	0.07	0.12	0.095	0.01	

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Dingo	Reticulation	Chlorine (Free)	mg/L	Monthly	12	0	0.14	1.68	0.97	0.01
		Coliforms	CFU/100mL	Monthly	12	1	0	1	0.08	0
		Ecoli	CFU/100mL	Monthly	12	0	0	0	0	0
		Trihalomethanes	µg/L	Seasonally	9	1	130	280	165	1
		Conductivity	us/cm	Monthly	12	No value	144	168	157	1
		pH	mg/L	Monthly	12	0	6.62	7.77	7.21	0.01
		Total Hardness	mg CaCO3/L	Monthly	12	0	24	30	27.33	1
		Alkalinity	mg CaCO3/L	Monthly	12	No value	34	44	39.5	1
		Silica	mg/L	Monthly	12	0	12	13	12.17	1
		Dissolved Solids	mg/L	Monthly	12	0	84	97	90	1
		True Colour	hazen	Monthly	12	0	<1	3	1.5	1
		Turbidity	NTU	Monthly	12	0	<1	3	1.5	1
		Sodium	mg/L	Monthly	12	0	17	20	18	1
		Potassium	mg/L	Monthly	12	No value	3.8	4.4	4.07	0.1
		Calcium	mg/L	Monthly	12	No value	4.6	5.9	5.33	0.1
		Magnesium	mg/L	Monthly	12	No value	2.9	3.8	3.43	0.1
		Chloride	mg/L	Monthly	12	0	19	25	21.67	1
		Fluoride	mg/L	Monthly	12	0	0.11	0.15	0.14	0.01
		Nitrate	mg/L	Monthly	12	0	0.5	0.5	0.5	0.5
		Sulphate	mg/L	Monthly	12	0	1	2	1.83	0.1
	Iron	mg/l	Monthly	12	0	<0.01	0.02	0.01	0.01	
	Manganese	mg/L	Monthly	12	0	<0.01	0.01	0.01	0.01	
	Zinc	mg/L	Monthly	12	0	<0.01	0.02	0.01	0.01	
	Aluminium	mg/L	Monthly	12	0	<0.05	<0.05	<0.05	0.05	
Boron	mg/L	Monthly	12	0	0.05	0.06	0.06	0.01		
Copper	mg/L	Monthly	12	0	<0.03	<0.03	<0.03	0.03		
Raw Water	Atrazine	µg/L	Seasonally	2	0	0.02	0.1	0.06	0.01	
	Desethyl Atrazine	µg/L	Seasonally	2	No value	0.02	0.1	0.06	0.01	
	Simazine	µg/L	Seasonally	2	0	0.01	0.1	0.05	0.01	
	Tebuthiuron	µg/L	Seasonally	2	No value	0.41	0.48	0.44	0.01	
	Metolachlor	µg/L	Seasonally	2	0	0.01	0.1	0.05	0.01	

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Duaringa	Reticulation	Chlorine (Free)	mg/L	Monthly	12	0	0.48	1.25	0.8	0.01
		Coliforms	CFU/100mL	Monthly	12	1	0	2	0.17	0
		Ecoli	CFU/100mL	Monthly	12	0	0	0	0	0
		Trihalomethanes	µg/L	Seasonally	8	0	66	140	93	1
		Conductivity	us/cm	Monthly	11	No value	214	321	275	1
		pH	mg/L	Monthly	11	0	7.12	8.14	7.72	0.01
		Total Hardness	mg CaCO3/L	Monthly	11	0	59	73	67	1
		Alkalinity	mg CaCO3/L	Monthly	11	No value	73	91	80.21	1
		Silica	mg/L	Monthly	11	0	5	15	9.91	1
		Dissolved Solids	mg/L	Monthly	11	0	128	171	152	1
		True Colour	hazen	Monthly	11	0	<1	4	1.91	1
		Turbidity	NTU	Monthly	11	0	<1	1	1	1
		Sodium	mg/L	Monthly	11	0	16	32	25.36	1
		Potassium	mg/L	Monthly	11	No value	6.8	7.6	7.16	0.1
		Calcium	mg/L	Monthly	11	No value	15	19	16.18	0.1
		Magnesium	mg/L	Monthly	11	No value	5	7.9	6.48	0.1
		Chloride	mg/L	Monthly	11	0	17	48	33	1
		Fluoride	mg/L	Monthly	11	0	0.11	0.17	0.14	0.01
		Nitrate	mg/L	Monthly	11	0	0.5	0.8	0.53	0.5
		Sulphate	mg/L	Monthly	11	0	4	6	5	0.1
	Iron	mg/l	Monthly	11	0	<0.01	<0.01	<0.01	0.01	
	Manganese	mg/L	Monthly	11	0	<0.01	<0.01	<0.01	0.01	
	Zinc	mg/L	Monthly	11	0	<0.01	0.05	0.01	0.01	
	Aluminium	mg/L	Monthly	11	0	<0.05	<0.05	<0.05	0.05	
	Boron	mg/L	Monthly	11	0	<0.03	0.06	0.05	0.01	
	Copper	mg/L	Monthly	11	0	<0.03	<0.03	<0.03	0.03	
	Raw Water	Atrazine	µg/L	Seasonally	2	NA	0.06	0.11	0.085	0.01
		Desethyl Atrazine	µg/L	Seasonally	2	NA	0.01	0.02	0.015	0.01
Simazine		µg/L	Seasonally	2	NA	0.01	0.1	0.055	0.01	
Tebuthiuron		µg/L	Seasonally	2	NA	0.53	0.77	0.65	0.01	
Metolachlor		µg/L	Seasonally	2	NA	0.05	0.05	0.05	0.01	
Algae (pot. toxic)		Cells/mL	Seasonally	1	No value	6680	6680	6680	1	

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Emerald	Reticulation	Chlorine (Free)	mg/L	Weekly	99	0	0.06	2.89	1.02	0.01
		Coliforms	CFU/100mL	Weekly	100	2	0	34	1	0
		Ecoli	CFU/100mL	Weekly	100	0	0	0	0	0
		Conductivity	us/cm	Monthly	24	No value	354	651	445	1
		pH	mg/L	Monthly	24	0	7.22	8.08	7.78	0.01
		Total Hardness	mg CaCO3/L	Monthly	24	0	104	171	129	1
		Alkalinity	mg CaCO3/L	Monthly	24	No value	112	182	143	1
		Silica	mg/L	Monthly	24	0	6	10	8	1
		Dissolved Solids	mg/L	Monthly	24	0	195	346	240	1
		True Colour	hazen	Monthly	24	0	<1	11	2	1
		Turbidity	NTU	Monthly	24	0	<1	1	1	1
		Sodium	mg/L	Monthly	24	0	27	63	37	1
		Potassium	mg/L	Monthly	24	No value	8.3	12	9.4	0.1
		Calcium	mg/L	Monthly	24	No value	24	37	29	0.1
		Magnesium	mg/L	Monthly	24	No value	11	19	13.5	0.1
		Chloride	mg/L	Monthly	24	0	29	94	43.5	1
		Fluoride	mg/L	Monthly	24	0	0.4	0.8	0.65	0.01
		Nitrate	mg/L	Monthly	24	0	0.05	1.4	0.55	0.5
		Sulphate	mg/L	Monthly	24	0	7	19	12.6	0.1
		Iron	mg/l	Monthly	24	0	<0.01	<0.01	<0.01	0.01
		Manganese	mg/L	Monthly	24	0	<0.01	<0.01	<0.01	0.01
		Zinc	mg/L	Monthly	24	0	<0.01	0.02	0.01	0.01
		Aluminium	mg/L	Monthly	24	0	<0.05	<0.05	<0.05	0.05
Boron	mg/L	Monthly	24	0	0.06	0.09	0.07	0.01		
Copper	mg/L	Monthly	24	0	<0.03	0.08	0.03	0.03		

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Rolleston	Reticulation	Chlorine (Free)	mg/L	Weekly	12	0	0.22	1.35	0.79	0.01
		Coliforms	CFU/100mL	Weekly	12	0	0	0	0	0
		Ecoli	CFU/100mL	Weekly	12	0	0	0	0	0
		Trihalomethanes	µg/L	Seasonal/Event	10	0	78	240	178	1
		Conductivity	us/cm	Monthly	11	No value	291	1260	657	1
		pH	mg/L	Monthly	11	7	8.37	8.8	8.6	0.01
		Total Hardness	mg CaCO3/L	Monthly	11	0	17	88	64	1
		Alkalinity	mg CaCO3/L	Monthly	11	No value	122	294	190	1
		Silica	mg/L	Monthly	11	0	1	18	11	1
		Dissolved Solids	mg/L	Monthly	11	3	165	700	364	1
		True Colour	hazen	Monthly	11	0	<1	3	1.55	1
		Turbidity	NTU	Monthly	11	0	<1	1	1	1
		Sodium	mg/L	Monthly	11	3	26	270	118	1
		Potassium	mg/L	Monthly	11	No value	1.2	7.5	5.22	0.1
		Calcium	mg/L	Monthly	11	No value	5.3	17	12.86	0.1
		Magnesium	mg/L	Monthly	11	No value	1	12	7.63	0.1
		Chloride	mg/L	Monthly	11	0	20	210	90	1
		Fluoride	mg/L	Monthly	11	0	0.2	0.3	0.24	0.01
		Nitrate	mg/L	Monthly	11	0	0.05	1	0.51	0.5
		Sulphate	mg/L	Monthly	11	0	1	22	5.64	0.1
		Iron	mg/l	Monthly	11	0	<0.01	0.04	0.01	0.01
		Manganese	mg/L	Monthly	11	0	<0.01	<0.01	<0.01	0.01
	Zinc	mg/L	Monthly	11	0	<0.01	<0.01	<0.01	0.01	
	Aluminium	mg/L	Monthly	11	0	<0.05	0.07	0.05	0.05	
	Boron	mg/L	Monthly	11	0	<0.05	0.08	0.06	0.01	
	Copper	mg/L	Monthly	11	0	<0.03	0.04	0.03	0.03	
	Algae (pot. toxic)	Cells/mL	Seasonally	4	No value	ND	ND	ND	1	
	Toxin (cylindro)	µg/L	Seasonally	4	No value	<0.2	<0.2	<0.2	0.2	
	Raw Water	Atrazine	µg/L	Seasonally	1	NA	0.14	0.14	0.14	0.01
		Desethyl Atrazine	µg/L	Seasonally	1	NA	0.05	0.05	0.05	0.01
		Simazine	µg/L	Seasonally	1	NA	0.12	0.12	0.12	0.01
		Tebuthiuron	µg/L	Seasonally	1	NA	0.58	0.58	0.58	0.01
Metolachlor		µg/L	Seasonally	1	NA	0.02	0.02	0.02	0.01	
Algae (pot. toxic)		Cells/mL	Seasonally	7	No value	45	139,000	24,454	1	
Toxin (cylindro)		µg/L	Seasonally	6	No value	0.5	1.3	0.82	0.2	

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Rubyvale	Reticulation	Chlorine (Free)	mg/L	Weekly	50	0	0.2	1.03	0.73	0.01
		Coliforms	CFU/100mL	Weekly	50	0	0	0	0	0
		Ecoli	CFU/100mL	Weekly	50	0	0	0	0	0
		Conductivity	us/cm	Monthly	13	No value	614	689	656	1
		pH	mg/L	Monthly	13	0	7.15	7.87	7.52	0.01
		Total Hardness	mg CaCO3/L	Monthly	13	10	191	216	206	1
		Alkalinity	mg CaCO3/L	Monthly	13	No value	166	183	174	1
		Silica	mg/L	Monthly	13	0	32	35	33	1
		Dissolved Solids	mg/L	Monthly	13	0	359	395	380	1
		True Colour	hazen	Monthly	13	0	<1	7	1.46	1
		Turbidity	NTU	Monthly	13	0	<1	1	1	1
		Sodium	mg/L	Monthly	13	0	50	57	54	1
		Potassium	mg/L	Monthly	13	No value	1.4	1.6	1.6	0.1
		Calcium	mg/L	Monthly	13	No value	48	54	51	0.1
		Magnesium	mg/L	Monthly	13	No value	18	48	21	0.1
		Chloride	mg/L	Monthly	13	0	69	85	79	1
		Fluoride	mg/L	Monthly	13	0	0.34	0.85	0.62	0.01
		Nitrate	mg/L	Monthly	13	0	1.4	2.1	1.8	0.5
		Sulphate	mg/L	Monthly	13	0	33	36	35	0.1
		Iron	mg/l	Monthly	13	0	<0.01	<0.01	<0.01	0.01
		Manganese	mg/L	Monthly	13	0	<0.01	<0.01	<0.01	0.01
		Zinc	mg/L	Monthly	13	0	<0.01	0.02	0.01	0.01
		Aluminium	mg/L	Monthly	13	0	<0.05	<0.05	<0.05	0.05
Boron	mg/L	Monthly	13	0	<0.03	<0.03	<0.03	0.01		
Copper	mg/L	Monthly	13	0	0.07	0.25	0.14	0.03		

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Sapphire	Reticulation	Chlorine (Free)	mg/L	Weekly	50	0	0.5	2.04	0.88	0.01
		Coliforms	CFU/100mL	Weekly	50	2	0	2	0.06	0
		Ecoli	CFU/100mL	Weekly	50	0	0	0	0	0
		Conductivity	us/cm	Monthly	12	No value	618	686	655	1
		pH	mg/L	Monthly	12	0	7.52	7.95	7.73	0.01
		Total Hardness	mg CaCO3/L	Monthly	12	8	191	215	205	1
		Alkalinity	mg CaCO3/L	Monthly	12	No value	162	182	174.5	1
		Silica	mg/L	Monthly	12	0	31	35	33.25	1
		Dissolved Solids	mg/L	Monthly	12	0	360	393	379	1
		True Colour	hazen	Monthly	12	0	<1	8	1.58	1
		Turbidity	NTU	Monthly	12	0	1	1	1	1
		Sodium	mg/L	Monthly	12	0	51	58	54.25	1
		Potassium	mg/L	Monthly	12	No value	1.4	1.8	1.59	0.1
		Calcium	mg/L	Monthly	12	No value	48	54	51	0.1
		Magnesium	mg/L	Monthly	12	No value	18	20	19	0.1
		Chloride	mg/L	Monthly	12	0	70	85	78	1
		Fluoride	mg/L	Monthly	12	0	0.31	0.83	0.66	0.01
		Nitrate	mg/L	Monthly	12	0	1.5	2.6	1.9	0.5
		Sulphate	mg/L	Monthly	12	0	32	36	34.67	0.1
		Iron	mg/l	Monthly	12	0	<0.01	<0.01	<0.01	0.01
Manganese	mg/L	Monthly	12	0	<0.01	<0.01	<0.01	0.01		
Zinc	mg/L	Monthly	12	0	<0.01	0.05	0.02	0.01		
Aluminium	mg/L	Monthly	12	0	<0.05	<0.05	<0.05	0.05		
Boron	mg/L	Monthly	12	0	<0.03	<0.03	<0.03	0.01		
Copper	mg/L	Monthly	12	0	0.04	0.13	0.07	0.03		

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Tier 1	Reticulation	Chlorine (Free)	mg/L	Weekly	51	0	0.07	1.61	0.84	0.01
		Coliforms	CFU/100mL	Weekly	51	2	0	4	0.12	0
		Ecoli	CFU/100mL	Weekly	51	0	0	0	0	0
		Trihalomethanes	µg/L	Seasonally/ Event	19	3	120	290	215	1
		Conductivity	us/cm	Monthly	13	No value	451	836	654	1
		pH	mg/L	Monthly	13	1	7.7	8.9	8.05	0.01
		Total Hardness	mg CaCO3/L	Monthly	13	0	72	162	124	1
		Alkalinity	mg CaCO3/L	Monthly	13	No value	116	192	154	1
		Silica	mg/L	Monthly	13	0	4	12	9	1
		Dissolved Solids	mg/L	Monthly	13	0	270	458	365	1
		True Colour	hazen	Monthly	13	0	<1	2	1.08	1
		Turbidity	NTU	Monthly	13	0	<1	1	1	1
		Sodium	mg/L	Monthly	13	0	62	110	87	1
		Potassium	mg/L	Monthly	13	No value	4.6	7	6.25	0.1
		Calcium	mg/L	Monthly	13	No value	18	35	27	0.1
		Magnesium	mg/L	Monthly	13	No value	1	19	13	0.1
		Chloride	mg/L	Monthly	13	0	27	120	79	1
		Fluoride	mg/L	Monthly	13	0	0.1	0.48	0.23	0.01
		Nitrate	mg/L	Monthly	13	0	0.5	0.6	0.51	0.5
		Sulphate	mg/L	Monthly	13	0	26	67	50	0.1
		Iron	mg/l	Monthly	13	0	<0.01	<0.01	<0.01	0.01
		Manganese	mg/L	Monthly	13	0	<0.01	<0.01	<0.01	0.01
		Zinc	mg/L	Monthly	13	0	<0.01	0.02	0.01	0.01
Aluminium	mg/L	Monthly	13	3	<0.05	0.46	0.14	0.05		
Boron	mg/L	Monthly	13	0	0.04	0.06	0.05	0.01		
Copper	mg/L	Monthly	13	0	<0.03	<0.03	<0.03	0.03		

Scheme name	Scheme component	Parameter	Units	Minimum frequency of sampling	Total No. samples collected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	LOR
Springsure	Upper Reticulation Zone	Chlorine (Free)	mg/L	Monthly	13	0	0.7	2.2	1.35	0.01
		Coliforms	CFU/100mL	Monthly	13	0	0	0	0	0
		Ecoli	CFU/100mL	Monthly	13	0	0	0	0	0
		Conductivity	us/cm	Monthly	11	No value	945	986	965	1
		pH	mg/L	Monthly	11	2	8.32	8.6	8.45	0.01
		Total Hardness	mg CaCO3/L	Monthly	11	0	14	36	17	1
		Alkalinity	mg CaCO3/L	Monthly	11	No value	468	505	485	1
		Silica	mg/L	Monthly	11	0	20	24	21	1
		Dissolved Solids	mg/L	Monthly	11	1	570	604	587	1
		True Colour	hazen	Monthly	11	0	<1	3	1.45	1
		Turbidity	NTU	Monthly	11	0	<1	1	1	1
		Sodium	mg/L	Monthly	11	11	220	240	232	1
		Potassium	mg/L	Monthly	11	No value	2.8	4.5	3.86	0.1
		Calcium	mg/L	Monthly	11	No value	3.5	7.4	4.12	0.1
		Magnesium	mg/L	Monthly	11	No value	1.1	4.3	1.55	0.1
		Chloride	mg/L	Monthly	11	0	31	36	32	1
		Fluoride	mg/L	Monthly	11	0	0.4	0.49	0.46	0.01
		Nitrate	mg/L	Monthly	11	0	0.5	0.6	0.52	0.5
		Sulphate	mg/L	Monthly	11	0	1	1	1	0.1
	Iron	mg/l	Monthly	11	0	<0.01	0.08	0.05	0.01	
	Manganese	mg/L	Monthly	11	0	<0.01	<0.01	<0.01	0.01	
	Zinc	mg/L	Monthly	11	0	<0.01	<0.01	<0.01	0.01	
	Aluminium	mg/L	Monthly	11	0	<0.05	<0.05	<0.05	0.05	
	Boron	mg/L	Monthly	11	0	0.15	0.17	0.16	0.01	
	Copper	mg/L	Monthly	11	0	<0.03	<0.03	<0.03	0.03	
	Lower Reticulation Zone	Chlorine (Free)	mg/L	Monthly	13	0	0.84	2.11	1.43	0.01
		Coliforms	CFU/100mL	Monthly	13	1	0	1	0.08	0
		Ecoli	CFU/100mL	Monthly	13	0	0	0	0	0
		Conductivity	us/cm	Monthly	11	No value	1120	1160	1149	1
		pH	mg/L	Monthly	11	9	8.34	8.7	8.57	0.01
		Total Hardness	mg CaCO3/L	Monthly	11	0	14	131	55.91	1
		Alkalinity	mg CaCO3/L	Monthly	11	No value	543	600	553	1
		Silica	mg/L	Monthly	11	0	18	37	24	1
		Dissolved Solids	mg/L	Monthly	11	11	687	727	696	1
		True Colour	hazen	Monthly	11	0	<1	2	1.18	1
		Turbidity	NTU	Monthly	11	0	<1	1	1	1
Sodium		mg/L	Monthly	11	11	220	290	261	1	
Potassium		mg/L	Monthly	11	No value	3.5	6.3	4.4	0.1	
Calcium		mg/L	Monthly	11	No value	3.5	22	10.38	0.1	
Magnesium		mg/L	Monthly	11	No value	1.3	18	7.22	0.1	
Chloride		mg/L	Monthly	11	0	48	60	54.36	1	
Fluoride		mg/L	Monthly	11	0	0.32	0.41	0.38	0.01	
Nitrate	mg/L	Monthly	11	0	0.5	0.5	0.5	0.5		
Sulphate	mg/L	Monthly	11	0	1	5	3	0.1		
Iron	mg/l	Monthly	11	0	<0.01	0.03	0.02	0.01		
Manganese	mg/L	Monthly	11	0	<0.01	<0.01	<0.01	0.01		
Zinc	mg/L	Monthly	11	0	<0.01	<0.01	<0.01	0.01		
Aluminium	mg/L	Monthly	11	0	<0.05	<0.05	<0.05	0.05		
Boron	mg/L	Monthly	11	0	0.19	0.3	0.27	0.01		
Copper	mg/L	Monthly	11	0	<0.03	<0.03	<0.03	0.03		

Appendix B – Reticulation *E. coli* verification monitoring

All samples taken tested negative for *E. coli* and below are summaries of the results of the reticulation *E. coli* verification monitoring program for all council water supply schemes.

Table 6.1 to 6.12 – Reticulation *E. coli* verification monitoring

Drinking water scheme: Anakie scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	1	1	1	1	1	1	1	1	1	1	1	1
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	12	12	12	12	12	12	12	12	12	12	12	12
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*.

This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Bauhinia Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	1	1	1	1	1	1	1	1	1	1	1	1
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	12	12	12	12	12	12	12	12	12	12	12	12
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*.

This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Blackwater & Bluff Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	6	5	5	6	5	4	6	4	5	5	5	5
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	64	63	63	63	63	63	63	62	62	62	61	61
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*.

This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Capella Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	1	1	1	1	4	3	5	4	4	5	4	4
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	12	12	12	12	15	17	21	24	27	31	34	37
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Comet Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	1	1	1	1	1	1	1	1	1	1	1	1
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	12	12	12	12	12	12	12	12	12	12	12	12
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*.

This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Dingo Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	1	1	1	1	1	1	1	1	1	1	1	1
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	12	12	12	12	12	12	12	12	12	12	12	12
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*.

This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Duaringa Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	1	1	1	1	1	1	1	1	1	1	1	1
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	12	12	12	12	12	12	12	12	12	12	12	12
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Emerald Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	10	8	8	10	8	6	10	8	8	8	8	8
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	102	102	102	102	102	102	102	102	102	100	100	100
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Rolleston Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	1	1	1	1	1	1	1	1	1	1	1	1
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	12	12	12	12	12	12	12	12	12	12	12	12
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Sapphire and Rubyvale Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	10	8	8	10	8	6	10	8	8	8	8	8
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	102	102	102	102	102	102	102	102	102	100	100	100
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*.

This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Springsure Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	2	2	2	2	4	2	2	2	2	2	2	2
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	24	24	24	24	26	26	26	26	26	26	26	26
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Tieri Scheme

Year	2018 to 2019											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	5	4	4	5	4	3	5	4	4	5	4	4
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period	51	51	51	52	51	51	51	51	51	51	51	51
No. of failures for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2018* (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no *E. Coli*.

This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Appendix C – Implementation of the DWQMP Risk Management Improvement Program

Table 7.1 to 7.14 – Progress against the RMIP program in the approved DWQMP

Legend: Complete Changes

RMIP Reference	Process Step	Risk Management Improvements			Status as at 30/06/2019	Responsible Position
		Short term	Medium term	Long term		
CHRC WIDE						
CHR 3	Procedures		Procedures required for bore inspection, reservoir inspection, disinfection, coagulation, PAC, filtration, mains breaks, pH correction, transfer procedure.		Disinfection, Filtration & Coagulation procedures drafted and under review. Aiming to introduce early 2020. (Issue now, then reissue version 2 etc).	Treatment Engineer
CHR 4	SCADA Lockout	Investigate alarm level and lockout to operators			Reviewed in greatest order of risk. Ongoing monitoring required.	Treatment Engineer
CHR 5	Treated water storage / Reservoirs		Formalise inspection checklist	Investigate how to vermin proof, frog proof storage.	Inspections completed 2019. Awaiting prioritisation in CAPEX budget to undertake recommendations / repairs - vermin proof reservoirs.	Manager WU
CHR 6	Recruitment	Fill vacancies	Plan for up skilling		Recruitment is ongoing due to continual staff turnover. Operator rotations to continue. More Emerald based operators to know other plants i.e. Anakie, Sapphire, Springsure, Rolleston, Comet. Blackwater based operators to know Bluff, Dingo, Daringa, Bauhinia.	Treatment Supervisor
CHR 7	Training	Implement training plans	More operators to have a minimum Cert III in Water Operations or equivalent.		Continual training required due to ongoing staff turnover.	Treatment Supervisor
CHR 8	Preventative Maintenance		develop internal skills to reduce reliance on external support, critical spares to be identified	Preventive maintenance of blowers, air compressors, centrifuges, spare retic pumps fixed, dam switchboards, fluoride plant maintenance, chlorine replacement work, generator plugs.	Consultant engaged to prepare mechanical maintenance contract for all schemes.	Treatment Supervisor
CHR 9	Network Management	Assess water cooling options with respect to this risk i.e. Keep current cooling systems offline. See bacteria RMIP's.		Pipe cleaning program (pigging).	Cooling options currently under investigation. Blackwater, Tieri and Rolleston are priority locations due to high manganese in Raw Water.	Treatment Engineer
		See bacteria RMIP items.	Consider Raw Water awareness alert on CHRC website			Planning Engineer
CHR 10	Catchment Management	Add to verification monitoring (5 years)			Initial PFAS testing on all surface drinking water schemes has commenced.	Treatment Supervisor
		Ensure mains replacement/repair procedure adequately addresses risk of microplastics.	Investigate testing options.		Mains replacement/repair procedure under development.	Network Engineer
CHR 11	Cyber Security	Investigate governance structure. See site security RMIP items.	Investigate cyber security detection process. Investigate current response and recovery plans, add cyber security focused section if necessary.		Liaise with CHRC governance and emergency response teams to understand current plans and identify gaps specific to water utilities.	Manager WU
CHR 12	Site Security	Implement non- capital Audit recommendations. Investigate reducing temptation of site access for robbery.	Conduct Site Security Assessment	Implement capital Audit and Assessment recommendations.	Implementation of Audit recommendations has commenced i.e. gates, locks, perimeter security.	Manager WU
CHR 13	Standpipe & Hydrant access	Notify standby and hydrant users of risks and the use of an air gap	Install RPZ (PM and HF)		Review Metered Standpipe (Mobile and Fixed) & Hydrant Usage Policy and publish on CHRC website.	Manager WU
ANAKIE						
ANA 2	Raw water storage	Inspect			Raw Water tank inspected by contractor during vermin inspections early 2019. As a result of the inspection the raw tank was taken offline and bypassed approx. June 2019. Capex budget of \$10k FY 19/20 to commence design/installation of a new tank.	Manager WU

RMIP Reference	Process Step	Risk Management Improvements			Status as at 30/06/2019	Responsible Position
		Short term	Medium term	Long term		
BAUHINIA						
BAU 4	Treated water storage / Reservoirs		Investigate extra capacity online permanently		Permanent set up - only 1 reservoir online	Operator
BLACKWATER						
BLK 5	Raw Water Abstraction		Investigate new raw water pumps		Project currently in 2019/20 Capex budget. An options study looking at different pump options was undertaken and being reviewed Nov 2019.	Manager WU
BLK 1, BLK 2			ripen to waste		Preliminary design completed early 2019. Tender docs currently being prepared for installation of filter to waste bypass on filters 5 & 6.	Project Team
BLK 9, BLK 10			data collection for options analysis	Investigate options / Chlorine gas	Awaiting prioritisation in CAPEX budget.	Manager WU
BLK 12	Reticulation		Investigate standby generator (reservoirs)		WTP generator installation tender closed. Due to tenders being significantly higher than budget the project has been deferred to next FY 20/21. Reservoir generator installation awaiting prioritisation in CAPEX budget.	Manager WU
BLK 13			need to develop routine flushing program		Once staff recruitment is completed, plan is to have designated crew undertaking routine flushing by early 2020.	Network Supervisor
BLK 14	Redosing (Bluff Reservoir)			replace generator on site	Awaiting prioritisation in CAPEX budget	Manager WU
CAPELLA						
CAP 1, CAP 3, CAP 4	Catchment	chlorination procedure being documented at present	online monitoring	Media Replacement	Not online (SCADA) chlorine and turbidity on final water (DONE) - media replacement tender completed and due to commence late 2019.	Project Team
CAP 1, CAP 2, CAP 5	Coagulation	data collection for procedure target ranges	coagulation procedure to be documented / investigate online monitoring	clarifier Turbidity monitoring	Turbidity meter in stock, awaiting installation.	Treatment Engineer
CAP 1, CAP 6, CAP 7, CAP 4	Filtration	Investigate alarm level and lockout to operators	auto backwash, shutdowns, to be investigated. procedure to be documented	Investigate replace filter media	Auto backwash - awaiting CAPEX prioritisation. Shutdowns completed.	Manager WU
CAP 8, CAP 9		Data collection on turbidity spikes	Investigate ripening to waste		Awaiting prioritisation within CAPEX budget.	Manager WU
CAP 10, CAP 11	Disinfection	Investigate ACH option and collect data	Investigate pH correction options		ACH system installation to be undertaken 19/20.	Project Team
CAP 14, CAP 15	Reticulation	Investigate bypass and backup power options	Implement option		Have tested system and confirm high zone will be gravity fed in the event of power failure.	Manager WU
COMET						
COM 3	Raw Water Abstraction		Reinstate duty standby pumps		Concept design complete, detailed design 19/20.	Manager WU
COM 1, COM 2, COM 4	Coagulation	data collection for procedure target ranges	coagulation procedure to be documented / online monitoring	clarifier Turbidity monitoring	Awaiting prioritisation within CAPEX budget.	Manager WU
COM 2, COM 7		Data collection on turbidity spikes	Investigate ripening to waste		Valves have been installed and commissioned. Have currently been configured into the backwash sequence to lower filter level prior to backwash. Outstanding action to add filter to waste at end of backwash sequence and at plant start up.	Treatment Engineer
COM 2, COM 8	Disinfection		data collection for options analysis	Investigate options / dual storage	Awaiting prioritisation within CAPEX budget	Manager WU
COM 11, COM 12	Reticulation		Investigate UPS and generator for transfer pumps	Implement appropriate action	Plug installed for mobile generator - permanent generator awaiting prioritisation within CAPEX budget and Tower UPS to be included.	Manager WU

RMIP Reference	Process Step	Risk Management Improvements			Status as at 30/06/2019	Responsible Position
		Short term	Medium term	Long term		
DINGO						
DIN 1, DIN 3, DIN 4	Catchment	chlorination procedure being documented at present	online monitoring	Media Replacement	Project design to be complete late 2019, construction to commence 20/21 FY.	Project Team
DIN 1, DIN 22		procedure being documented at present	Investigate need and use of PAC		Awaiting prioritisation within CAPEX budget.	Manager WU
DIN 6				Relocated pumps	Awaiting prioritisation within CAPEX budget.	Manager WU
DIN 1, DIN 2, DIN 8, DIN 9	Coagulation	PLC replacement / data collection for procedure target ranges	Develop Clarification / Coagulation procedure / Turbidity meter online monitoring	clarifier Turbidity monitoring	Project design to be complete late 2019, construction to commence 20/21 FY.	Project Team
DIN 8, DIN 10	Filtration		Turbidity meter online monitoring, develop procedure	Filtered Turbidity monitoring	Project design to be complete late 2019, construction to commence 20/21 FY.	Project Team
DIN 2, DIN 11		Collect data	Investigate ripen to waste option		Project design to be complete late 2019, construction to commence 20/21 FY.	Project Team
DIN 1, DIN 12	Disinfection	chlorination procedure being documented at present	online monitoring and alarms		Project design to be complete late 2019, construction to commence 20/21 FY.	Project Team
DIN 13, DIN 14			data collection for options analysis	Investigate options / dual storage	Awaiting prioritisation within CAPEX budget.	Manager WU
DIN 16	Reticulation		need to develop routine flushing program		Once staff recruitment is completed, plan is to have designated crew undertaking routine flushing by early 2020.	Network Supervisor
DINGO						
DUARINGA						
DUA 1, DUA 3, DUA 4	Catchment	chlorination procedure being documented at present	online monitoring	Media Replacement	Project design to be complete late 19, construction to commence 20/21.	Project Team
DUA 1, DUA 2, DUA 6	Coagulation	data collection for procedure target ranges	coagulation procedure to be documented	flow switch	Project design to be complete late 19, construction to commence 20/21.	Manager WU
DUA 1, DUA 2, DUA 7		data collection for procedure target ranges	coagulation procedure to be documented / online monitoring	clarifier Turbidity monitoring	Project design to be complete late 19, construction to commence 20/21.	Project Team
DUA 1, DUA 2, DUA 8,	Filtration	data collection for procedure target ranges	filtration procedures to be documented	Filtered Turbidity monitoring	Project design to be complete late 19, construction to commence 20/21.	Project Team
DUA 10, DUA 11		Operator checks	Investigate to Seal the well		Safety cover installed on backwash well to seal it.	Manager WU
DUA 12, DUA 13		Investigate lockout		Investigate blanking off	Completed - clarifier & filter bypass removed.	Treatment Supervisor
DUA 14, DUA 15	Disinfection		data collection for options analysis	Investigate options / dual storage	Awaiting prioritisation within CAPEX budget.	Manager WU
DUARINGA						
EMERALD EAST NOGOA						
EMEN 1, EMEN 3	Coagulation	develop operational rules and document procedure	investigate control of supernatant return		Investigating capital work upgrades required for the installation of new tanks.	Treatment Engineer
EMEN 1, EMEN 2, EMEN 4		data collection for procedure target ranges	procedure to be documented. Investigate lowering target and critical limits over time.		Clarifier limit reviewed and confirmed existing 5 NTU is required for current operation.	Treatment Engineer
EMEN 9	Reticulation		need to develop routine flushing program		Once staff recruitment is completed, plan is to have designated crew undertaking routine flushing by early 2020.	Network Supervisor

RMIP Reference	Process Step	Risk Management Improvements			Status as at 30/06/2019	Responsible Position
		Short term	Medium term	Long term		
EMERALD OPAL ST						
EMOS 4		investigate alarm at 2.5			Reviewed and set at 4 NTU.	Treatment Engineer
EMOS 5, EMOS 6	Filtration		auto backwash, shutdowns, to be investigated.	Investigate need to replace filter media	Media replace design undertaken awaiting prioritisation in CAPEX budget. Auto backwash not possible with current pump arrangement but backwashed on time as a work around. Auto backwash at peak time is a risk and we should investigate new backwash pumps. Auto shutdowns complete.	Manager WU
EMOS 8			need to install a valve to prevent backflow.		Awaiting prioritisation within CAPEX budget - we should investigate new backwash pumps instead of valve installation.	Manager WU
EMOS 9			investigate blanking off valve		Awaiting prioritisation within CAPEX budget.	Manager WU
EMOS 13, EMOS 14, EMOS 15	Reticulation	talk to hospital about water issues	Investigate UPS and water tower options	Implement appropriate action	Use of water tower is not feasible. UPS at Opal St to be added to CAPEX budget.	Manager WU
EMOS 16			need to develop routine flushing program		Once staff recruitment is completed, plan is to have designated crew undertaking routine flushing by early 2020.	Network Supervisor
ROLLESTON						
ROL 1, ROL 4, ROL 5, ROL 6	Coagulation	manual turbidity testing at clarifier (ROL 4)	turbidity meters, jar testing, take spare pump (same pump for coagulant and disinfection) (ROL 5) / coagulation procedure to be documented	SCADA (ROL 6)	Switchboard and control system project is currently in design stage.	Project Team
ROL 1, ROL 6, ROL 7,	Filtration	manual turbidity testing of filtrate	filtration procedure to be documented / turbidity meter	SCADA	Filtered water turbidity meter installed.	Manager WU
ROL 8, ROL 9	Disinfection		calculation of CT, probably OK, but need to check.	pH adjustment to be considered.	Concept design for pH undertaken and waiting for CAPEX prioritisation.	Manager WU
ROL 10			Check chlorate levels		Test methodology to be developed.	Planning Engineer
SAPPHIRE						
SPRINGSURE						
SPR 2	Disinfection		Need to upgrade to auto dosing		Awaiting prioritisation within CAPEX budget.	Manager WU
SPR 3, SPR 4	Cooling systems	Check integrity and sealing	Seal if this is an issue		As a result of consultant review, taken offline. Awaiting CAPEX prioritisation.	Manager WU

RMIP Reference	Process Step	Risk Management Improvements			Status as at 30/06/2019	Responsible Position
		Short term	Medium term	Long term		
TIER I						
TIE 1, TIE 2, TIE 3	Catchment	chlorination procedure being documented at present	online monitoring	Media Replacement	Media replacement budgeted for 19/20.	Project Team
TIE 1, TIE 3, TIE 4		data collection for procedure target ranges (TIE 4)	Backwash, Coagulation and filtration procedures to be documented / online monitoring	Media Replacement	Media replacement budgeted for 19/20.	Project Team
TIE 1, TIE 5	Raw Water Abstraction	develop operational rules and document procedure	investigate turbidity meter as control of supernatant return		Awaiting prioritisation within CAPEX budget.	Manager WU
TIE 1, TIE 4, TIE 6	Coagulation	data collection for procedure target ranges	coagulation procedure to be documented / online monitoring	clarifier Turbidity monitoring	Turbidity meter in stock, awaiting installation.	Treatment Engineer
TIE 1, TIE 7		document recycle procedure	Investigate recycle control. Requires flow meter/pump upgrade.		Awaiting prioritisation within CAPEX budget.	Manager WU
TIE 1, TIE 3, TIE 4, TIE 8, TIE 9	Filtration	Investigate alarm level and lockout to operators, data collection for procedure target ranges	auto backwash, shutdowns, to be investigated, procedure to be documented		Implemented high filter turbidity shutdown.	Manager WU
TIE 4, TIE 10		Data collection on turbidity spikes	Investigate ripening to waste		Awaiting prioritisation within CAPEX budget with recommendations in filter media replacement report	Manager WU
TIE 11, TIE 12		Investigate lockout		Investigate blanking off	Have quotes for materials, order and install 19/20 FY.	Treatment Supervisor
TIE 13, TIE 14	Disinfection	Investigate ACH option and collect data	Investigate pH correction options		Planned to follow Capella ACH dosing changes.	Manager WU