



DRINKING WATER QUALITY MANAGEMENT PLAN

ANNUAL REPORT

FINANCIAL YEAR **2017-2018**

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Appendix 1 – DWQMP Risk Management Improvement Plan

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1. INTRODUCTION

This is the Drinking Water Quality Management Plan (DWQMP) report for Mackay Regional Council (MRC) for the financial year (FY) 2017 – 2018.

MRC is a registered service provider with identification (SPID) number 489. MRC is operating under an approved DWQMP to ensure consistent supply of safe quality drinking water in order to protect public health. This is done through proactive identification and minimisation of public health related risks associated with drinking water.

This DWQMP report includes:

- the activities undertaken over the financial year in operating MRC's drinking water service;
- drinking water quality summary; and
- summary of MRC's performance in implementing the approved DWQMP.

This report is submitted to the Regulator to fulfil MRC's regulatory requirement, and is also made available to MRC's customers through council's website or for inspection upon request at council office.

2. DRINKING WATER SUPPLY SYSTEM OVERVIEW

MRC's DWQMP applies to the operation and maintenance of the schemes tabulated in Table 2 - 1. The location of the water sources and water treatment facilities is shown in Figure 2 - 1 and Figure 2 - 2.

Table 2 - 1 MRC schemes

SCHEME	WATER SOURCE	TREATMENT FACILITY	TOWNS SUPPLIED
Bloomsbury	Bloomsbury Bore	Bloomsbury Water Treatment Plant	Bloomsbury
Calen	Calen Bores	Calen Treatment Facility	Calen Kolijo
Eton	Eton Bores	Eton Treatment Facility	Eton
Finch Hatton	Finch Hatton Bore	Finch Hatton Treatment Facility	Finch Hatton
Gargett	Gargett Bores	Gargett Treatment Facility	Gargett Pinnacle
Koumala	Koumala Bores	Koumala Treatment Facility	Koumala
Mackay	Dumbleton Weir	Nebo Road Water Treatment Plant	Mackay Walkerston
	Mackay Bores		
Marian	Marian Weir	Marian Water Treatment Plant	Marian Mirani
	Marian Bores	Marian Bores Treatment Facility	
	Mirani Bore	Mirani Bore Treatment Facility	
Midge Point	Proserpine River (Crystal Brook Bores)	Midge Point Treatment Facility	Midge Point Laguna Quays
Sarina	Armstrong Beach Bore	Armstrong Beach Bore Treatment Facility	Sarina Alligator Creek Freshwater Point Sarina Beach Armstrong Beach Grasstree Beach Hay Point
	Bally Keel Bore	Bally Keel Bore Treatment Facility	
	Sarina Bores	Sarina Bores Treatment Facility	

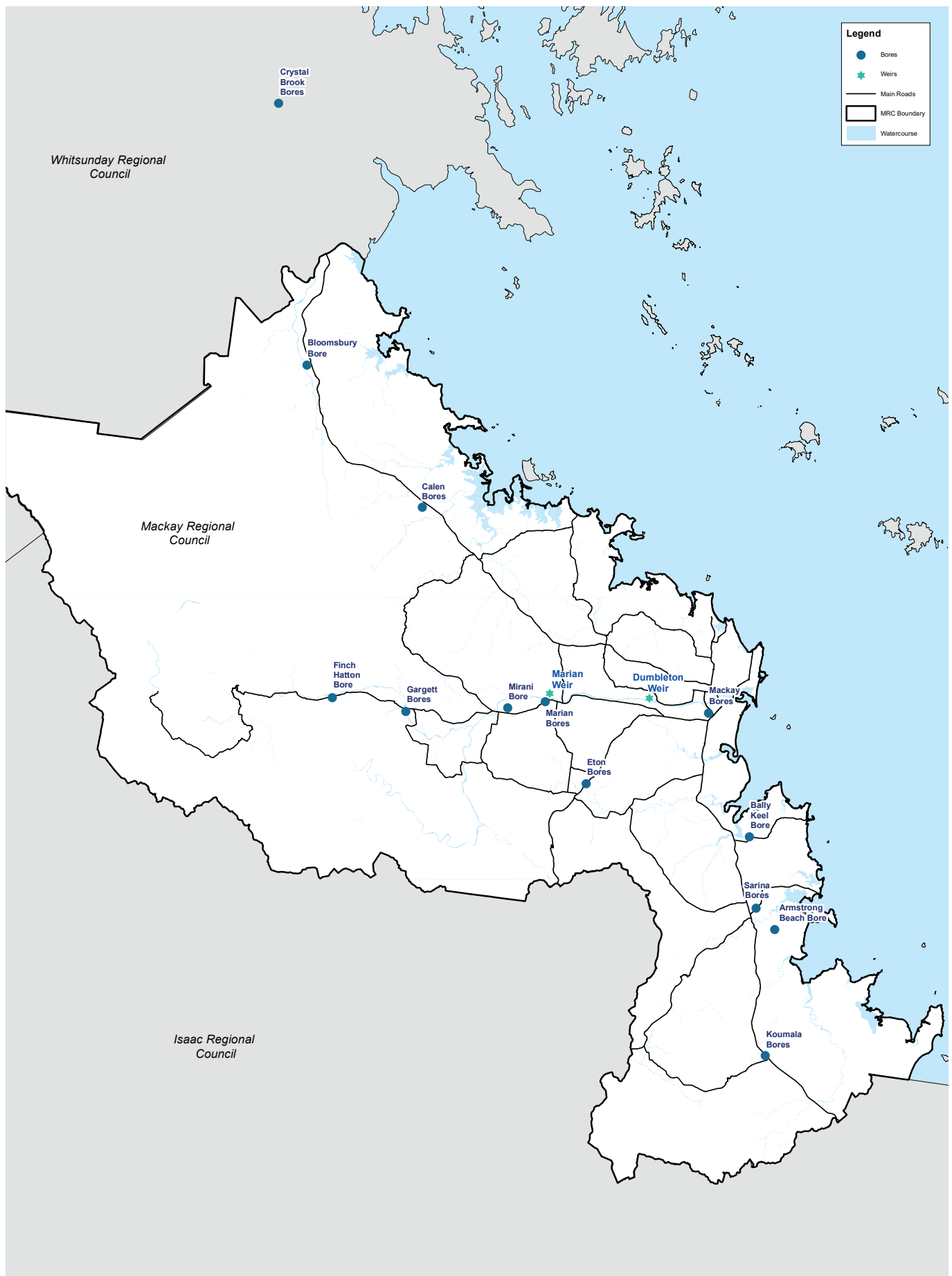


Figure 2 - 1 Water source locations

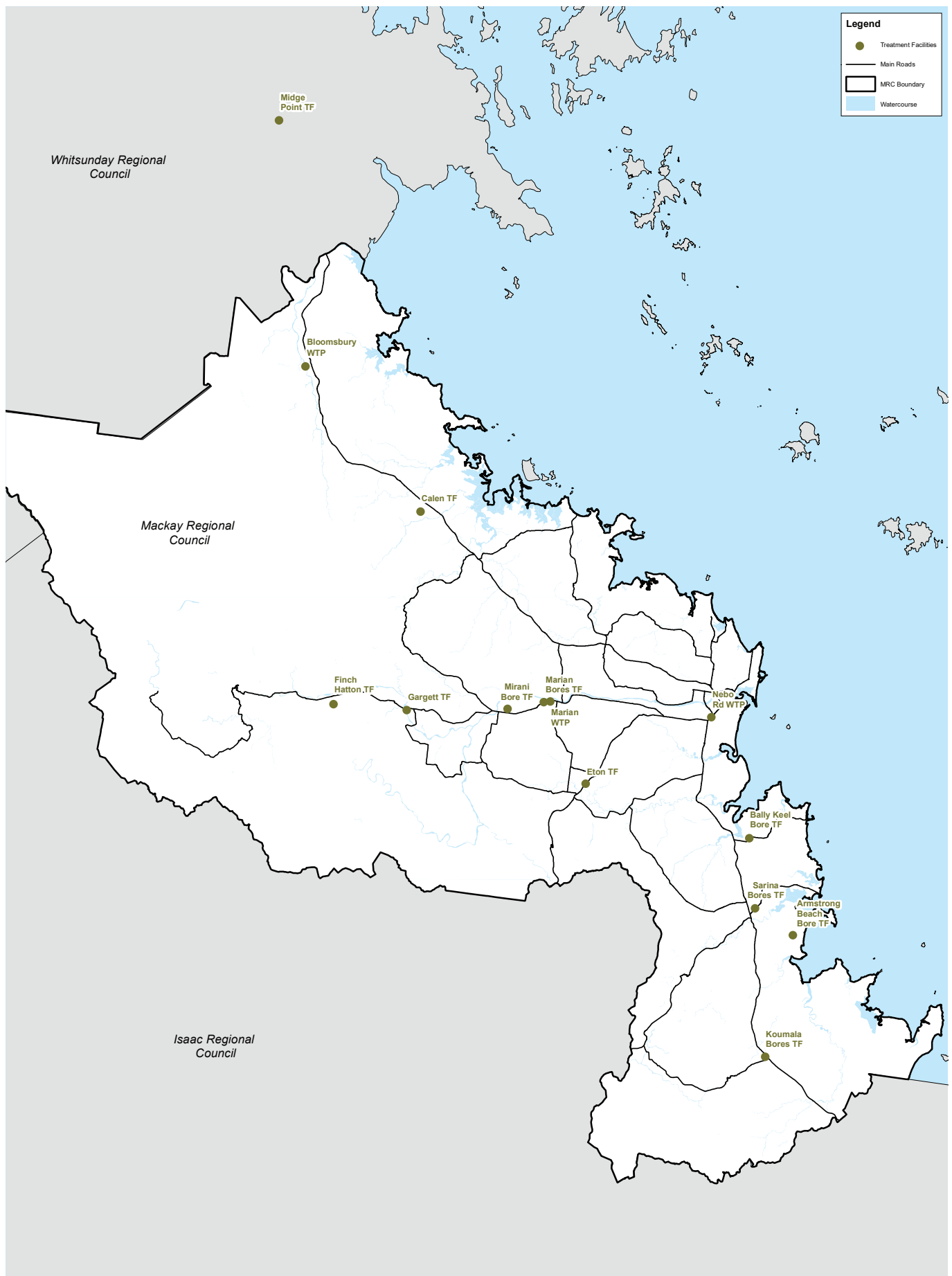


Figure 2 - 2 Water treatment facility locations



3. SOURCE WATER

3.1 SOURCE WATER USE

MRC's main sources of water are from Dumbleton Weir and Marian Weir. These weirs are located on the Pioneer River and are fed by water collected in the Pioneer River Basin. The basin, river and weirs are controlled by SunWater. Entitlements for the Dumbleton and Marian Weir are set by agreement with SunWater.

All other sources of water for MRC's drinking water schemes come from groundwater bores. The allocation of water for MRC's groundwater bores is generally set under licence with the Department of Natural Resources, Mines and Energy (DNRME) or by announced allocation as determined by DNRME. The allocation for Midge Point (Proserpine River) and Gargett bores are set under licence/contract with SunWater.

The consumption and allocation for MRC water sources for the FY 2017 – 2018 are shown in Figure 3 - 1.

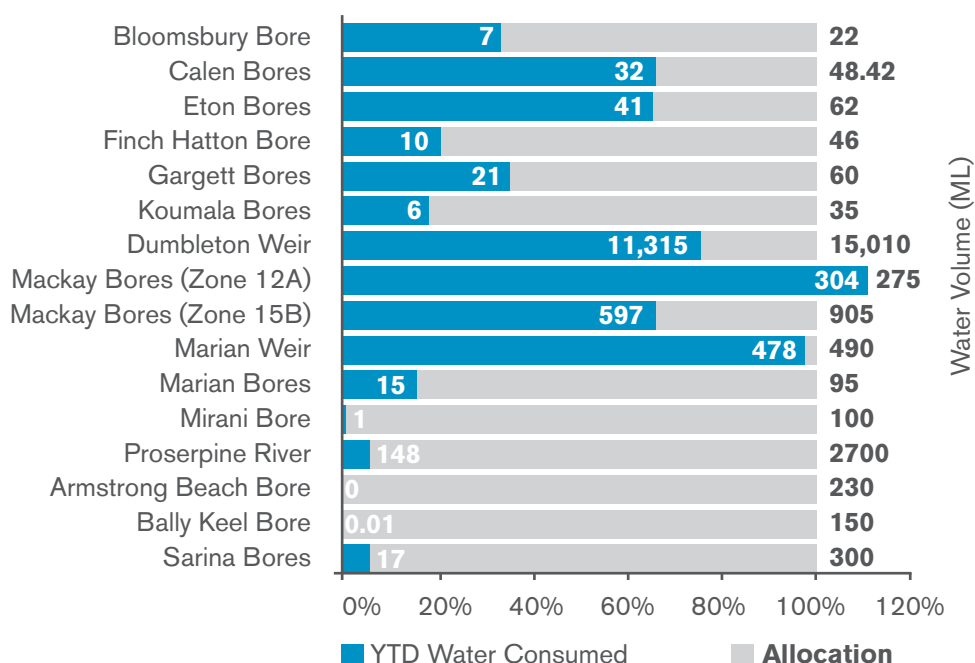


Figure 3 - 1 Water source consumption and allocation FY 2017 – 2018

3.2 SOURCE WATER QUALITY

MRC undertakes an extensive sampling and analysis program to monitor water quality for its raw water sources. The raw water monitoring requirements are captured in the operating monitoring component of the drinking water monitoring program. The program adequately assesses the quality of source waters and helps to identify any issues that could affect the drinking water supply. The parameters routinely monitored within the raw water sources are detailed in Table 3 - 1. Key water quality parameters are further discussed in the sections below.

Table 3 - 1 Parameters routinely monitored in raw water sources

MICROBIOLOGICAL	PHYSICAL	CHEMICAL
<i>E. coli</i>	Temperature	Alkalinity
Total Coliforms	pH	Chlorophyll-a*
Heterotrophic Plate Count	Conductivity	Anions and Cations
<i>Enterococci</i>	Turbidity	SVOCs
Algae (incl. cyanobacteria)*	Dissolved Oxygen	Dissolved Metals
	Colour - True	Total Organic Carbon
	UV Absorbing Organics	Nutrients (e.g. Ammonia, NOx, Ortho-Phosphate)

* for surface water sources only

3.2.1 Turbidity

Turbidity is a measure of the light-scattering property of water caused by the presence of fine suspended matter such as clay, silt, plankton and other microscopic organisms. The turbidity of surface waters increases during wet weather when particles from the soil surface are washed into waterways and waterway bed sediment is re-suspended.

An increase in turbidity for raw surface water sources for Nebo Road Water Treatment Plant (WTP) and Marian WTP (i.e. water taken from weirs along the Pioneer River) was noted in FY 2017 – 2018 during wet weather events. When the turbidity in the raw surface water source for Nebo Road WTP reaches a certain level, it is difficult to treat the water. In these instances, Nebo Road WTP switched to using the Mackay bores as the raw water source.

3.2.2 Cyanobacteria

Cyanobacteria (blue-green algae) occurs in all natural waters and becomes a problem only when present in excessive numbers (blooms). Blooms are likely to occur when temperatures are high, with long sunny days, high levels of plant nutrients in the water, low stream flows, and calm conditions that permit the cells to migrate to the surface. In addition, eutrophication (nutrient enrichment) associated with increased agriculture and urbanisation can increase the occurrence of cyanobacterial blooms.

Dumbleton and Marian Weir, located along the Pioneer River, occasionally experience blue-green algae blooms. MRC undertakes regular monitoring of blue-green algae in the raw water sources for Nebo Road WTP and Marian WTP which take water from these weirs.

Concentrations of blue-green algae (cyanobacteria total cells) for FY 2017 – 2018 are graphed in Figure 3 - 2. Cyanobacteria total cell results for FY 2017 – 2018 are similar to those for FY 2016 – 2017.

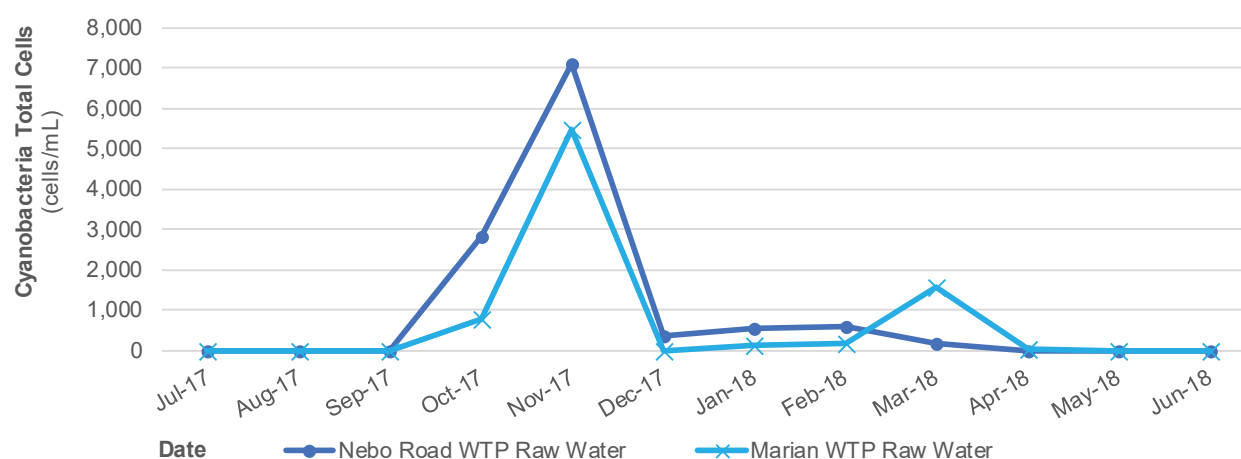


Figure 3 - 1 Raw water cyanobacteria results FY 2017 – 2018

3.2.3 Semi Volatile Organic Compounds

A large portion of the MRC area is utilised for sugarcane agriculture. The application of herbicides and pesticides as part of sugar cane cultivation is common practice. The potential for herbicides and pesticides to flow into waterways or leach into aquifers has been identified as a drinking water risk. MRC undertakes regular Semi Volatile Organic Compound (SVOC) monitoring in raw water sources. The parameters which form part of the SVOC analytical suite are detailed in Table 3 - 2. This analytical suite covers a range of herbicides and pesticides which are used in the Mackay region.

Table 3 - 2 Semi Volatile Organic Compounds (SVOCs)

2.3.4.6-tetrachlorophenol	Anthracene	Dinoseb	Naphthalene
2.4.5-Trichlorophenol	Atrazine	Diuron	Naphthalene, 1-methyl-
2.4.6-Trichlorophenol	Azinphos methyl	Endosulphan alpha	Naphthalene, 2-methyl-
2.4-Dichlorophenol	Benz(a)anthracene	Endosulphan beta	Omethoate
2.4-Dimethylphenol	Benzo(a)pyrene	Endosulphan Sulphate	Pentachlorophenol
2.4-Dinitrophenol	Benzo(b)fluoranthene	Endrin	Phenanthrene
2.6-Dichlorophenol	Benzo(g,h,i)perylene	Endrin aldehyde	Phenol
2-Chlorophenol	Benzo(k)fluoranthene	Endrin ketone	Pirimiphos methyl
2-Methylphenol	Beta-BHC	Ethion	Profenofos
2-Nitrophenol	Bromacil	Fluoranthene	Prometryn
3- & 4-Methylphenol	Caffeine	Fluorene	Propazine
4,4'-DDD	Chlordane cis	Heptachlor	Propyzamide
4,4'-DDE	Chlordane trans	Heptachlor Epoxide	Prothiofos
4,4'-DDT	Chlorpyrifos	Hexazinone	Pyrazophos
4.6-Dinitro-2-methylphenol	Chrysene	Indeno(1.2.3.cd)pyrene	Pyrene
4-Chloro-3-Methylphenol	delta-BHC	Lindane	Simazine
4-Nitrophenol	Demeton-S-methyl	Malathion	Tebuthiuron
Acenaphthene	Diazinon	Methamidophos	Terbutryn
Acenaphthylene	Dibenz(a,h)anthracene	Methidathion	Tolclofos-methyl
Aldrin	Dichlorvos	Methoxychlor	Trifluralin
Alpha-BHC	Dieldrin	Metolachlor	
Ametryn	Dimethoate	Metribuzin	

During FY 2017 – 2018 the only SVOCs detected were for Nebo Road WTP and Marian WTP raw water sources. The SVOCs detected were Atrazine, Dinoseb, Diuron, Hexazinone and Metolachlor. As shown in Table 3 - 3 the levels detected were all well below the Australian Drinking Water Guidelines (ADWG) health values.

Table 3 - 3 Nebo Road WTP and Marian WTP raw water routine SVOC results FY 2017 – 2018

	MONTH	ATRAZINE (µg/L)	DINOSEB (µg/L)	DIURON (µg/L)	HEXAZINONE (µg/L)	METOLACHLOR (µg/L)
SAMPLE POINT	ADWG Health Value	≤20	-	≤20	≤400	≤300
Marian WTP Raw Water	Jul-17	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Aug-17	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Sep-17	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Oct-17	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Nov-17	0.4488	<0.0001	0.5744	0.1073	0.1248
	Dec-17	0.8298	<0.0001	1.4509	<0.0001	<0.0001
	Jan-18	0.4404	<0.0001	0.3382	<0.0001	<0.0001
	Feb-18	1.0176	<0.0001	1.5455	0.4357	<0.0001
	Mar-18	0.1891	<0.0001	0.8048	0.4098	<0.0001
	Apr-18	<0.0001	<0.0001	0.1434	<0.0001	<0.0001
	May-18	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
	Jun-18	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nebo Road WTP Raw Water	Jul-17	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Aug-17	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Sep-17	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Oct-17	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Nov-17	0.2468	<0.0001	<0.0001	<0.0001	<0.0001
	Dec-17	0.8155	<0.0001	0.6916	<0.0001	<0.0001
	Jan-18	0.394	<0.0001	0.6148	0.2612	<0.0001
	Feb-18	0.0755	<0.0001	0.4473	<0.0001	<0.0001
	Mar-18	0.3342	<0.0001	0.7759	0.4089	<0.0001
	Apr-18	0.2038	<0.0001	0.4794	<0.0001	<0.0001
	May-18	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
	Jun-18	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

- no current ADWG health value

4. WATER TREATMENT

4.1 MACKAY TREATMENT

4.1.1 Nebo Road Water Treatment Plant

The Nebo Road WTP is located approximately 3 km to the south-west of the Mackay CBD on land adjoining the Botanic Gardens. It is MRC's largest water treatment plant.

The plant has the capacity to treat 75 ML of water per day. The plant treats raw water sourced from the Dumbleton Weir on the Pioneer River and water from groundwater bores located in close proximity to the plant. In FY 2017 – 2018 approximately 90% of the water was sourced from the weir. The remaining 10% was sourced from the bores.

The treatment process used at Nebo Road WTP is shown in Figure 4 - 1.

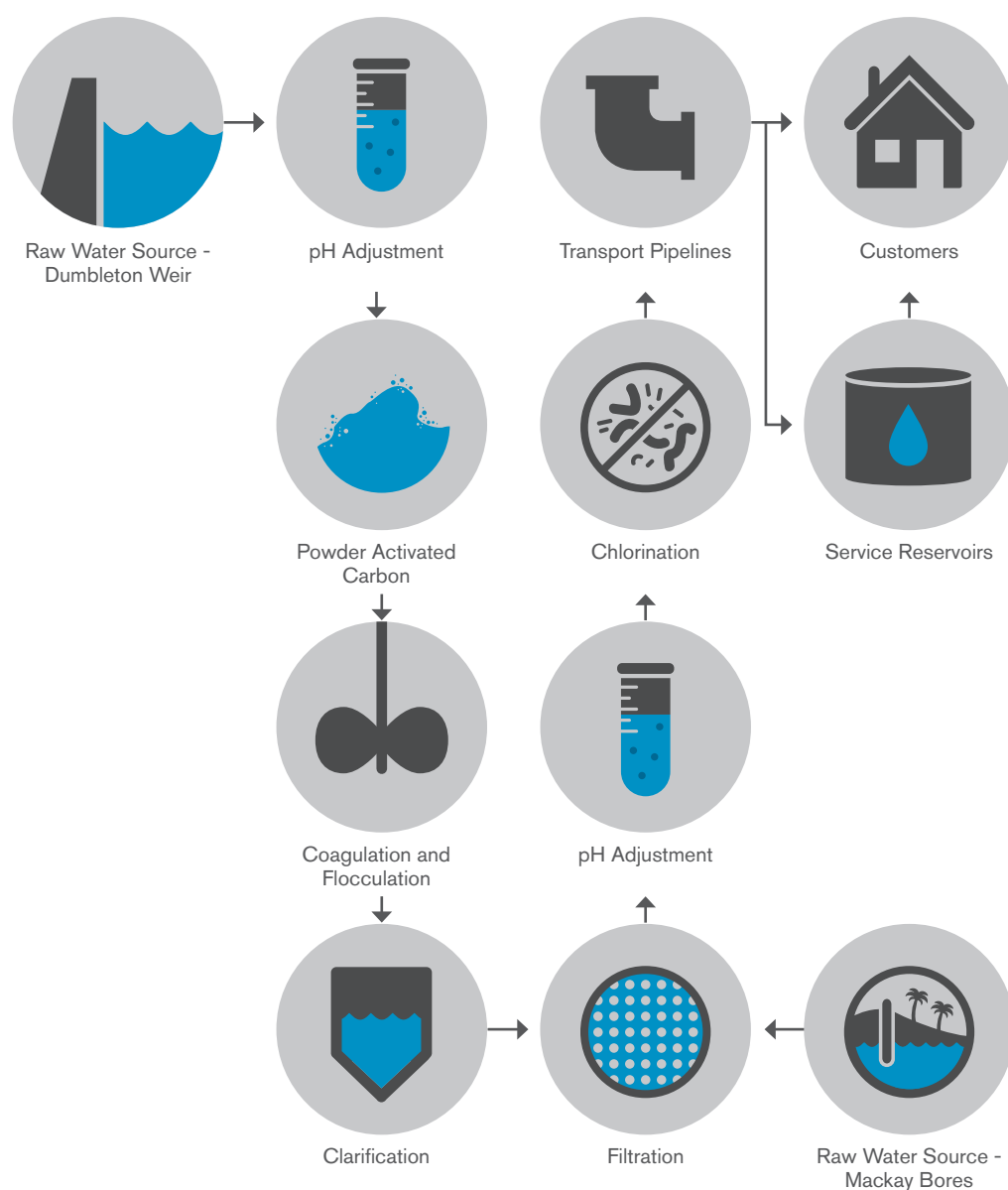


Figure 4 - 1 Water supply process from raw water source to Nebo Road WTP to customers' taps

4.2 MARIAN TREATMENT

4.2.1 Marian Water Treatment Plant

Marian WTP is located on Anzac Avenue approximately 30 kilometres west of Mackay. The plant was commissioned in February 2015 and has the capacity to treat 4 ML of water per day.

The treatment processes used at Marian WTP are shown in Figure 4 - 2.

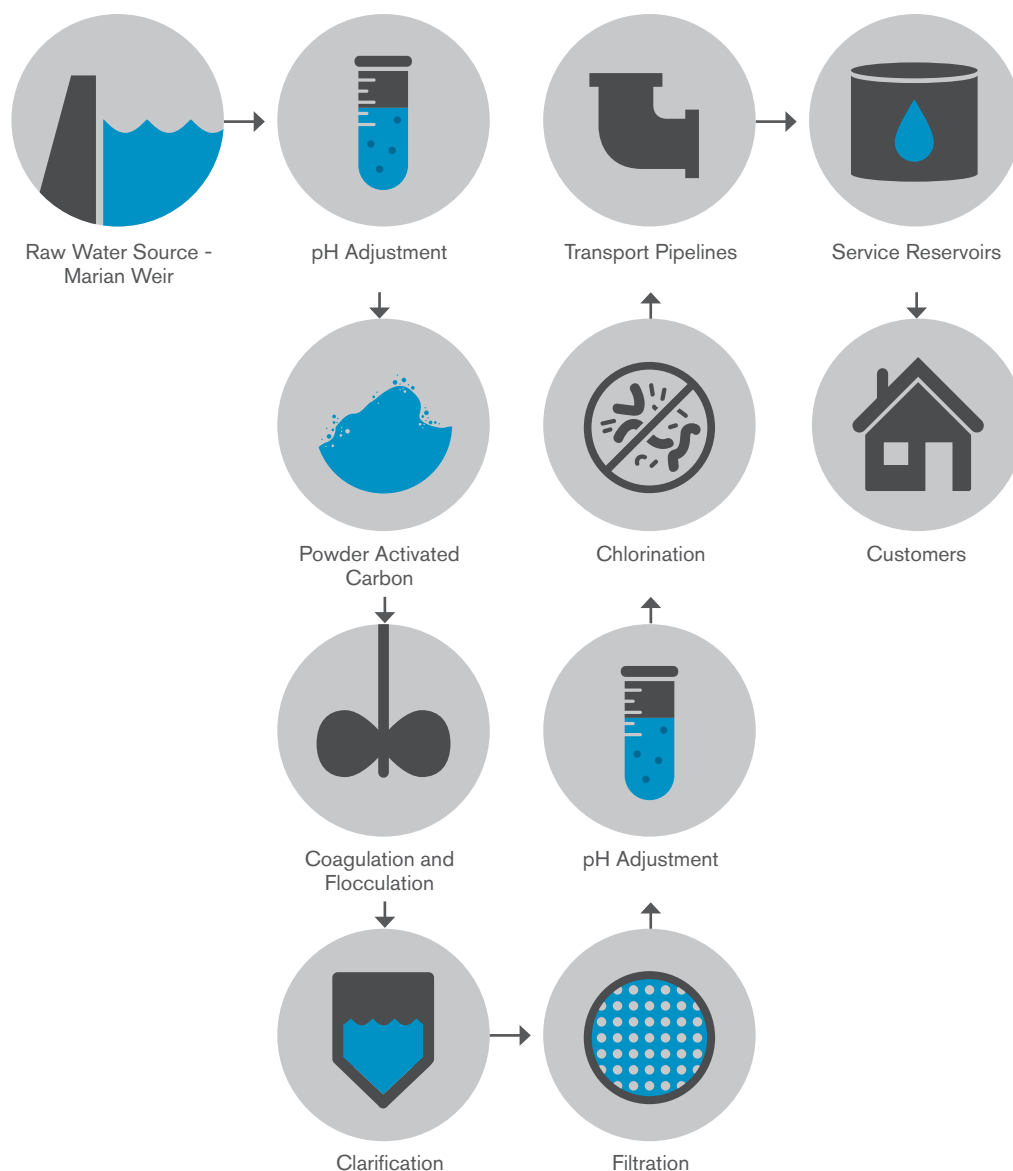


Figure 4 - 2 Water supply process from raw water source to Marian WTP to customers' taps

4.2.2 Marian and Mirani Bores Treatment

Prior to commissioning of the Marian WTP, the sole source of raw water for Marian and Mirani was from groundwater bores. The groundwater bores are now only used as an emergency backup during high demand or event circumstances.

The treatment process for Marian and Mirani Bores is shown in Figure 4 - 3 and Figure 4 - 4.

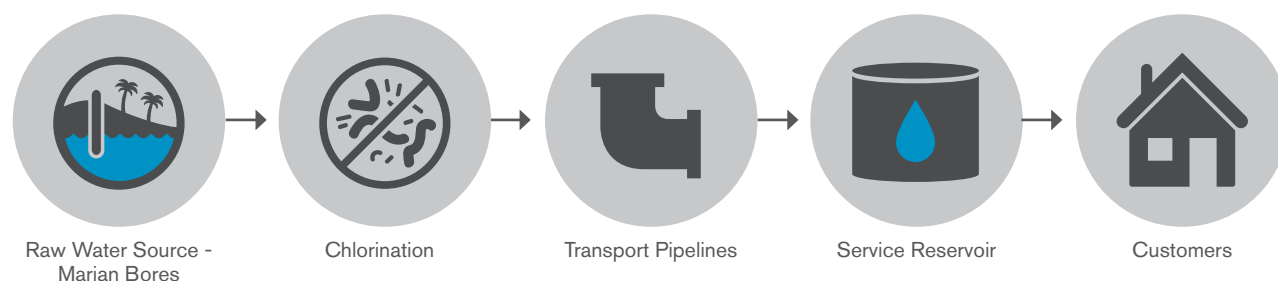


Figure 4 - 3 Water supply process from raw water source to Marian Bores Treatment Facility to customers' taps

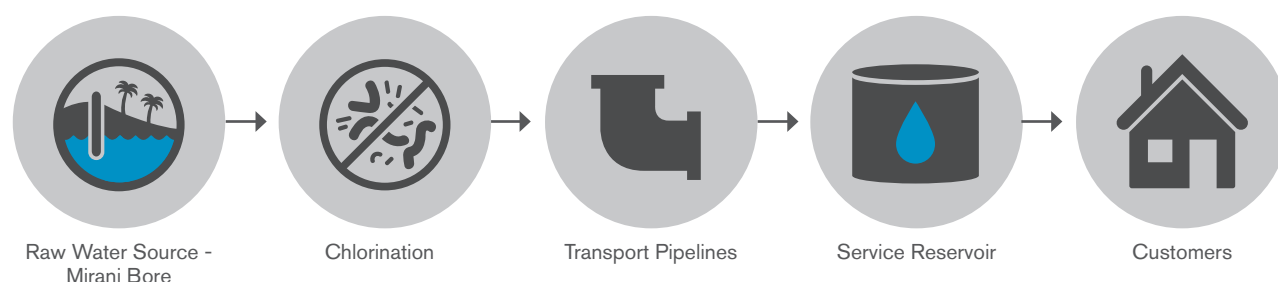


Figure 4 - 4 Water supply process from raw water source to Mirani Bore Treatment Facility to customers' taps

4.3 SARINA TREATMENT

4.3.1 Armstrong Beach, Bally Keel Bore and Sarina Bores Treatment

Sarina's only treatment for the groundwater bore sources is disinfection. The treatment processes for Armstrong Beach Bore, Bally Keel Bore and Sarina Bores treatment facilities are shown in Figure 4 - 5, Figure 4 - 6 and Figure 4 - 7.

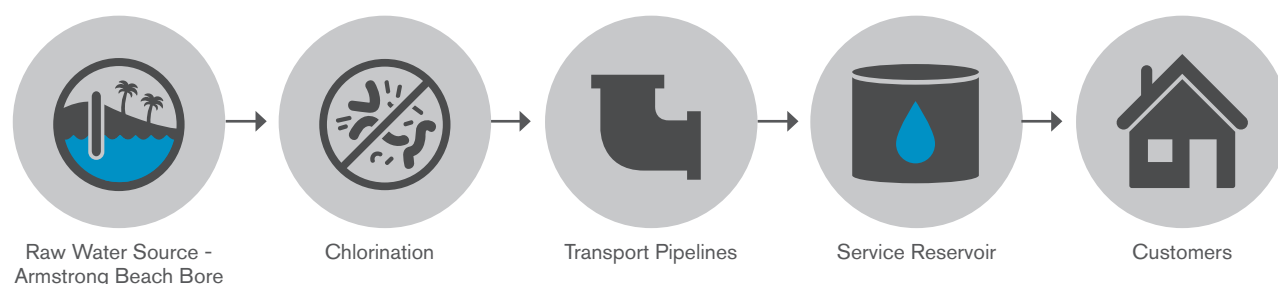


Figure 4 - 5 Water supply process from raw water source to Armstrong Beach Bore Treatment Facility to customers' taps

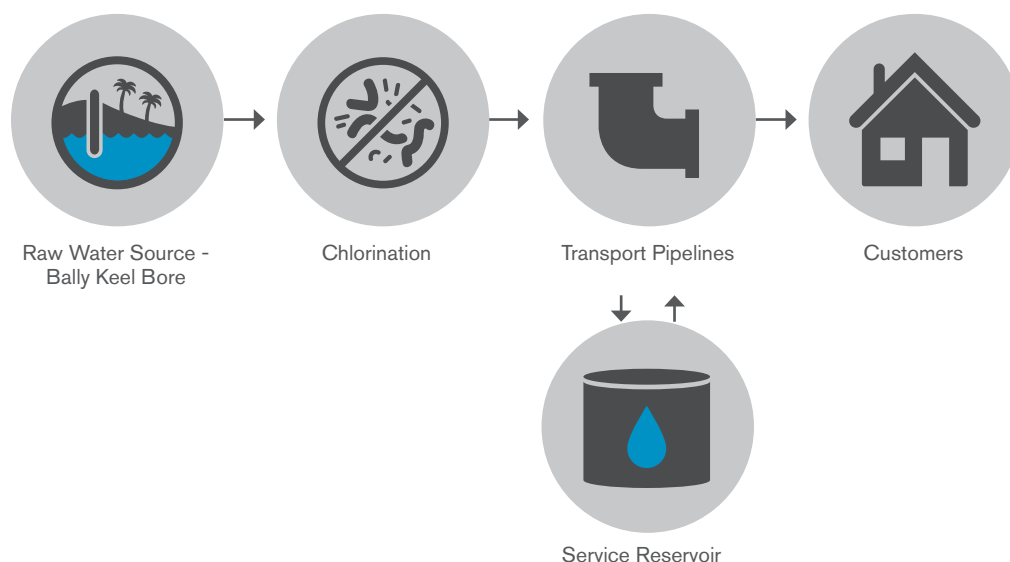


Figure 4 - 6 Water supply process from raw water source to Bally Keel Bore Treatment Facility to customers' taps

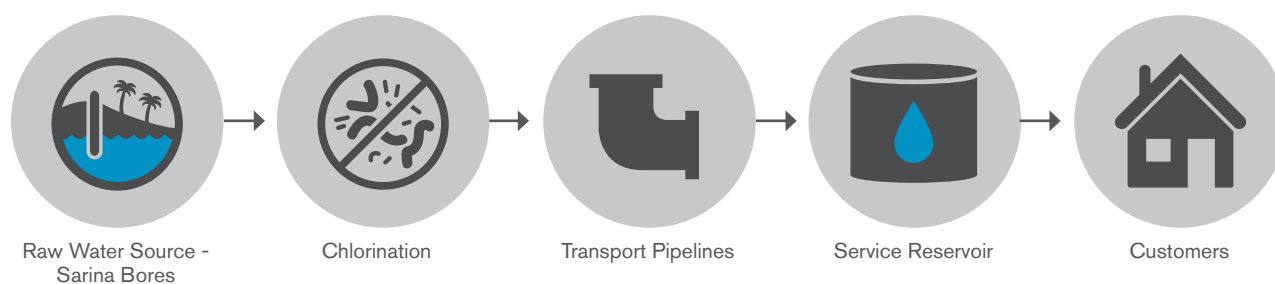


Figure 4 - 7 Water supply process from raw water source to Sarina Bores Treatment Facility to customers' taps

4.3.2 Transfer of Supply from Mackay to Sarina

Sarina's groundwater sources contribute only a small amount to the water supply scheme. A large portion of the water sourced for the Sarina scheme (98% for FY 2017 - 2018) comes from the Mackay scheme via an interconnecting pipeline. The interconnecting pipeline supplies potable water to the Sarina scheme through a connection at Alligator Creek balance tank. Water has been supplied to Sarina from this interconnecting pipeline since March 2015.

4.4 BLOOMSBURY WATER TREATMENT PLANT

The treatment process at Bloomsbury Water Treatment Plant involves chlorination and filtration as shown in Figure 4 - 8.

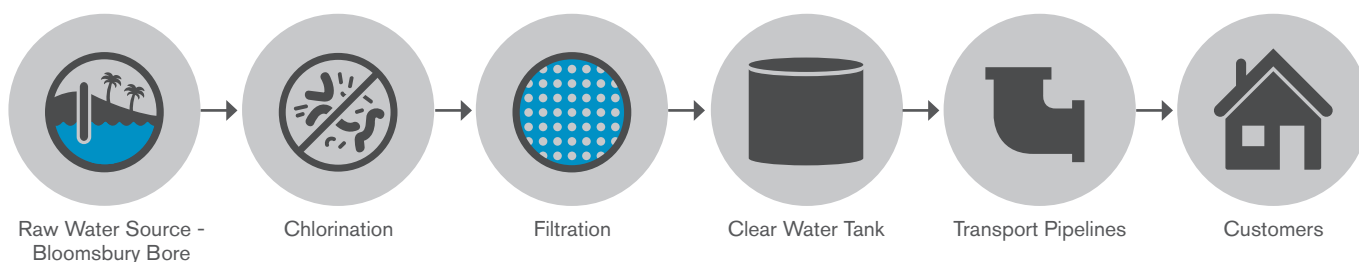


Figure 4 - 8 Water supply process from raw water source to Bloomsbury WTP to customers' taps

4.5 CALEN TREATMENT

The groundwater pumped from the Calen bores may either flow through the ion exchange softener or flow down the softener bypass. The two streams, the softened water and the bypass water, are combined after the softener and undergo chlorination. The treatment process for Calen Treatment Facility is shown in Figure 4 - 9.

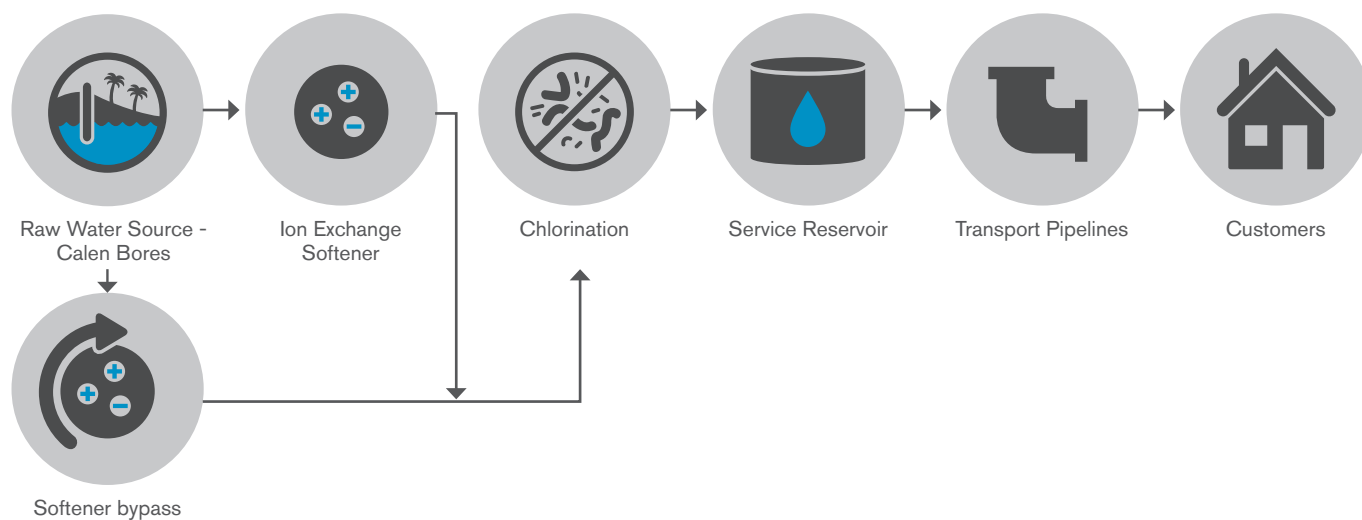


Figure 4 - 9 Water supply process from raw water source to Calen Treatment Facility to customers' taps

4.6 ETON TREATMENT

The current treatment process for Eton involves chlorination (see Figure 4 - 10).

Upgrades to the current Eton treatment process are currently being undertaken. The upgrade will involve the use of an ion exchange softener with a softener bypass. The upgraded treatment facility will come online in early 2019.

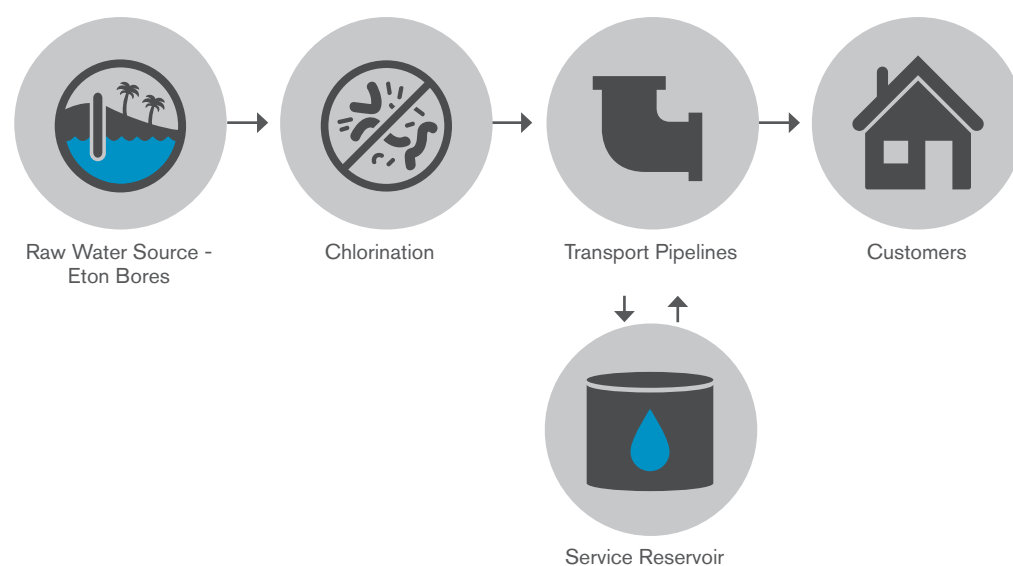


Figure 4 - 10 Water supply process from raw water source to Eton Treatment Facility to customers' taps

4.7 FINCH HATTON TREATMENT

Finch Hatton's only treatment process is chlorination as presented in Figure 4 - 11.

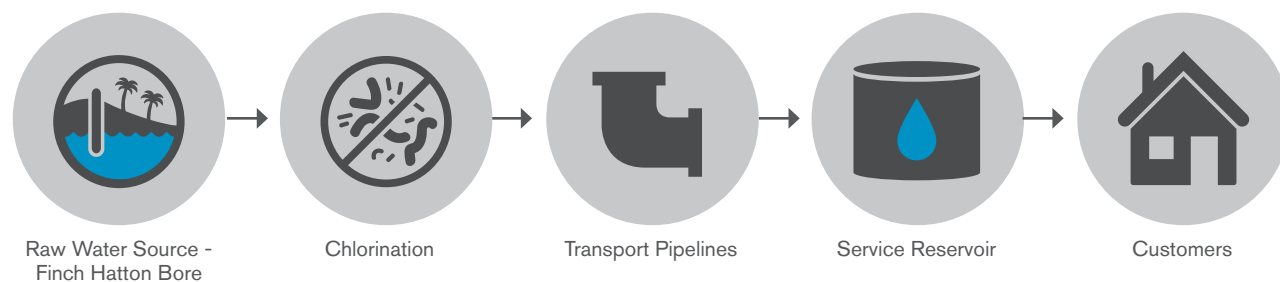


Figure 4 - 11 Water supply process from raw water source to Finch Hatton Treatment Facility to customers' taps

4.8 GARGETT TREATMENT

Gargett's only treatment process is chlorination as presented in Figure 4 - 12.

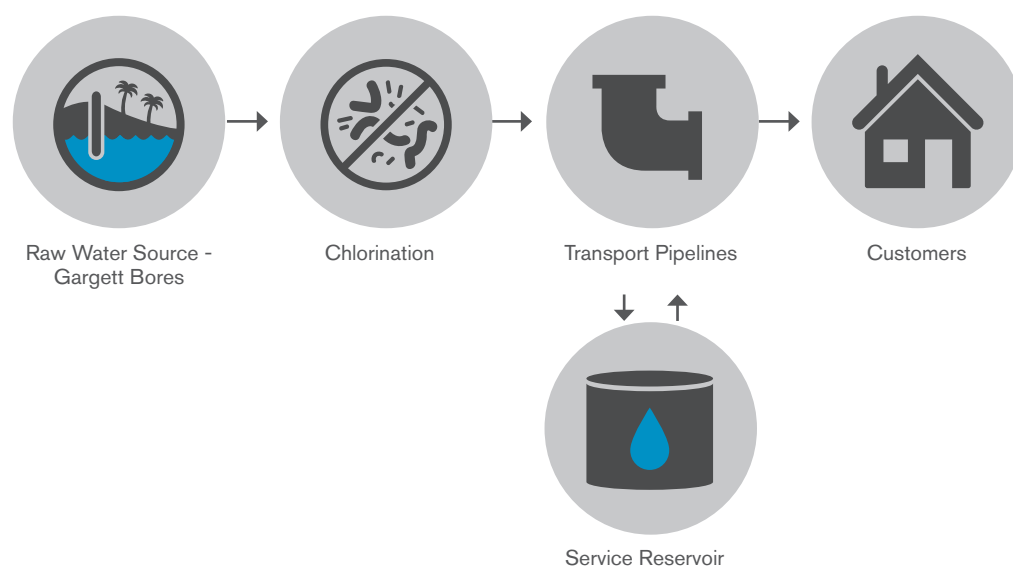


Figure 4 - 12 Water supply process from raw water source to Gargett Treatment Facility to customers' taps

4.9 KOUMALA TREATMENT

Koumala's only treatment process is chlorination as presented in Figure 4 - 13.

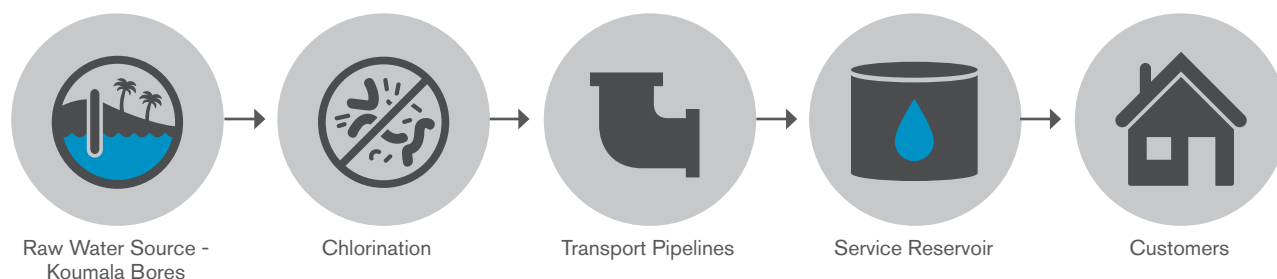


Figure 4 - 13 Water supply process from raw water source to Koumala Treatment Facility to customers' taps

4.10 MIDGE POINT TREATMENT

Midge Point's only treatment process is chlorine gas dosing for disinfection and oxidation of the iron and manganese in the source water. Figure 4 - 14 provides an overview of the Midge Point treatment process.

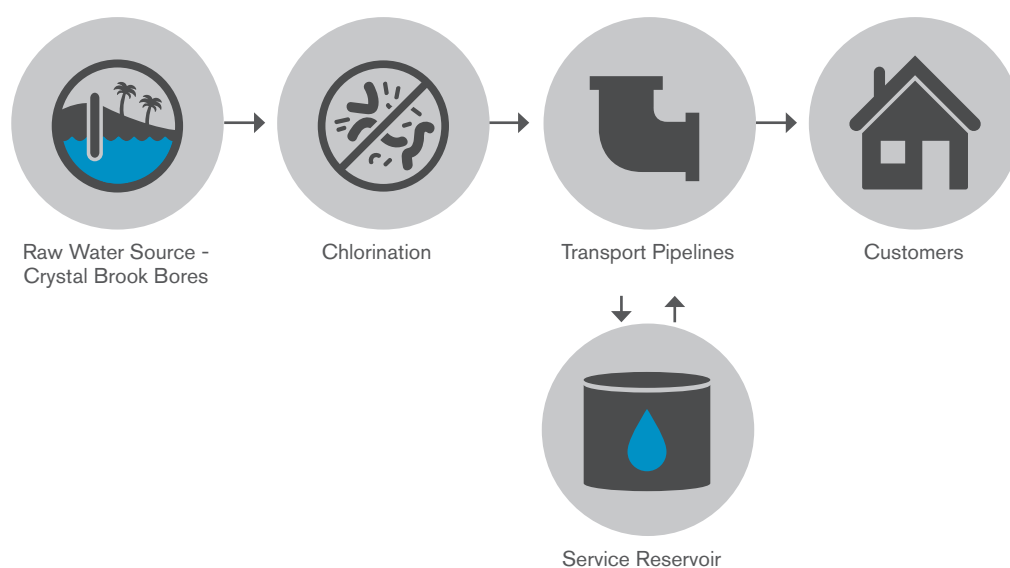


Figure 4 - 14 Water supply process from raw water source to Midge Point Treatment Facility to customers' taps

4.11 WATER TREATMENT PLANT PERFORMANCE

Extensive monitoring of process operations is required to ensure systems are operating within performance limits.

Nebo Road WTP, Marian WTP, Bloomsbury WTP and a number MRC's treatment facilities contain online analysers to enable continuous monitoring of key water quality parameters so that changes in water quality can be quickly identified and addressed. In addition, on-site bench tests and regular laboratory monitoring for treated water is performed and involves analysis of a range of parameters including, but not limited to *E. coli*, chlorine, pH, turbidity and colour. Online, bench test and laboratory monitoring are relied upon to ensure that the treatment processes are operating correctly and producing high quality water within specification.

Table 4 - 1 shows a comparison of ADWG values and the average treated water quality values for key parameters at MRC's WTPs and treatment facilities from laboratory analysis conducted during FY 2017 – 2018. The ADWG includes two different types of guideline values:

- a health value, which is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption;
- an aesthetic value, which is the concentration or measure of a water quality characteristic that is associated with acceptability of water to the consumer; for example, appearance, taste and odour.

Key treated water quality parameters are further discussed in the sections below.

Table 4 - 1 Average final treated water quality at WTPs and treatment facilities FY 2017 – 2018

TREATMENT PLANT / DISINFECTION FACILITY*	E.coli (MPN/ 100mL)	Free Residual Chlorine (mg/L)	Total Chlorine (mg/L)	pH (pH units)	Turbidity (NTU)	Colour - True (TCU)
<i>ADWG Aesthetic Value</i>	-	-	0.6	6.5-8.5	5	15
<i>ADWG Health Value</i>	<1	-	5	-	-	-
Nebo Road WTP	<1	1.66	1.79	7.09	0.23	0.98
Marian WTP	<1	1.55	1.66	7.25	0.21	1.32
Bloomsbury WTP	<1	1.32	1.42	7.17	0.55	1.08
Calen Treatment Facility	<1	1.2	1.26	6.95	0.32	0.33
Eton Treatment Facility	<1	0.76	0.86	7.16	0.46	1.66
Finch Hatton Treatment Facility	<1	1.19	1.25	7.21	0.23	1.33
Gargett Treatment Facility	<1	1.54	1.64	6.62	0.26	0.89
Koumala Treatment Facility	<1	0.94	1.01	7.58	0.45	2.42
Midge Point Treatment Facility	<1	1.7	1.78	6.91	0.71	1.33

- no current ADWG aesthetic or health guideline value

* final treated water quality for Armstrong Beach Bore, Bally Keel Bore and Sarina Bores treatment facilities is not available for FY 2017 – 2018 as treated water samples were not taken due to lack of use.

4.11.1 *E. coli*

Microbiological quality is the most important factor in determining the ongoing safety of water supplies for human consumption. The microbiological indicator bacterium *E. coli* is used as a marker for the presence of faecal contamination and the possible presence of microbiological pathogens.

The ADWG states that *E. coli* should not be detected in any 100 mL sample of drinking water. If detected in drinking water, immediate action should be taken including investigation of potential sources of faecal contamination.

During FY 2017 – 2018 there was no *E. coli* detected in the treated water leaving MRC's WTPs or treatment facilities.



4.11.2 Chlorine

All drinking water treated by MRC's WTPs and treatment facilities is disinfected with chlorine. Chlorine is a common drinking water disinfectant used to kill bacteria and inactivate viruses. The ADWG health guideline for total chlorine is 5 mg/L. The ADWG aesthetic guideline for total chlorine is 0.6 mg/L and is based on an odour threshold.

The average total chlorine for treated water leaving MRC's WTPs and treatment facilities in FY 2017 – 2018 ranged from 0.86 mg/L to 1.79 mg/L. The highest average treated water total chlorine for FY 2017 – 2018 was at Nebo Road WTP. A high target for chlorine is set for Nebo Road WTP treated water so that an effective disinfectant residual is maintained throughout the extensive distribution network to protect against recontamination from backflow, pipeline breaks and other causes.

4.11.3 pH

The average pH of treated water from MRC's WTPs and treatment facilities ranged from 6.62 to 7.58 during FY 2017 – 2018. The ADWG states chlorine disinfection efficiency is impaired above pH 8.0 and that when pH is below 6.5 water may corrode plumbing fitting and pipes.

Sodium hydroxide can be used, if needed, to increase the pH of the river and/or filtered water at Nebo Rd WTP and Marian WTP. Increasing the pH of the river water can help achieve optimum coagulation conditions prior to clarification. Increasing the pH of the filtered water can reduce the corrosivity of the water, improving stability.

4.11.4 Turbidity

Turbidity measures the cloudiness of water caused by fine suspended matter. As a guide, water with a turbidity of 5 NTU appears slightly muddy or milky whilst “crystal-clear” water usually has a turbidity of less than 1 NTU.

Continuous monitoring of turbidity at Nebo Road WTP and Marian WTP is undertaken and is used as an indicator of filter performance. Filtration is an essential part of the treatment process at Nebo Road WTP and Marian WTP as it is the last physical solids removal step in the treatment train, thus it is important for removing contaminants such as pathogens which are resistant to chlorine such as *Giardia* and *Cryptosporidium* cysts.

The ADWG states “Where filtration alone is used as the water treatment process to address identified risks from *Cryptosporidium* and *Giardia*, it is essential that filtration is optimised and consequently the target for the turbidity of water leaving individual filters should be less than 0.2 NTU, and should not exceed 0.5 NTU at any time”. During FY 2017 – 2018 the turbidity of water from the filter outlets at Nebo Road WTP and Marian WTP was below 0.2 NTU 81% of the time for Nebo Road WTP and 94% of the time for Marian WTP.

4.12 WATER PRODUCTION

The volume of water produced during FY 2017 – 2018 across MRC WTPs and treatment facilities is presented in Table 4 - 2. The majority of the water produced in FY 2017 - 2018 (11,732 ML or 94%) was produced by Nebo Road WTP.

Table 4 - 2 Water production volumes FY 2017 - 2018

SCHEME	TREATMENT FACILITY	WATER PRODUCED (ML)
Bloomsbury	Bloomsbury WTP	6
Calen	Calen Treatment Facility	32
Eton	Eton Treatment Facility	41
Finch Hatton	Finch Hatton Treatment Facility	23*
Gargett	Gargett Treatment Facility	21
Koumala	Koumala Treatment Facility	6
Mackay	Nebo Road WTP	10,823
		909^
Marian	Marian WTP	478
	Marian Bores/Mirani Bore Treatment Facilities	15
Midge Point	Midge Point	148
Sarina	Bally Keel Bore Treatment Facility	0.01
	Sarina Bores Treatment Facility	17

^ volume transferred from Nebo Road WTP to Sarina water supply scheme

* estimate based on 5-month flow meter reading extrapolation

5. THE RETICULATION NETWORK

MRC operates and maintains 40 service reservoirs, 36 water pump stations and over 1,200 km of water pipelines within the reticulation network. This infrastructure is maintained and closely monitored to ensure the MRC community receives high quality drinking water at their tap. Ensuring safe and aesthetically pleasing water is delivered to customers is a priority for MRC, and water from MRC's Nebo Road WTP was selected top drop in the 2018 Ixom Best of the Best Queensland Water Taste Test.

5.1 SERVICE RESERVOIRS

Service reservoirs provide storage for drinking water in the reticulation network. Storage of drinking water enables MRC to provide a continuity of supply to customers in the event of a water treatment facility being non-operational or when a peak in demand arises which exceeds the available output from the treatment facility. Reservoirs are monitored frequently as part of MRC's drinking water monitoring program. Parameters routinely monitored at reservoirs are outlined in Table 5 - 1. Results for all parameters monitored at MRC reservoirs in FY 2017 – 2018 are displayed in Section 6.

Table 5 - 1 Parameters routinely monitored at reservoirs

MICROBIOLOGICAL	PHYSICAL
<i>E. coli</i>	Free Chlorine Residual
Total Coliforms	Total Chlorine
Heterotrophic Plate Count	

5.2 DISINFECTION IN THE RETICULATION NETWORK

Re-chlorination systems are implemented within MRC's Mackay, Midge Point and Sarina reticulation networks to ensure that disinfection of drinking water is maintained and safe drinking water is supplied to customers. Re-chlorination systems are set up at locations within the reticulation network where historical water quality data has provided evidence of low to nil free chlorine residual in the drinking water. The presence of free chlorine residual in drinking water indicates that the water has been fully disinfected. Lack of or low free chlorine residual increases the risk to consumers if contamination does occur, as the water does not have the capacity to disinfect additional contamination.

Re-chlorination systems are operated to ensure the free chlorine residual in the drinking water is maintained at a level which confirms full disinfection to the extremities of the water network. The average free chlorine residual recorded in each reticulation network for FY 2017 – 2018 is presented in Figure 5 - 1.

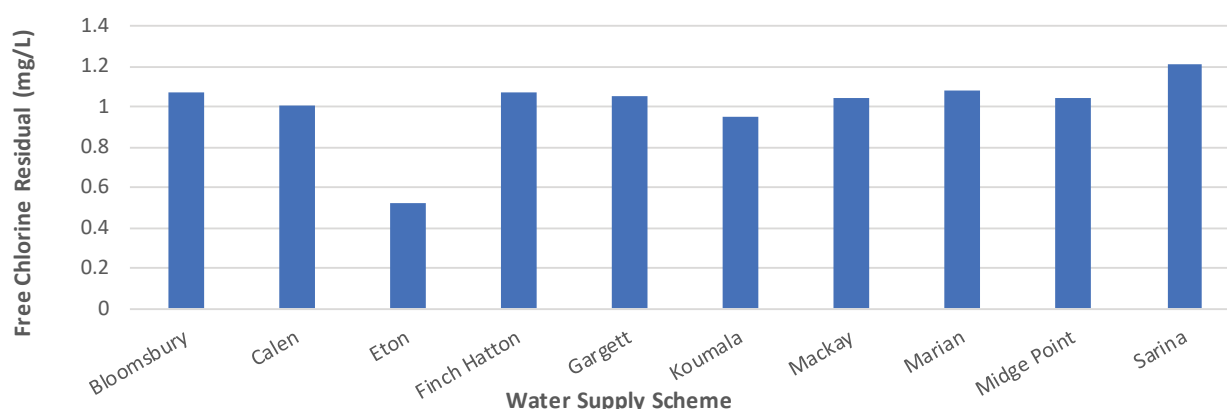


Figure 5 - 1 Average free chlorine residual FY 2017 – 2018

5.3 MONITORING WATER QUALITY IN THE RETICULATION NETWORK

As part of MRC's commitment to providing high quality water to the community, MRC undertakes a comprehensive drinking water monitoring program. During FY 2017 – 2018, 56 drinking water sites located across the reticulation networks for all ten of MRC's drinking water schemes were sampled. Designated sample taps and boxes have been installed for the majority of the drinking water sites (see Figure 5 - 2). Samples collected from within the reticulation network as part of the drinking water monitoring program are analysed for a range of microbiological, chemical and physical parameters as detailed in Table 5 - 2. Results for all parameters monitored throughout MRC's reticulation networks in FY 2017 – 2018 are displayed in Section 6.



Figure 5 - 2 Water sample box

Table 5 - 2 Parameters routinely monitored in the reticulation network

MICROBIOLOGICAL	PHYSICAL	CHEMICAL
<i>E. coli</i>	Temperature	Total Organic Carbon
Total Coliforms	pH	Alkalinity
Heterotrophic Plate Count	Conductivity	Anions
	Turbidity	Cations
	Dissolved Oxygen	Dissolved Metals
	Colour - True	Trihalomethanes
	Free and Total Chlorine	

6. VERIFICATION MONITORING

The purpose of drinking water verification monitoring is to assess that the barriers and preventive measures implemented to safeguard public health are working effectively. Verification monitoring confirms water quality at the point of supply, compliance with water quality criteria and identifies deficiencies in existing preventative or control measures.

MRC's verification monitoring requirements are captured in the drinking water monitoring program included as an appendix to the DWQMP. MRC's NATA accredited Scientific and Analytical Services (SAS) arrange for the collection and analysis of drinking water samples required as part of the verification monitoring program. Except for trihalomethanes (which are analysed by Townsville Water Laboratory (TWL)), all verification monitoring analysis is undertaken by SAS.

A summary of the verification monitoring results for FY 2017 – 2018 is presented in the following tables:

- Table 6 - 2 Bloomsbury WTP – final water quality data summary
- Table 6 - 3 Bloomsbury reticulation water quality data summary
- Table 6 - 4 Calen treatment facility – final water quality data summary
- Table 6 - 5 Calen reticulation water quality data summary
- Table 6 - 6 Calen reservoir water quality data summary
- Table 6 - 7 Eton treatment facility – final water quality data summary
- Table 6 - 8 Eton reticulation water quality data summary
- Table 6 - 9 Eton reservoir water quality data summary
- Table 6 - 10 Finch Hatton treatment facility – final water quality data summary
- Table 6 - 11 Finch Hatton reticulation water quality data summary
- Table 6 - 12 Finch Hatton reservoir water quality data summary
- Table 6 - 13 Gargett treatment facility – final water quality data summary
- Table 6 - 14 Gargett reticulation water quality data summary
- Table 6 - 15 Gargett reservoir water quality data summary
- Table 6 - 16 Koumala treatment facility – final water quality data summary
- Table 6 - 17 Koumala reticulation water quality data summary
- Table 6 - 18 Nebo Road WTP - final water quality data summary
- Table 6 - 19 Mackay reticulation water quality data summary
- Table 6 - 20 Mackay reservoirs water quality data summary
- Table 6 - 21 Marian WTP – final water quality data summary
- Table 6 - 22 Marian reticulation water quality data summary
- Table 6 - 23 Marian reservoirs water quality data summary
- Table 6 - 24 Midge Point treatment facility - final water quality data summary
- Table 6 - 25 Midge Point reticulation water quality data summary
- Table 6 - 26 Midge Point reservoir water quality data summary
- Table 6 - 27 Sarina reticulation water quality data summary
- Table 6 - 28 Sarina reservoir water quality data summary

The verification monitoring summary tables include the ADWG health values to enable comparison between the ADWG health value and the corresponding parameters' results. It should be noted that dissolved metal results have been compared to total metal ADWG health values.

Testing for *E. coli* as part of the verification monitoring program allows for assessment against drinking water standards outlined in the *Public Health Regulation 2005*. The *Public Health Regulation 2005* requires that 98% 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.

All MRC drinking water supply schemes in the FY 2017 – 2018 met the required annual value as shown in Table 6 - 1. Less than 100% of samples complied with the nil *E. coli* standard for some months in FY 2017 – 2018 for the Mackay and Sarina water supply schemes (see grey shading in Table 6 - 1) due to an *E. coli* detection at McEwens Beach in July 2017 and at Sarina Apex Park in March 2017. The annual value calculation sheets for each scheme have been supplied in Appendix 2.

Table 6 - 1 Rolling 12 month annual value *E. coli* compliance FY 2017 – 2018

MONTH	% of samples which comply with the nil <i>E. coli</i> standard									
	BLOOMSBURY	CALEN	ETON	FINCH HATTON	GARGETT	KOUMALA	MACKAY	MARIAN	MIDGE POINT	SARINA
July -17	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	99.4%
August -17	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	99.4%
September -17	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	99.4%
October -17	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	99.4%
November -17	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	99.4%
December -17	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	99.4%
January -18	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	99.4%
February -18	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	99.3%
March -18	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	100%
April -18	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	100%
May -18	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	100%
June - 18	100%	100%	100%	100%	100%	100%	99.8%	100%	100%	100%

6.1 SCHEME: BLOOMSBURY

Table 6 - 2 Bloomsbury WTP – final water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	23	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	23	<1	93	7.26
Total Coliforms	cfu/100mL	1	SAS	-	23	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	23	0.92	2.1	1.32
Total Chlorine	mg/L	0.02	SAS	≤5	23	1.07	2.18	1.42
Temperature	°C	0.1	SAS	-	12	21	25.8	23.21
pH	pH unit	0 - 14	SAS	-	12	6.92	7.46	7.17
Conductivity	µS/cm	10	SAS	-	12	351	616	463.67
Turbidity	NTU	0.1	SAS	-	12	0.23	0.93	0.55
Dissolved Oxygen	% Sat	0 - 110	SAS	-	12	64	91.9	77.65
Colour - True	TCU	1	SAS	-	12	<1	3	1.08
Total Organic Carbon	mg/L	0.3	SAS	-	12	0.83	3.05	1.5
Inorganic								
Alkalinity	mg/L	1	SAS	-	12	84.6	122.86	106.92
Bicarbonate	mg/L	0.1	SAS	-	12	99.63	144.83	125.97
Carbonate	mg/L	0.1	SAS	-	12	<0.1	0.17	<0.1
Hydroxide	mg/L	0.1	SAS	-	12	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	12	6.63	25.83	16.41
Fluoride	mg/L	0.01	SAS	≤1.5	12	0.05	0.1	0.08
Chloride	mg/L	0.005	SAS	-	12	53.93	112.59	79.98
Nitrate	mg/L	0.015	SAS	≤50	12	<0.015	0.29	0.15
Nitrite	mg/L	0.004	SAS	≤3	12	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	12	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	12	0.75	2.88	1.88
Phosphate	mg/L	0.015	SAS	-	12	<0.015	1.41	0.12
Calcium	mg/L	0.5	SAS	-	12	23.66	40.71	33.3
Potassium	mg/L	0.5	SAS	-	12	0.98	3.1	1.36
Magnesium	mg/L	0.5	SAS	-	12	9.55	16.3	13.29
Sodium	mg/L	1	SAS	-	12	32.57	51.05	40.2
Hardness	mg/L	0.25	SAS	-	12	98.39	168.77	137.88
Larson Index	LI	0	SAS	-	12	0.86	1.36	1.07
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	12	<5	12.52	2.93
Antimony	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	12	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	12	3.84	41.53	25.69
Beryllium	µg/L	0.5	SAS	≤0.06	6	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	12	10.48	18.62	14.08
Cadmium	µg/L	0.1	SAS	≤2	12	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	12	<0.1	0.18	<0.1
Cobalt	µg/L	0.2	SAS	-	12	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	12	16.28	43.7	30.87
Iron	µg/L	2	SAS	-	12	2.59	30.72	10.94
Lead	µg/L	0.5	SAS	≤10	12	<0.5	<0.5	<0.5
Manganese	µg/L	1	SAS	≤500	12	<1	3.09	<1
Mercury	µg/L	0.5	SAS	≤1	1	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	12	<1	1.51	<1
Nickel	µg/L	0.5	SAS	≤20	12	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	12	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	12	<0.1	0.92	0.11
Strontium	µg/L	1	SAS	-	12	174.07	342.89	257.27
Thallium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	12	<0.5	10.16	3.7
Tin	µg/L	0.5 / 1	SAS	-	12	<0.5	4.3	<1
Titanium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	12	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	12	<0.1	0.38	0.1
Zinc	µg/L	1	SAS	-	12	1.04	12.26	4.35
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	1	91	91	91
SVOCs								
All SVOCs	µg/L	0.0001	SAS	various	2	<0.0001	<0.0001	<0.0001

Table 6 - 3 Bloomsbury reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	24	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	24	<1	22	1.67
Total Coliforms	cfu/100mL	1	SAS	-	24	<1	3	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	24	0.3	1.39	1.07
Total Chlorine	mg/L	0.02	SAS	≤5	24	0.44	1.48	1.17
Temperature	°C	0.1	SAS	-	12	20.9	28.3	23.47
pH	pH unit	0 - 14	SAS	-	12	6.9	7.65	7.26
Conductivity	µS/cm	10	SAS	-	12	340	590	470.5
Turbidity	NTU	0.1	SAS	-	12	0.26	0.9	0.49
Dissolved Oxygen	% Sat	0 - 110	SAS	-	12	73.3	91.9	79.56
Colour - True	TCU	1	SAS	-	12	<1	6	1.64
Total Organic Carbon	mg/L	0.3	SAS	-	12	0.64	2.91	1.42
Inorganic								
Alkalinity	mg/L	1	SAS	-	12	84.4	122.38	106.66
Bicarbonate	mg/L	0.1	SAS	-	12	99.32	144.28	125.61
Carbonate	mg/L	0.1	SAS	-	12	<0.1	0.29	0.11
Hydroxide	mg/L	0.1	SAS	-	12	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	12	5.14	25.42	13.63
Fluoride	mg/L	0.01	SAS	≤1.5	12	0.05	0.11	0.08
Chloride	mg/L	0.005	SAS	-	12	51.75	109.21	78.15
Nitrate	mg/L	0.015	SAS	≤50	12	<0.015	0.21	0.12
Nitrite	mg/L	0.004	SAS	≤3	12	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	12	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	12	0.84	2.96	1.78
Phosphate	mg/L	0.015	SAS	-	12	<0.015	<0.015	<0.015
Calcium	mg/L	0.5	SAS	-	12	22.99	42.48	33.5
Potassium	mg/L	0.5	SAS	-	12	1.02	2.43	1.32
Magnesium	mg/L	0.5	SAS	-	12	9.34	16.42	13.39
Sodium	mg/L	1	SAS	-	12	32.42	52.64	40.12
Hardness	mg/L	0.25	SAS	-	12	95.87	173.7	138.77
Larson Index	LI	0	SAS	-	12	0.89	1.32	1.05
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	12	<5	15.8	3.14
Antimony	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	12	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	12	3.87	43	25.5
Beryllium	µg/L	0.5	SAS	≤0.06	6	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	12	9.23	18.11	13.65
Cadmium	µg/L	0.1	SAS	≤2	12	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	12	<0.1	0.27	<0.1
Cobalt	µg/L	0.2	SAS	-	12	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	12	18.73	53.1	32.13
Iron	µg/L	2	SAS	-	12	<2	12.71	7.12
Lead	µg/L	0.5	SAS	≤10	12	<0.5	<0.5	<0.5
Manganese	µg/L	1	SAS	≤500	12	<1	1.37	<1
Mercury	µg/L	0.5	SAS	≤1	1	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	12	<1	1.51	<1
Nickel	µg/L	0.5	SAS	≤20	12	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	12	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	12	<0.1	0.31	<0.1
Strontium	µg/L	1	SAS	-	12	172.63	315.48	257.43
Thallium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	12	<0.5	9.94	3.46
Tin	µg/L	0.5 / 1	SAS	-	12	<0.5	4.23	<1
Titanium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	12	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	12	<0.1	0.12	<0.1
Zinc	µg/L	1	SAS	-	12	3.35	22.78	10.64
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	1	76	76	76

6.2 SCHEME: CALEN

Table 6 - 4 Calen treatment facility – final water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	4	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	4	<1	<1	<1
Total Coliforms	cfu/100mL	1	SAS	-	4	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	4	0.93	1.59	1.2
Total Chlorine	mg/L	0.02	SAS	≤5	4	0.96	1.66	1.26
Temperature	°C	0.1	SAS	-	4	23.8	25.3	24.55
pH	pH unit	0 - 14	SAS	-	4	6.7	7.56	6.95
Conductivity	µS/cm	10	SAS	-	4	778	857	822.75
Turbidity	NTU	0.1	SAS	-	4	0.29	0.38	0.32
Dissolved Oxygen	% Sat	0 - 110	SAS	-	4	55.8	73.6	64.9
Colour - True	TCU	1	SAS	-	4	<1	<1	<1
Total Organic Carbon	mg/L	0.3	SAS	-	4	<0.3	0.36	<0.3
Inorganic								
Alkalinity	mg/L	1	SAS	-	4	217.7	241.2	229.53
Bicarbonate	mg/L	0.1	SAS	-	4	256.79	284.47	270.53
Carbonate	mg/L	0.1	SAS	-	4	<0.1	0.46	0.14
Hydroxide	mg/L	0.1	SAS	-	4	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	4	12.47	88.37	64.75
Fluoride	mg/L	0.01	SAS	≤1.5	4	0.05	0.13	0.09
Chloride	mg/L	0.005	SAS	-	4	79.92	115.27	100.64
Nitrate	mg/L	0.015	SAS	≤50	4	21.46	26.58	24.02
Nitrite	mg/L	0.004	SAS	≤3	4	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	4	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	4	3.43	4.61	4.25
Phosphate	mg/L	0.015	SAS	-	4	<0.015	0.41	0.17
Calcium	mg/L	0.5	SAS	-	4	15.02	24.62	20.72
Potassium	mg/L	0.5	SAS	-	4	<0.5	<0.5	<0.5
Magnesium	mg/L	0.5	SAS	-	4	15.19	26.25	21.29
Sodium	mg/L	1	SAS	-	4	99.26	144.01	116.5
Hardness	mg/L	0.25	SAS	-	4	100.03	169.58	139.41
Larson Index	LI	0	SAS	-	4	0.5	0.76	0.66
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	4	<5	11.75	6.31
Antimony	µg/L	0.5	SAS	-	4	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	4	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	4	<1	<1	<1
Beryllium	µg/L	0.5	SAS	≤0.06	2	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	4	14.38	16.1	15.48
Cadmium	µg/L	0.1	SAS	≤2	4	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	4	0.47	0.71	0.57
Cobalt	µg/L	0.2	SAS	-	4	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	4	16.32	30.67	24.17
Iron	µg/L	2	SAS	-	4	<2	3.05	<2
Lead	µg/L	0.5	SAS	≤10	4	<0.5	<0.5	<0.5
Manganese	µg/L	1	SAS	≤500	4	<1	<1	<1
Mercury	µg/L	0.5	SAS	≤1	2	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	4	<1	<1	<1
Nickel	µg/L	0.5	SAS	≤20	4	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	4	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	4	<0.1	0.28	0.1
Strontium	µg/L	1	SAS	-	4	182.87	290.52	239.47
Thallium	µg/L	0.5	SAS	-	4	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	4	<0.5	8.8	3.03
Tin	µg/L	0.5 / 1	SAS	-	4	<0.5	2.6	<1
Titanium	µg/L	0.5	SAS	-	4	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	4	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	4	21.88	24.46	23.25
Zinc	µg/L	1	SAS	-	4	2.32	6.65	4.54
SVOCs								
All SVOCs	µg/L	0.0001	SAS	various	2	<0.0001	<0.0001	<0.0001

Table 6 - 5 Calen reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	52	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	52	<1	66	1.65
Total Coliforms	cfu/100mL	1	SAS	-	52	<1	14	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	52	0.69	1.33	1.01
Total Chlorine	mg/L	0.02	SAS	≤5	52	0.76	1.41	1.1
Temperature	°C	0.1	SAS	-	28	19.8	29.4	24.15
pH	pH unit	0-14	SAS	-	28	6.73	7.56	7.16
Conductivity	µS/cm	10	SAS	-	28	775	879	837.04
Turbidity	NTU	0.1	SAS	-	28	0.15	0.74	0.32
Dissolved Oxygen	% Sat	0 - 110	SAS	-	28	53.1	87.9	66.91
Colour - True	TCU	1	SAS	-	28	<1	10	1.5
Total Organic Carbon	mg/L	0.3	SAS	-	28	<0.3	1.84	0.32
Inorganic								
Alkalinity	mg/L	1	SAS	-	28	217.84	260.26	238.02
Bicarbonate	mg/L	0.1	SAS	-	28	256.89	306.54	280.42
Carbonate	mg/L	0.1	SAS	-	28	<0.1	0.51	0.22
Hydroxide	mg/L	0.1	SAS	-	28	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	28	13.06	87.02	38.93
Fluoride	mg/L	0.01	SAS	≤1.5	28	0.03	0.17	0.11
Chloride	mg/L	0.005	SAS	-	28	80.98	113.95	102.02
Nitrate	mg/L	0.015	SAS	≤50	28	17.31	27.38	23.43
Nitrite	mg/L	0.004	SAS	≤3	28	<0.004	0.26	0.01
Bromide	mg/L	0.015	SAS	-	28	<0.015	0.12	0.03
Sulphate	mg/L	0.02	SAS	≤500	28	3.52	5.95	4.58
Phosphate	mg/L	0.015	SAS	-	28	<0.015	0.49	0.18
Calcium	mg/L	0.5	SAS	-	28	14.92	25.49	18.59
Potassium	mg/L	0.5	SAS	-	28	<0.5	1.09	0.22
Magnesium	mg/L	0.5	SAS	-	28	14.91	29.15	18.36
Sodium	mg/L	1	SAS	-	28	109.35	151.22	134.66
Hardness	mg/L	0.25	SAS	-	28	99.54	183.69	122.03
Larson Index	LI	0	SAS	-	28	0.51	0.76	0.65
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	28	<5	29.46	4.8
Antimony	µg/L	0.5	SAS	-	28	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	28	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	28	<1	1.43	<1
Beryllium	µg/L	0.5	SAS	≤0.06	16	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	28	11.2	36.88	18.13
Cadmium	µg/L	0.1	SAS	≤2	28	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	28	0.3	0.75	0.49
Cobalt	µg/L	0.2	SAS	-	28	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	28	20.01	80.51	56.32
Iron	µg/L	2	SAS	-	28	<2	2.7	<2
Lead	µg/L	0.5	SAS	≤10	28	<0.5	1.72	0.86
Manganese	µg/L	1	SAS	≤500	28	<1	1.11	<1
Mercury	µg/L	0.5	SAS	≤1	2	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	28	<1	1.72	<1
Nickel	µg/L	0.5	SAS	≤20	28	<0.5	6.82	<0.5
Selenium	µg/L	5	SAS	≤10	28	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	28	<0.1	0.3	<0.1
Strontium	µg/L	1	SAS	-	28	167	276.27	204.82
Thallium	µg/L	0.5	SAS	-	28	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	28	<0.5	12.77	3.91
Tin	µg/L	0.5 / 1	SAS	-	28	<0.5	3.17	<1
Titanium	µg/L	0.5	SAS	-	28	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	28	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	28	22.19	25.66	23.7
Zinc	µg/L	1	SAS	-	28	3.88	34.27	13.48

Table 6 - 6 Calen reservoir water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	1	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	1	1	1	1
Total Coliforms	cfu/100mL	1	SAS	-	1	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	1	0.92	0.92	0.92
Total Chlorine	mg/L	0.02	SAS	≤5	1	1.04	1.04	1.04
Temperature	°C	0.1	SAS	-	1	23.8	23.8	23.8
pH	pH unit	0 - 14	SAS	-	1	6.72	6.72	6.72
Conductivity	µS/cm	10	SAS	-	1	792	792	792
Turbidity	NTU	0.1	SAS	-	1	0.64	0.64	0.64
Dissolved Oxygen	% Sat	0 - 110	SAS	-	1	70.1	70.1	70.1
Colour - True	TCU	1	SAS	-	1	4	4	4
Total Organic Carbon	mg/L	0.3	SAS	-	1	<0.3	<0.3	<0.3
Inorganic								
Alkalinity	mg/L	1	SAS	-	1	228	228	228
Bicarbonate	mg/L	0.1	SAS	-	1	268.94	268.94	268.94
Carbonate	mg/L	0.1	SAS	-	1	<0.1	<0.1	<0.1
Hydroxide	mg/L	0.1	SAS	-	1	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	1	86.85	86.85	86.85
Fluoride	mg/L	0.01	SAS	≤1.5	1	0.13	0.13	0.13
Chloride	mg/L	0.005	SAS	-	1	86.97	86.97	86.97
Nitrate	mg/L	0.015	SAS	≤50	1	22.27	22.27	22.27
Nitrite	mg/L	0.004	SAS	≤3	1	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	1	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	1	3.86	3.86	3.86
Phosphate	mg/L	0.015	SAS	-	1	0.33	0.33	0.33
Calcium	mg/L	0.5	SAS	-	1	16.24	16.24	16.24
Potassium	mg/L	0.5	SAS	-	1	<0.5	<0.5	<0.5
Magnesium	mg/L	0.5	SAS	-	1	15.93	15.93	15.93
Sodium	mg/L	1	SAS	-	1	126.32	126.32	126.32
Hardness	mg/L	0.25	SAS	-	1	106.14	106.14	106.14
Larson Index	LI	0	SAS	-	1	0.58	0.58	0.58
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	1	<5	<5	<5
Antimony	µg/L	0.5	SAS	-	1	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	1	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	1	1.39	1.39	1.39
Boron	µg/L	5	SAS	≤4000	1	17.34	17.34	17.34
Cadmium	µg/L	0.1	SAS	≤2	1	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	1	0.59	0.59	0.59
Cobalt	µg/L	0.2	SAS	-	1	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	1	1.46	1.46	1.46
Iron	µg/L	2	SAS	-	1	<2	<2	<2
Lead	µg/L	0.5	SAS	≤10	1	<0.5	<0.5	<0.5
Manganese	µg/L	1	SAS	≤500	1	<1	<1	<1
Molybdenum	µg/L	1	SAS	≤50	1	<1	<1	<1
Nickel	µg/L	0.5	SAS	≤20	1	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	1	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	1	<0.1	<0.1	<0.1
Strontium	µg/L	1	SAS	-	1	189.56	189.56	189.56
Thallium	µg/L	0.5	SAS	-	1	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	1	5.01	5.01	5.01
Tin	µg/L	0.5 / 1	SAS	-	1	0.91	<1	<1
Titanium	µg/L	0.5	SAS	-	1	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	1	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	1	24.13	24.13	24.13
Zinc	µg/L	1	SAS	-	1	1.48	1.48	1.48

6.3 SCHEME: ETON

Table 6 - 7 Eton treatment facility – final water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	49	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	49	<1	64	15.22
Total Coliforms	cfu/100mL	1	SAS	-	49	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	49	0.02	1.39	0.76
Total Chlorine	mg/L	0.02	SAS	≤5	49	0.06	1.61	0.86
pH	pH unit	0 - 14	SAS	-	49	6.86	8.25	7.16
Conductivity	μS/cm	10	SAS	-	49	564.2	1,200.80	1,084.27
Turbidity	NTU	0.1	SAS	-	49	<0.1	3.84	0.46
Dissolved Oxygen	% Sat	0 - 110	SAS	-	49	26.6	105.6	54.49
Colour - True	TCU	1	SAS	-	49	<1	6	1.66
Total Organic Carbon	mg/L	0.3	SAS	-	49	<0.3	0.59	<0.3
Inorganic								
Alkalinity	mg/L	1	SAS	-	49	272	307.12	282.67
Bicarbonate	mg/L	0.1	SAS	-	49	320.61	362.07	333.01
Carbonate	mg/L	0.1	SAS	-	49	0.12	2.82	0.29
Hydroxide	mg/L	0.1	SAS	-	49	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	49	3.17	78.24	42.08
Fluoride	mg/L	0.01	SAS	≤1.5	49	0.03	0.13	0.1
Chloride	mg/L	0.005	SAS	-	49	166.45	192.41	183.81
Nitrate	mg/L	0.015	SAS	≤50	49	10.27	15.35	13.26
Nitrite	mg/L	0.004	SAS	≤3	49	<0.004	0.42	0.03
Bromide	mg/L	0.015	SAS	-	49	<0.015	0.24	0.08
Sulphate	mg/L	0.02	SAS	≤500	49	10.96	13.43	12.27
Phosphate	mg/L	0.015	SAS	-	49	<0.015	0.58	0.12
Calcium	mg/L	0.5	SAS	-	49	76.71	94.62	83.96
Potassium	mg/L	0.5	SAS	-	49	0.56	0.76	0.63
Magnesium	mg/L	0.5	SAS	-	49	39.12	47.12	42.45
Sodium	mg/L	1	SAS	-	49	78.36	94.88	84.24
Hardness	mg/L	0.25	SAS	-	49	356.53	430.29	384.44
Larson Index	LI	0	SAS	-	49	0.92	1.08	1
Dissolved Metals								
Aluminium	μg/L	5	SAS	-	49	<5	9.86	2.13
Antimony	μg/L	0.5	SAS	-	49	<0.5	0.86	<0.5
Arsenic	μg/L	0.5	SAS	≤10	49	<0.5	0.92	0.63
Barium	μg/L	1	SAS	≤2000	49	60.51	83.98	69.14
Beryllium	μg/L	0.5	SAS	≤0.06	26	<0.5	<0.5	<0.5
Boron	μg/L	5	SAS	≤4000	49	13	33.12	25.37
Cadmium	μg/L	0.1	SAS	≤2	49	<0.1	<0.1	<0.1
Chromium	μg/L	0.1	SAS	≤50	49	<0.1	0.61	<0.1
Cobalt	μg/L	0.2	SAS	-	49	<0.2	0.25	<0.2
Copper	μg/L	1	SAS	≤2000	49	26.97	553.88	139.09
Iron	μg/L	2	SAS	-	49	<2	3.61	<2
Lead	μg/L	0.5	SAS	≤10	49	<0.5	1.19	<0.5
Manganese	μg/L	1	SAS	≤500	49	<1	26.86	12.27
Mercury	μg/L	0.5	SAS	≤1	2	<0.5	<0.5	<0.5
Molybdenum	μg/L	1	SAS	≤50	49	<1	1.94	<1
Nickel	μg/L	0.5	SAS	≤20	49	<0.5	2.31	<0.5
Selenium	μg/L	5	SAS	≤10	49	8.92	12.9	11.23
Silver	μg/L	0.1	SAS	≤100	49	<0.1	0.26	<0.1
Strontium	μg/L	1	SAS	-	49	786.3	1,007.55	871.43
Thallium	μg/L	0.5	SAS	-	49	<0.5	<0.5	<0.5
Thorium	μg/L	0.5	SAS	-	49	<0.5	12.86	3.15
Tin	μg/L	0.5 / 1	SAS	-	49	<0.5	5.05	<1
Titanium	μg/L	0.5	SAS	-	49	<0.5	<0.5	<0.5
Uranium	μg/L	0.5	SAS	≤17	49	5.7	8.04	6.56
Vanadium	μg/L	0.1	SAS	-	49	51.27	60.69	55.3
Zinc	μg/L	1	SAS	-	49	3.35	159.28	28.54
Trihalomethanes								
Trihalomethanes (Total)	μg/L	5	TWL	≤250	2	<5	<5	<5
SVOCs								
All SVOCs	μg/L	0.0001	SAS	various	2	<0.0001	<0.0001	<0.0001

Table 6 - 8 Eton reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	12	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	12	<1	8	2
Total Coliforms	cfu/100mL	1	SAS	-	12	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	15	0.29	0.81	0.52
Total Chlorine	mg/L	0.02	SAS	≤5	15	0.35	0.9	0.61
Temperature	°C	0.1	SAS	-	12	22.4	26.7	24.53
pH	pH unit	0 - 14	SAS	-	12	6.77	7.2	6.98
Conductivity	µS/cm	10	SAS	-	12	1,044.00	1,216.00	1,151.33
Turbidity	NTU	0.1	SAS	-	12	0.1	0.61	0.3
Dissolved Oxygen	% Sat	0 - 110	SAS	-	12	40	67.7	53.63
Colour - True	TCU	1	SAS	-	12	<1	4	1.58
Total Organic Carbon	mg/L	0.3	SAS	-	12	<0.3	0.94	0.33
Inorganic								
Alkalinity	mg/L	1	SAS	-	12	300.68	332.3	310.52
Bicarbonate	mg/L	0.1	SAS	-	12	354.63	391.79	366.09
Carbonate	mg/L	0.1	SAS	-	12	0.1	0.28	0.17
Hydroxide	mg/L	0.1	SAS	-	12	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	12	39.45	104.13	69.08
Fluoride	mg/L	0.01	SAS	≤1.5	12	0.09	0.14	0.1
Chloride	mg/L	0.005	SAS	-	12	173	194.58	184.79
Nitrate	mg/L	0.015	SAS	≤50	12	11.49	15.36	13.35
Nitrite	mg/L	0.004	SAS	≤3	12	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	12	<0.015	0.23	0.13
Sulphate	mg/L	0.02	SAS	≤500	12	12	13.23	12.58
Phosphate	mg/L	0.015	SAS	-	12	<0.015	0.41	0.18
Calcium	mg/L	0.5	SAS	-	12	89.8	112.04	101.05
Potassium	mg/L	0.5	SAS	-	12	0.68	1.36	0.84
Magnesium	mg/L	0.5	SAS	-	12	35.01	43.46	38.95
Sodium	mg/L	1	SAS	-	12	79.1	93.85	84.71
Hardness	mg/L	0.25	SAS	-	12	378.04	447.02	412.71
Larson Index	LI	0	SAS	-	12	0.86	0.97	0.91
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	12	<5	47.12	7.49
Antimony	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	12	0.58	0.78	0.67
Barium	µg/L	1	SAS	≤2000	12	59.35	70.81	65.36
Beryllium	µg/L	0.5	SAS	≤0.06	7	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	12	23.75	33.09	27.84
Cadmium	µg/L	0.1	SAS	≤2	12	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	12	0.5	0.85	0.63
Cobalt	µg/L	0.2	SAS	-	12	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	12	4.95	23.13	12.45
Iron	µg/L	2	SAS	-	12	<2	15.59	2.81
Lead	µg/L	0.5	SAS	≤10	12	<0.5	0.69	<0.5
Manganese	µg/L	1	SAS	≤500	12	<1	4.85	<1
Mercury	µg/L	0.5	SAS	≤1	1	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	12	<1	1.35	<1
Nickel	µg/L	0.5	SAS	≤20	12	<0.5	1.24	<0.5
Selenium	µg/L	5	SAS	≤10	12	9.68	12.64	11.51
Silver	µg/L	0.1	SAS	≤100	12	<0.1	0.2	<0.1
Strontium	µg/L	1	SAS	-	12	897.65	1,097.11	949.02
Thallium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	12	<0.5	17.11	3.77
Tin	µg/L	0.5 / 1	SAS	-	12	<0.5	3.07	<1
Titanium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	12	5.47	7.8	6.33
Vanadium	µg/L	0.1	SAS	-	12	49.92	62.34	53.62
Zinc	µg/L	1	SAS	-	12	7.31	14.58	10.07

Table 6 - 9 Eton reservoir water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	2	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	2	<1	14	7
Total Coliforms	cfu/100mL	1	SAS	-	2	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	4	0.7	1.3	1
Total Chlorine	mg/L	0.02	SAS	≤5	4	0.81	1.39	1.09

6.4 SCHEME: FINCH HATTON

Table 6 - 10 Finch Hatton treatment facility – final water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	12	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	12	<1	8	1.67
Total Coliforms	cfu/100mL	1	SAS	-	12	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	12	0.91	1.49	1.19
Total Chlorine	mg/L	0.02	SAS	≤5	12	0.98	1.6	1.25
pH	pH unit	0 - 14	SAS	-	12	6.94	7.62	7.21
Conductivity	µS/cm	10	SAS	-	12	121.8	377.2	209.5
Turbidity	NTU	0.1	SAS	-	12	0.12	0.44	0.23
Dissolved Oxygen	% Sat	0 - 110	SAS	-	11	73.6	96.1	86.2
Colour - True	TCU	1	SAS	-	12	<1	4	1.33
Total Organic Carbon	mg/L	0.3	SAS	-	12	<0.3	0.48	<0.3
Inorganic								
Alkalinity	mg/L	1	SAS	-	12	69.66	77.5	72.75
Bicarbonate	mg/L	0.1	SAS	-	12	82.11	91.33	85.69
Carbonate	mg/L	0.1	SAS	-	12	<0.1	0.18	<0.1
Hydroxide	mg/L	0.1	SAS	-	12	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	12	3.58	16.57	9.85
Fluoride	mg/L	0.01	SAS	≤1.5	12	0.03	0.09	0.06
Chloride	mg/L	0.005	SAS	-	12	15.2	19.11	17.02
Nitrate	mg/L	0.015	SAS	≤50	12	1.35	2.63	1.96
Nitrite	mg/L	0.004	SAS	≤3	12	<0.004	0.15	0.02
Bromide	mg/L	0.015	SAS	-	12	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	12	2.22	3.46	3
Phosphate	mg/L	0.015	SAS	-	12	<0.015	0.59	0.1
Calcium	mg/L	0.5	SAS	-	12	13.49	15.92	14.28
Potassium	mg/L	0.5	SAS	-	12	1.51	1.86	1.62
Magnesium	mg/L	0.5	SAS	-	12	5.96	7.15	6.48
Sodium	mg/L	1	SAS	-	12	14.63	18.93	16.31
Hardness	mg/L	0.25	SAS	-	12	58.58	69.17	62.36
Larson Index	LI	0	SAS	-	12	0.34	0.43	0.39
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	12	<5	<5	<5
Antimony	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	12	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	12	8.38	10.27	9.49
Beryllium	µg/L	0.5	SAS	≤0.06	6	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	12	14	21.79	17.15
Cadmium	µg/L	0.1	SAS	≤2	12	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	12	<0.1	0.19	<0.1
Cobalt	µg/L	0.2	SAS	-	12	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	12	24.14	38.48	30.07
Iron	µg/L	2	SAS	-	12	<2	14.07	<2
Lead	µg/L	0.5	SAS	≤10	12	<0.5	0.69	<0.5
Manganese	µg/L	1	SAS	≤500	12	<1	<1	<1
Mercury	µg/L	0.5	SAS	≤1	1	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	12	<1	1.91	<1
Nickel	µg/L	0.5	SAS	≤20	12	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	12	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	12	<0.1	0.23	<0.1
Strontium	µg/L	1	SAS	-	12	90.28	106.63	99.53
Thallium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	12	<0.5	9.37	3.2
Tin	µg/L	0.5 / 1	SAS	-	12	<0.5	3.11	<1
Titanium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	12	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	12	5.91	6.98	6.48
Zinc	µg/L	1	SAS	-	12	5.19	11.4	7.79
SVOCs								
All SVOCs	µg/L	0.0001	SAS	various	2	<0.0001	<0.0001	<0.0001

Table 6 - 11 Finch Hatton reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	11	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	11	<1	17	2.18
Total Coliforms	cfu/100mL	1	SAS	-	11	<1	1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	11	0.19	1.75	1.07
Total Chlorine	mg/L	0.02	SAS	≤5	11	0.97	1.95	1.25
Temperature	°C	0.1	SAS	-	11	21.7	29.5	24.74
pH	pH unit	0 - 14	SAS	-	11	6.87	7.76	7.14
Conductivity	µS/cm	10	SAS	-	11	199	225.3	213.93
Turbidity	NTU	0.1	SAS	-	11	0.15	0.36	0.27
Dissolved Oxygen	% Sat	0 - 110	SAS	-	11	73.9	84.3	78.99
Colour - True	TCU	1	SAS	-	11	<1	3	1
Total Organic Carbon	mg/L	0.3	SAS	-	11	<0.3	0.75	0.31
Inorganic								
Alkalinity	mg/L	1	SAS	-	11	70.8	76.28	73.53
Bicarbonate	mg/L	0.1	SAS	-	11	83.07	89.87	86.62
Carbonate	mg/L	0.1	SAS	-	11	<0.1	0.23	<0.1
Hydroxide	mg/L	0.1	SAS	-	11	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	11	2.45	20.12	12.67
Fluoride	mg/L	0.01	SAS	≤1.5	11	0.02	0.07	0.06
Chloride	mg/L	0.005	SAS	-	11	14.27	19.05	16.82
Nitrate	mg/L	0.015	SAS	≤50	11	1.3	2.85	1.97
Nitrite	mg/L	0.004	SAS	≤3	11	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	11	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	11	2.54	4.39	3.39
Phosphate	mg/L	0.015	SAS	-	11	<0.015	1.31	0.24
Calcium	mg/L	0.5	SAS	-	11	14.41	16.11	15.01
Potassium	mg/L	0.5	SAS	-	11	1.59	2.14	1.79
Magnesium	mg/L	0.5	SAS	-	11	5.73	6.86	6.2
Sodium	mg/L	1	SAS	-	11	14.5	18.43	15.93
Hardness	mg/L	0.25	SAS	-	11	59.95	68.35	62.99
Larson Index	LI	0	SAS	-	11	0.34	0.43	0.38
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	11	<5	8.4	3.13
Antimony	µg/L	0.5	SAS	-	11	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	11	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	11	7.97	9.83	8.88
Beryllium	µg/L	0.5	SAS	≤0.06	7	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	11	15.67	26.64	18.56
Cadmium	µg/L	0.1	SAS	≤2	11	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	11	<0.1	0.2	0.1
Cobalt	µg/L	0.2	SAS	-	11	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	11	6.71	56.38	30.83
Iron	µg/L	2	SAS	-	11	<2	5.78	<2
Lead	µg/L	0.5	SAS	≤10	11	<0.5	1.93	0.99
Manganese	µg/L	1	SAS	≤500	11	<1	<1	<1
Mercury	µg/L	0.5	SAS	≤1	2	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	11	<1	1.67	<1
Nickel	µg/L	0.5	SAS	≤20	11	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	11	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	11	<0.1	0.12	<0.1
Strontium	µg/L	1	SAS	-	11	95.09	116.99	108.87
Thallium	µg/L	0.5	SAS	-	11	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	11	<0.5	23.04	4.31
Tin	µg/L	0.5 / 1	SAS	-	11	<0.5	4.72	1.17
Titanium	µg/L	0.5	SAS	-	11	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	11	<0.5	2.54	<0.5
Vanadium	µg/L	0.1	SAS	-	11	5.86	6.98	6.42
Zinc	µg/L	1	SAS	-	11	3.11	28.72	17.26
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	2	5	10	7.5

Table 6 - 12 Finch Hatton reservoir water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	9	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	9	<1	2	<1
Total Coliforms	cfu/100mL	1	SAS	-	9	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	10	0.9	1.49	1.16
Total Chlorine	mg/L	0.02	SAS	≤5	10	0.95	1.58	1.23



6.5 SCHEME: GARGETT

Table 6 - 13 Gargett treatment facility – final water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	12	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	12	<1	6	<1
Total Coliforms	cfu/100mL	1	SAS	-	12	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	12	0.8	2.68	1.54
Total Chlorine	mg/L	0.02	SAS	≤5	12	0.88	2.92	1.64
pH	pH unit	0 - 14	SAS	-	12	6.36	6.99	6.62
Conductivity	µS/cm	10	SAS	-	12	81.4	186.1	155.26
Turbidity	NTU	0.1	SAS	-	12	0.14	0.39	0.26
Dissolved Oxygen	% Sat	0 - 110	SAS	-	11	52.4	86.2	71.95
Colour - True	TCU	1	SAS	-	12	<1	3	0.89
Total Organic Carbon	mg/L	0.3	SAS	-	12	<0.3	0.73	<0.3
Inorganic								
Alkalinity	mg/L	1	SAS	-	12	47.6	64	54.51
Bicarbonate	mg/L	0.1	SAS	-	12	56.15	75.45	64.3
Carbonate	mg/L	0.1	SAS	-	12	<0.1	<0.1	<0.1
Hydroxide	mg/L	0.1	SAS	-	12	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	12	11.79	45.91	27.78
Fluoride	mg/L	0.01	SAS	≤1.5	12	0.03	0.07	0.06
Chloride	mg/L	0.005	SAS	-	12	11.34	16.76	14.15
Nitrate	mg/L	0.015	SAS	≤50	12	1.18	6.78	3.35
Nitrite	mg/L	0.004	SAS	≤3	12	<0.004	0.15	0.01
Bromide	mg/L	0.015	SAS	-	12	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	12	2.48	3.28	2.87
Phosphate	mg/L	0.015	SAS	-	12	<0.015	<0.015	<0.015
Calcium	mg/L	0.5	SAS	-	12	11.27	18.93	14.22
Potassium	mg/L	0.5	SAS	-	12	0.7	1.06	0.82
Magnesium	mg/L	0.5	SAS	-	12	3.12	5.3	3.93
Sodium	mg/L	1	SAS	-	12	11.03	17.76	13.01
Hardness	mg/L	0.25	SAS	-	12	40.99	69.1	51.68
Larson Index	LI	0	SAS	-	12	0.37	0.58	0.44
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	12	<5	12.68	3
Antimony	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	12	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	12	8.7	18.21	12.45
Beryllium	µg/L	0.5	SAS	≤0.06	6	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	12	6.89	22.35	11.96
Cadmium	µg/L	0.1	SAS	≤2	12	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	12	<0.1	0.26	<0.1
Cobalt	µg/L	0.2	SAS	-	12	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	12	3.32	326.34	158.12
Iron	µg/L	2	SAS	-	12	<2	4.13	<2
Lead	µg/L	0.5	SAS	≤10	12	<0.5	2.02	0.59
Manganese	µg/L	1	SAS	≤500	12	<1	10.82	1.2
Mercury	µg/L	0.5	SAS	≤1	1	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	12	<1	1.74	<1
Nickel	µg/L	0.5	SAS	≤20	12	<0.5	0.91	<0.5
Selenium	µg/L	5	SAS	≤10	12	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	12	<0.1	0.16	<0.1
Strontium	µg/L	1	SAS	-	12	93.03	173.8	123.36
Thallium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	12	<0.5	23.73	4.53
Tin	µg/L	0.5 / 1	SAS	-	12	<0.5	3.47	<1
Titanium	µg/L	0.5	SAS	-	12	<0.5	0.82	<0.5
Uranium	µg/L	0.5	SAS	≤17	12	<0.5	0.65	<0.5
Vanadium	µg/L	0.1	SAS	-	12	0.86	1.19	1.01
Zinc	µg/L	1	SAS	-	12	1.85	11.11	5.98
SVOCs								
All SVOCs	µg/L	0.0001	SAS	various	2	<0.0001	<0.0001	<0.0001

Table 6 - 14 Gargett reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	11	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	11	<1	8	1.64
Total Coliforms	cfu/100mL	1	SAS	-	11	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	11	0.52	1.51	1.05
Total Chlorine	mg/L	0.02	SAS	≤5	11	0.6	1.6	1.12
Temperature	°C	0.1	SAS	-	11	20.6	27.4	24.67
pH	pH unit	0 - 14	SAS	-	11	6.47	7.65	7.02
Conductivity	µS/cm	10	SAS	-	11	146.9	212.2	172.46
Turbidity	NTU	0.1	SAS	-	11	0.22	0.47	0.29
Dissolved Oxygen	% Sat	0 - 110	SAS	-	11	53.1	75.9	64.01
Colour - True	TCU	1	SAS	-	11	<1	3	1.09
Total Organic Carbon	mg/L	0.3	SAS	-	11	<0.3	0.87	<0.3
Inorganic								
Alkalinity	mg/L	1	SAS	-	11	46.8	68.5	55.17
Bicarbonate	mg/L	0.1	SAS	-	11	55.19	80.77	65.01
Carbonate	mg/L	0.1	SAS	-	11	<0.1	0.13	<0.1
Hydroxide	mg/L	0.1	SAS	-	11	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	11	2.36	18.32	11.58
Fluoride	mg/L	0.01	SAS	≤1.5	11	<0.01	0.08	0.04
Chloride	mg/L	0.005	SAS	-	11	11.21	16.29	13.79
Nitrate	mg/L	0.015	SAS	≤50	11	1.71	7.58	3.08
Nitrite	mg/L	0.004	SAS	≤3	11	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	11	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	11	2.37	3.52	3.05
Phosphate	mg/L	0.015	SAS	-	11	<0.015	0.91	0.13
Calcium	mg/L	0.5	SAS	-	11	12.07	20.42	14.66
Potassium	mg/L	0.5	SAS	-	11	0.75	2.19	1.08
Magnesium	mg/L	0.5	SAS	-	11	3.16	5.26	3.8
Sodium	mg/L	1	SAS	-	11	11.25	17.8	12.56
Hardness	mg/L	0.25	SAS	-	11	43.27	72.66	52.26
Larson Index	LI	0	SAS	-	11	0.35	0.57	0.43
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	11	<5	144.76	17.19
Antimony	µg/L	0.5	SAS	-	11	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	11	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	11	9.65	16.41	12.78
Beryllium	µg/L	0.5	SAS	≤0.06	7	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	11	9.15	15.35	12.45
Cadmium	µg/L	0.1	SAS	≤2	11	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	11	<0.1	0.36	0.1
Cobalt	µg/L	0.2	SAS	-	11	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	11	3.25	117.2	57.62
Iron	µg/L	2	SAS	-	11	2.38	53.78	9.13
Lead	µg/L	0.5	SAS	≤10	11	<0.5	3.48	2.05
Manganese	µg/L	1	SAS	≤500	11	<1	<1	<1
Mercury	µg/L	0.5	SAS	≤1	2	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	11	<1	1.39	<1
Nickel	µg/L	0.5	SAS	≤20	11	<0.5	13.8	1.46
Selenium	µg/L	5	SAS	≤10	11	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	11	<0.1	0.65	<0.1
Strontium	µg/L	1	SAS	-	11	96.31	151.17	119.36
Thallium	µg/L	0.5	SAS	-	11	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	11	<0.5	12.34	3.35
Tin	µg/L	0.5 / 1	SAS	-	11	<0.5	4.52	1.15
Titanium	µg/L	0.5	SAS	-	11	<0.5	4.32	0.54
Uranium	µg/L	0.5	SAS	≤17	11	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	11	0.88	1.41	1.13
Zinc	µg/L	1	SAS	-	11	7.56	97.9	24.68
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	2	<5	6	3.83

Table 6 - 15 Gargett reservoir water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	10	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	10	<1	14	2.9
Total Coliforms	cfu/100mL	1	SAS	-	10	<1	1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	11	0.59	1.69	1.14
Total Chlorine	mg/L	0.02	SAS	≤5	11	0.66	1.8	1.22

6.6 SCHEME: KOUMALA

Table 6 - 16 Koumala treatment facility – final water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	16	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	16	<1	3	<1
Total Coliforms	cfu/100mL	1	SAS	-	16	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	16	0.41	1.42	0.94
Total Chlorine	mg/L	0.02	SAS	≤5	15	0.51	1.52	1.01
Temperature	°C	0.1	SAS	-	4	21	24.1	21.93
pH	pH unit	0 - 14	SAS	-	16	7.03	7.86	7.58
Conductivity	µS/cm	10	SAS	-	16	491.3	1,000.50	893.64
Turbidity	NTU	0.1	SAS	-	16	0.11	1.11	0.45
Dissolved Oxygen	% Sat	0 - 110	SAS	-	16	69.7	91.1	83.51
Colour - True	TCU	1	SAS	-	16	<1	6	2.42
Total Organic Carbon	mg/L	0.3	SAS	-	16	<0.3	<0.3	<0.3
Inorganic								
Alkalinity	mg/L	1	SAS	-	16	296.4	324.08	305.07
Bicarbonate	mg/L	0.1	SAS	-	16	348.01	382	358.52
Carbonate	mg/L	0.1	SAS	-	16	0.19	1.21	0.75
Hydroxide	mg/L	0.1	SAS	-	16	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	16	8.17	57.28	19.66
Fluoride	mg/L	0.01	SAS	≤1.5	16	0.12	0.2	0.17
Chloride	mg/L	0.005	SAS	-	16	100.37	137.96	119.49
Nitrate	mg/L	0.015	SAS	≤50	16	16.12	22.52	19.13
Nitrite	mg/L	0.004	SAS	≤3	16	<0.004	0.33	0.02
Bromide	mg/L	0.015	SAS	-	16	<0.015	0.11	0.03
Sulphate	mg/L	0.02	SAS	≤500	16	3.81	4.94	4.67
Phosphate	mg/L	0.015	SAS	-	16	<0.015	<0.015	<0.015
Calcium	mg/L	0.5	SAS	-	16	82.51	100.92	89.88
Potassium	mg/L	0.5	SAS	-	16	<0.5	<0.5	<0.5
Magnesium	mg/L	0.5	SAS	-	16	39.04	45.56	41.62
Sodium	mg/L	1	SAS	-	16	41.72	49.47	45.08
Hardness	mg/L	0.25	SAS	-	16	369.5	435.82	395.83
Larson Index	LI	0	SAS	-	16	0.5	0.66	0.59
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	16	<5	8.26	2.93
Antimony	µg/L	0.5	SAS	-	16	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	16	0.6	0.8	0.68
Barium	µg/L	1	SAS	≤2000	16	<1	1.45	<1
Beryllium	µg/L	0.5	SAS	≤0.06	9	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	16	16.71	26.46	21.02
Cadmium	µg/L	0.1	SAS	≤2	16	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	16	<0.1	0.21	<0.1
Cobalt	µg/L	0.2	SAS	-	16	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	16	2.51	5.03	4.29
Iron	µg/L	2	SAS	-	16	<2	2.65	<2
Lead	µg/L	0.5	SAS	≤10	16	<0.5	<0.5	<0.5
Manganese	µg/L	1	SAS	≤500	16	<1	1.91	<1
Mercury	µg/L	0.5	SAS	≤1	11	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	16	<1	1.21	<1
Nickel	µg/L	0.5	SAS	≤20	16	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	16	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	16	<0.1	<0.1	<0.1
Strontium	µg/L	1	SAS	-	16	322.93	433.6	368.45
Thallium	µg/L	0.5	SAS	-	16	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	16	<0.5	10.16	2.91
Tin	µg/L	0.5 / 1	SAS	-	16	<0.5	4.94	1.16
Titanium	µg/L	0.5	SAS	-	16	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	16	<0.5	0.73	0.58
Vanadium	µg/L	0.1	SAS	-	16	13.09	15.01	14.03
Zinc	µg/L	1	SAS	-	16	3.39	7.52	4.48
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	1	13	13	13
SVOCs								
All SVOCs	µg/L	0.0001	SAS	various	2	<0.0001	<0.0001	<0.0001

Table 6 - 17 Koumala reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	12	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	12	<1	12	2
Total Coliforms	cfu/100mL	1	SAS	-	12	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	12	0.68	1.46	0.95
Total Chlorine	mg/L	0.02	SAS	≤5	12	0.77	1.53	1.03
Temperature	°C	0.1	SAS	-	12	20.7	26.3	23.26
pH	pH unit	0 - 14	SAS	-	12	6.77	7.6	7.16
Conductivity	µS/cm	10	SAS	-	12	925	1,041.00	968.58
Turbidity	NTU	0.1	SAS	-	12	0.11	0.43	0.27
Dissolved Oxygen	% Sat	0 - 110	SAS	-	12	61.6	81.3	70.97
Colour - True	TCU	1	SAS	-	12	<1	7	2.3
Total Organic Carbon	mg/L	0.3	SAS	-	12	<0.3	0.35	<0.3
Inorganic								
Alkalinity	mg/L	1	SAS	-	12	292.72	309.74	301.96
Bicarbonate	mg/L	0.1	SAS	-	12	344.93	365.32	355.79
Carbonate	mg/L	0.1	SAS	-	12	0.1	0.66	0.28
Hydroxide	mg/L	0.1	SAS	-	12	<0.1	394.05	32.87
Free Carbon Dioxide	mg/L	0.1	SAS	-	12	14.72	104.15	48.94
Fluoride	mg/L	0.01	SAS	≤1.5	12	0.13	0.2	0.17
Chloride	mg/L	0.005	SAS	-	12	111.76	142.3	122.98
Nitrate	mg/L	0.015	SAS	≤50	12	17.26	21.11	19.25
Nitrite	mg/L	0.004	SAS	≤3	12	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	12	<0.015	0.13	0.02
Sulphate	mg/L	0.02	SAS	≤500	12	4.34	5.36	4.77
Phosphate	mg/L	0.015	SAS	-	12	<0.015	<0.015	<0.015
Calcium	mg/L	0.5	SAS	-	12	85.77	100.42	90.4
Potassium	mg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Magnesium	mg/L	0.5	SAS	-	12	39.16	45.45	41.7
Sodium	mg/L	1	SAS	-	12	42.59	49.62	45.54
Hardness	mg/L	0.25	SAS	-	12	<0.25	435.77	364.63
Larson Index	LI	0	SAS	-	12	0.55	0.69	0.61
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	12	<5	11.06	2.82
Antimony	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	12	0.62	0.75	0.69
Barium	µg/L	1	SAS	≤2000	12	<1	2.67	1.19
Beryllium	µg/L	0.5	SAS	≤0.06	6	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	12	10.21	25.14	20.44
Cadmium	µg/L	0.1	SAS	≤2	12	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	12	<0.1	0.22	<0.1
Cobalt	µg/L	0.2	SAS	-	12	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	12	3.12	7.2	4.97
Iron	µg/L	2	SAS	-	12	<2	38.19	4.68
Lead	µg/L	0.5	SAS	≤10	12	<0.5	<0.5	<0.5
Manganese	µg/L	1	SAS	≤500	12	<1	4.18	<1
Mercury	µg/L	0.5	SAS	≤1	2	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	12	<1	<1	<1
Nickel	µg/L	0.5	SAS	≤20	12	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	12	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	12	<0.1	<0.1	<0.1
Strontium	µg/L	1	SAS	-	12	317.75	411	374.51
Thallium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	12	<0.5	8.06	3.24
Tin	µg/L	0.5 / 1	SAS	-	12	<0.5	1.81	<1
Titanium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	12	<0.5	0.72	0.59
Vanadium	µg/L	0.1	SAS	-	12	13.33	15.21	14.02
Zinc	µg/L	1	SAS	-	12	4.09	7.05	5.56
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	1	<5	<5	<5

6.7 SCHEME: MACKAY

Table 6 - 18 Nebo Road WTP - final water quality data summary

* all SVOCs with the exception of those listed below

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	52	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	52	<1	4	<1
Total Coliforms	cfu/100mL	1	SAS	-	52	<1	10	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	52	1.41	1.9	1.66
Total Chlorine	mg/L	0.02	SAS	≤5	52	1.52	2.03	1.79
Temperature	°C	0.1	SAS	-	51	20	27.9	23.43
pH	pH unit	0 - 14	SAS	-	52	6.52	7.94	7.09
Conductivity	µS/cm	10	SAS	-	52	162.2	492.4	273.22
Turbidity	NTU	0.1	SAS	-	104	<0.1	0.7	0.23
Dissolved Oxygen	% Sat	0 - 110	SAS	-	51	59.5	93.4	79.02
Colour - True	TCU	1	SAS	-	52	<1	7	0.98
Total Organic Carbon	mg/L	0.3	SAS	-	52	0.42	2.48	1.12
Inorganic								
Alkalinity	mg/L	1	SAS	-	52	35.18	104.1	73.78
Bicarbonate	mg/L	0.1	SAS	-	52	41.46	122.71	86.94
Carbonate	mg/L	0.1	SAS	-	52	<0.1	0.41	<0.1
Hydroxide	mg/L	0.1	SAS	-	52	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	52	1.92	42.27	14.27
Fluoride	mg/L	0.01	SAS	≤1.5	52	<0.01	0.12	0.06
Chloride	mg/L	0.005	SAS	-	52	18.31	47.77	30.3
Nitrate	mg/L	0.015	SAS	≤50	52	0.43	9.93	1.91
Nitrite	mg/L	0.004	SAS	≤3	52	<0.004	0.07	<0.004
Bromide	mg/L	0.015	SAS	-	52	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	52	0.69	13.15	4.39
Phosphate	mg/L	0.015	SAS	-	52	<0.015	0.94	0.11
Calcium	mg/L	0.5	SAS	-	52	9.52	24.92	18.2
Potassium	mg/L	0.5	SAS	-	52	0.91	3.22	1.54
Magnesium	mg/L	0.5	SAS	-	52	3.57	12	7.83
Sodium	mg/L	1	SAS	-	52	10.28	34.77	18.65
Hardness	mg/L	0.25	SAS	-	52	38.49	110.86	77.67
Larson Index	LI	0	SAS	-	52	0.51	1.02	0.68
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	52	<5	48.72	11.76
Antimony	µg/L	0.5	SAS	-	52	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	52	<0.5	0.56	<0.5
Barium	µg/L	1	SAS	≤2000	52	8.43	32.73	23.15
Beryllium	µg/L	0.5	SAS	≤0.06	27	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	52	5.75	48.3	17.04
Cadmium	µg/L	0.1	SAS	≤2	52	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	52	<0.1	0.19	<0.1
Cobalt	µg/L	0.2	SAS	-	52	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	52	8.22	24.96	15.63
Iron	µg/L	2	SAS	-	52	<2	12.49	<2
Lead	µg/L	0.5	SAS	≤10	52	<0.5	1.83	1.04
Manganese	µg/L	1	SAS	≤500	52	<1	54.19	1.52
Mercury	µg/L	0.5	SAS	≤1	4	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	52	<1	1.93	<1
Nickel	µg/L	0.5	SAS	≤20	52	<0.5	0.58	<0.5
Selenium	µg/L	5	SAS	≤10	52	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	52	<0.1	0.15	<0.1
Strontium	µg/L	1	SAS	-	52	74.41	209.66	146.49
Thallium	µg/L	0.5	SAS	-	52	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	52	<0.5	17.53	3.42
Tin	µg/L	0.5 / 1	SAS	-	52	<0.5	5.06	<1
Titanium	µg/L	0.5	SAS	-	52	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	52	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	52	0.65	1.59	0.99
Zinc	µg/L	1	SAS	-	52	4.57	48.21	16.62
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	3	10	31	20.33
SVOCs								
All SVOCs*	µg/L	0.0001	SAS	various	12	<0.0001	<0.0001	<0.0001
Atrazine	µg/L	0.0001	SAS	≤20	12	<0.0001	0.71	0.15
Diuron	µg/L	0.0001	SAS	≤20	12	<0.0001	0.72	0.12
Hexazinone	µg/L	0.0001	SAS	≤400	12	<0.0001	0.46	0.06

Table 6 - 19 Mackay reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	365	<1	34	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	365	<1	4,200.00	57.76
Total Coliforms	cfu/100mL	1	SAS	-	365	<1	165	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	368	0.09	2.19	1.04
Total Chlorine	mg/L	0.02	SAS	≤5	368	0.13	2.28	1.14
Temperature	°C	0.1	SAS	-	362	18.9	31.8	25.11
pH	pH unit	0 - 14	SAS	-	362	6.7	9.05	7.42
Conductivity	µS/cm	10	SAS	-	362	142.5	455	258.31
Turbidity	NTU	0.1	SAS	-	362	<0.1	1.54	0.32
Dissolved Oxygen	% Sat	0 - 110	SAS	-	354	63.8	102.6	79.16
Colour - True	TCU	1	SAS	-	361	<1	18	1.58
Total Organic Carbon	mg/L	0.3	SAS	-	361	0.36	23.64	1.15
Inorganic								
Alkalinity	mg/L	1	SAS	-	362	25.6	107.34	73.19
Bicarbonate	mg/L	0.1	SAS	-	362	26.77	126.26	86.08
Carbonate	mg/L	0.1	SAS	-	362	<0.1	1.43	0.12
Hydroxide	mg/L	0.1	SAS	-	362	<0.1	0.19	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	362	<0.1	26.8	6.93
Fluoride	mg/L	0.01	SAS	≤1.5	362	<0.01	0.22	0.07
Chloride	mg/L	0.005	SAS	-	362	15.35	43.74	29.51
Nitrate	mg/L	0.015	SAS	≤50	362	0.37	9.54	1.82
Nitrite	mg/L	0.004	SAS	≤3	362	<0.004	0.15	0.01
Bromide	mg/L	0.015	SAS	-	362	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	362	0.57	11.34	3.95
Phosphate	mg/L	0.015	SAS	-	362	<0.015	2.12	0.04
Calcium	mg/L	0.5	SAS	-	362	9.7	33.36	19.82
Potassium	mg/L	0.5	SAS	-	362	0.89	2.75	1.54
Magnesium	mg/L	0.5	SAS	-	362	<0.5	11.83	7
Sodium	mg/L	1	SAS	-	362	8.78	31.33	18.02
Hardness	mg/L	0.25	SAS	-	362	33.32	121.17	78.31
Larson Index	LI	0	SAS	-	362	0.4	2.33	0.67
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	362	<5	92.19	10.69
Antimony	µg/L	0.5	SAS	-	362	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	362	<0.5	1.41	<0.5
Barium	µg/L	1	SAS	≤2000	362	6.63	31.8	22.14
Beryllium	µg/L	0.5	SAS	≤0.06	195	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	362	<5	53.32	16.01
Cadmium	µg/L	0.1	SAS	≤2	362	<0.1	0.48	<0.1
Chromium	µg/L	0.1	SAS	≤50	362	<0.1	1.11	<0.1
Cobalt	µg/L	0.2	SAS	-	362	<0.2	0.34	<0.2
Copper	µg/L	1	SAS	≤2000	362	<1	373.39	12.71
Iron	µg/L	2	SAS	-	362	<2	78.45	6.37
Lead	µg/L	0.5	SAS	≤10	362	<0.5	23.81	<0.5
Manganese	µg/L	1	SAS	≤500	362	<1	6.88	<1
Mercury	µg/L	0.5	SAS	≤1	35	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	362	<1	1.7	<1
Nickel	µg/L	0.5	SAS	≤20	362	<0.5	17.25	<0.5
Selenium	µg/L	5	SAS	≤10	362	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	362	<0.1	0.15	<0.1
Strontium	µg/L	1	SAS	-	362	65.48	550.85	163.82
Thallium	µg/L	0.5	SAS	-	362	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	362	<0.5	24.33	3.37
Tin	µg/L	0.5 / 1	SAS	-	362	<0.5	5.32	<1
Titanium	µg/L	0.5	SAS	-	362	<0.5	4.19	<0.5
Uranium	µg/L	0.5	SAS	≤17	362	<0.5	2.98	<0.5
Vanadium	µg/L	0.1	SAS	-	362	0.52	2.61	1.04
Zinc	µg/L	1	SAS	-	362	<1	732.55	16.73
Trihalomethanes								
Bromodichloromethane	µg/L	1	TWL	≤250	6	27	41	36.67
Bromoform	µg/L	5	TWL	≤250	6	<5	<5	<5
Chloroform	µg/L	1	TWL	≤250	6	32	62	46.83
Dibromochloromethane	µg/L	1	TWL	≤250	6	8	26	13.17
Trihalomethanes (Total)	µg/L	5	TWL	≤250	53	11	116	62.94

Table 6 - 20 Mackay reservoirs water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	65	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	65	<1	700	19.18
Total Coliforms	cfu/100mL	1	SAS	-	65	<1	3	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	85	0.46	1.86	1.16
Total Chlorine	mg/L	0.02	SAS	≤5	85	0.58	2.01	1.26
Temperature	°C	0.1	SAS	-	39	19.8	28.9	24.55
pH	pH unit	0 - 14	SAS	-	39	7.04	8.28	7.51
Conductivity	μS/cm	10	SAS	-	39	174.1	329	253.72
Turbidity	NTU	0.1	SAS	-	39	0.13	0.76	0.28
Dissolved Oxygen	% Sat	0 - 110	SAS	-	39	67.9	98.2	78.41
Colour - True	TCU	1	SAS	-	39	<1	8	1.27
Total Organic Carbon	mg/L	0.3	SAS	-	39	0.44	2.05	1.07
Inorganic								
Alkalinity	mg/L	1	SAS	-	39	46.2	95.28	74.18
Bicarbonate	mg/L	0.1	SAS	-	39	54.28	112.12	87.19
Carbonate	mg/L	0.1	SAS	-	39	<0.1	0.75	0.16
Hydroxide	mg/L	0.1	SAS	-	39	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	39	0.73	14.54	5.36
Fluoride	mg/L	0.01	SAS	≤1.5	39	0.03	0.1	0.07
Chloride	mg/L	0.005	SAS	-	39	15.43	41.76	29.75
Nitrate	mg/L	0.015	SAS	≤50	39	0.06	5.27	1.56
Nitrite	mg/L	0.004	SAS	≤3	39	<0.004	0.16	0.01
Bromide	mg/L	0.015	SAS	-	39	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	39	0.65	6.75	3.75
Phosphate	mg/L	0.015	SAS	-	39	<0.015	0.19	0.01
Calcium	mg/L	0.5	SAS	-	39	11.65	25.63	19.78
Potassium	mg/L	0.5	SAS	-	39	0.98	2.57	1.49
Magnesium	mg/L	0.5	SAS	-	39	3.62	11.76	7.27
Sodium	mg/L	1	SAS	-	39	11.86	23.68	18.19
Hardness	mg/L	0.25	SAS	-	39	47.57	107.84	79.34
Larson Index	LI	0	SAS	-	39	0.43	0.96	0.64
Dissolved Metals								
Aluminium	μg/L	5	SAS	-	39	<5	48.52	10.25
Antimony	μg/L	0.5	SAS	-	39	<0.5	<0.5	<0.5
Arsenic	μg/L	0.5	SAS	≤10	39	<0.5	<0.5	<0.5
Barium	μg/L	1	SAS	≤2000	39	14.09	31.63	22.89
Beryllium	μg/L	0.5	SAS	≤0.06	21	<0.5	<0.5	<0.5
Boron	μg/L	5	SAS	≤4000	39	<5	28.5	14.9
Cadmium	μg/L	0.1	SAS	≤2	39	<0.1	<0.1	<0.1
Chromium	μg/L	0.1	SAS	≤50	39	<0.1	0.38	<0.1
Cobalt	μg/L	0.2	SAS	-	39	<0.2	<0.2	<0.2
Copper	μg/L	1	SAS	≤2000	39	<1	17.81	6.63
Iron	μg/L	2	SAS	-	39	<2	32.13	3.59
Lead	μg/L	0.5	SAS	≤10	39	<0.5	1.09	<0.5
Manganese	μg/L	1	SAS	≤500	39	<1	4.47	<1
Mercury	μg/L	0.5	SAS	≤1	2	<0.5	<0.5	<0.5
Molybdenum	μg/L	1	SAS	≤50	39	<1	1.48	<1
Nickel	μg/L	0.5	SAS	≤20	39	<0.5	0.95	<0.5
Selenium	μg/L	5	SAS	≤10	39	<5	<5	<5
Silver	μg/L	0.1	SAS	≤100	39	<0.1	<0.1	<0.1
Strontium	μg/L	1	SAS	-	39	90.13	215.65	150.72
Thallium	μg/L	0.5	SAS	-	39	<0.5	<0.5	<0.5
Thorium	μg/L	0.5	SAS	-	39	<0.5	9.44	3.09
Tin	μg/L	0.5 / 1	SAS	-	39	<0.5	5.03	1.02
Titanium	μg/L	0.5	SAS	-	39	<0.5	<0.5	<0.5
Uranium	μg/L	0.5	SAS	≤17	39	<0.5	<0.5	<0.5
Vanadium	μg/L	0.1	SAS	-	39	0.64	1.64	1.02
Zinc	μg/L	1	SAS	-	39	<1	37.25	8.38
Trihalomethanes								
Trihalomethanes (Total)	μg/L	5	TWL	≤250	1	67	67	67

6.8 SCHEME: MARIAN

Table 6 - 21 Marian WTP – final water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	52	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	52	<1	6	<1
Total Coliforms	cfu/100mL	1	SAS	-	52	<1	3	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	52	1.16	1.89	1.55
Total Chlorine	mg/L	0.02	SAS	≤5	52	1.25	2.01	1.66
Temperature	°C	0.1	SAS	-	52	16.3	27.3	23.63
pH	pH unit	0 - 14	SAS	-	52	6.82	7.87	7.25
Conductivity	µS/cm	10	SAS	-	52	126.2	343	235.09
Turbidity	NTU	0.1	SAS	-	52	0.13	0.48	0.21
Dissolved Oxygen	% Sat	0 - 110	SAS	-	52	64.4	89.3	77.57
Colour - True	TCU	1	SAS	-	52	<1	6	1.32
Total Organic Carbon	mg/L	0.3	SAS	-	52	<0.3	4.68	0.89
Inorganic								
Alkalinity	mg/L	1	SAS	-	52	20.82	104.52	64.99
Bicarbonate	mg/L	0.1	SAS	-	52	24.55	123	76.53
Carbonate	mg/L	0.1	SAS	-	52	<0.1	0.21	<0.1
Hydroxide	mg/L	0.1	SAS	-	52	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	52	1.36	16.19	7.76
Fluoride	mg/L	0.01	SAS	≤1.5	52	<0.01	0.1	0.06
Chloride	mg/L	0.005	SAS	-	52	11.39	44.44	29.46
Nitrate	mg/L	0.015	SAS	≤50	52	0.06	2.41	0.61
Nitrite	mg/L	0.004	SAS	≤3	52	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	52	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	52	0.24	4.97	3.05
Phosphate	mg/L	0.015	SAS	-	52	<0.015	0.48	0.01
Calcium	mg/L	0.5	SAS	-	52	7.57	26.18	17.12
Potassium	mg/L	0.5	SAS	-	52	0.93	3.06	1.5
Magnesium	mg/L	0.5	SAS	-	52	2.12	12.58	7.34
Sodium	mg/L	1	SAS	-	52	7.14	22.98	15.55
Hardness	mg/L	0.25	SAS	-	52	27.63	115.49	72.96
Larson Index	LI	0	SAS	-	52	0.54	1.97	0.75
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	52	<5	109.92	12.3
Antimony	µg/L	0.5	SAS	-	52	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	52	<0.5	0.52	<0.5
Barium	µg/L	1	SAS	≤2000	52	20.75	36.54	27.5
Beryllium	µg/L	0.5	SAS	≤0.06	28	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	52	<5	22.38	12.8
Cadmium	µg/L	0.1	SAS	≤2	52	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	52	<0.1	0.23	<0.1
Cobalt	µg/L	0.2	SAS	-	52	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	52	<1	2.84	<1
Iron	µg/L	2	SAS	-	52	<2	69.44	2.7
Lead	µg/L	0.5	SAS	≤10	52	<0.5	<0.5	<0.5
Manganese	µg/L	1	SAS	≤500	52	<1	3.16	<1
Mercury	µg/L	0.5	SAS	≤1	5	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	52	<1	1.7	<1
Nickel	µg/L	0.5	SAS	≤20	52	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	52	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	52	<0.1	0.21	<0.1
Strontium	µg/L	1	SAS	-	52	64.02	209.25	135.7
Thallium	µg/L	0.5	SAS	-	52	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	52	<0.5	12.01	2.99
Tin	µg/L	0.5 / 1	SAS	-	52	<0.5	4.87	<1
Titanium	µg/L	0.5	SAS	-	52	<0.5	3.42	<0.5
Uranium	µg/L	0.5	SAS	≤17	52	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	52	0.14	1.89	0.9
Zinc	µg/L	1	SAS	-	52	<1	4.66	<1
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	3	8	30	20.33
SVOCs								
All SVOCs	µg/L	0.0001	SAS	various	12	<0.0001	<0.0001	<0.0001

Table 6 - 22 Marian reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	206	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	206	<1	136	2.37
Total Coliforms	cfu/100mL	1	SAS	-	206	<1	6	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	206	0.36	1.62	1.08
Total Chlorine	mg/L	0.02	SAS	≤5	206	0.47	1.73	1.18
Temperature	°C	0.1	SAS	-	206	20.4	29.7	24.92
pH	pH unit	0 - 14	SAS	-	206	6.66	7.97	7.25
Conductivity	µS/cm	10	SAS	-	206	128.8	388	244.75
Turbidity	NTU	0.1	SAS	-	206	<0.1	0.59	0.26
Dissolved Oxygen	% Sat	0 - 110	SAS	-	206	65.4	90.3	80.63
Colour - True	TCU	1	SAS	-	206	<1	8	1.57
Total Organic Carbon	mg/L	0.3	SAS	-	206	<0.3	1.68	0.77
Inorganic								
Alkalinity	mg/L	1	SAS	-	206	29.64	111.7	66.47
Bicarbonate	mg/L	0.1	SAS	-	206	34.95	131.6	78.28
Carbonate	mg/L	0.1	SAS	-	206	<0.1	0.44	<0.1
Hydroxide	mg/L	0.1	SAS	-	206	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	206	1.3	29.1	8.35
Fluoride	mg/L	0.01	SAS	≤1.5	206	<0.01	0.11	0.06
Chloride	mg/L	0.005	SAS	-	206	13.82	47.26	30.23
Nitrate	mg/L	0.015	SAS	≤50	206	0.04	11.38	1.31
Nitrite	mg/L	0.004	SAS	≤3	206	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	206	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	206	0.23	5.04	3.08
Phosphate	mg/L	0.015	SAS	-	206	<0.015	1.07	0.03
Calcium	mg/L	0.5	SAS	-	206	6.54	29.86	18.08
Potassium	mg/L	0.5	SAS	-	206	0.89	3.49	1.45
Magnesium	mg/L	0.5	SAS	-	206	1.61	13.58	7.35
Sodium	mg/L	1	SAS	-	206	8.68	25.46	16.03
Hardness	mg/L	0.25	SAS	-	206	23.44	130.46	75.4
Larson Index	LI	0	SAS	-	206	0.43	1.06	0.74
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	206	<5	36.81	11.19
Antimony	µg/L	0.5	SAS	-	207	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	207	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	207	11.23	58.48	25.26
Beryllium	µg/L	0.5	SAS	≤0.06	111	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	206	<5	20.1	12.48
Cadmium	µg/L	0.1	SAS	≤2	207	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	206	<0.1	0.41	<0.1
Cobalt	µg/L	0.2	SAS	-	207	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	207	<1	267.48	14.96
Iron	µg/L	2	SAS	-	207	<2	23.86	2.81
Lead	µg/L	0.5	SAS	≤10	207	<0.5	9.72	0.88
Manganese	µg/L	1	SAS	≤500	207	<1	2.18	<1
Mercury	µg/L	0.5	SAS	≤1	11	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	207	<1	1.7	<1
Nickel	µg/L	0.5	SAS	≤20	207	<0.5	1.55	<0.5
Selenium	µg/L	5	SAS	≤10	207	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	207	<0.1	0.51	<0.1
Strontium	µg/L	1	SAS	-	207	64.18	260.95	147.02
Thallium	µg/L	0.5	SAS	-	207	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	206	<0.5	12.34	2.91
Tin	µg/L	0.5 / 1	SAS	-	207	<0.5	4.92	<1
Titanium	µg/L	0.5	SAS	-	206	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	206	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	206	0.29	2.5	1.07
Zinc	µg/L	1	SAS	-	207	<1	126.54	12.31
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	4	46	67	54.5

Table 6 - 23 Marian reservoirs water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	7	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	7	<1	5	1.29
Total Coliforms	cfu/100mL	1	SAS	-	7	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	13	0.84	1.7	1.18
Total Chlorine	mg/L	0.02	SAS	≤5	13	0.93	1.84	1.28

6.9 SCHEME: MIDGE POINT

Table 6 - 24 Midge Point treatment facility - final water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	4	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	4	<1	4	1.25
Total Coliforms	cfu/100mL	1	SAS	-	4	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	4	1.42	1.98	1.7
Total Chlorine	mg/L	0.02	SAS	≤5	4	1.51	2.07	1.78
Temperature	°C	0.1	SAS	-	4	21.2	25.2	23.65
pH	pH unit	0 - 14	SAS	-	4	6.52	7.5	6.91
Conductivity	µS/cm	10	SAS	-	4	301	402	337.5
Turbidity	NTU	0.1	SAS	-	4	0.27	1.57	0.71
Dissolved Oxygen	% Sat	0 - 110	SAS	-	4	61.3	79.3	70.43
Colour - True	TCU	1	SAS	-	4	<1	3	1.33
Total Organic Carbon	mg/L	0.3	SAS	-	4	1.82	2.44	2.1
Inorganic								
Alkalinity	mg/L	1	SAS	-	4	63.4	71.08	67.47
Bicarbonate	mg/L	0.1	SAS	-	4	74.58	83.86	79.53
Carbonate	mg/L	0.1	SAS	-	4	<0.1	0.11	<0.1
Hydroxide	mg/L	0.1	SAS	-	4	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	4	4	42.92	22.97
Fluoride	mg/L	0.01	SAS	≤1.5	4	<0.01	0.12	0.07
Chloride	mg/L	0.005	SAS	-	4	47.17	77.93	59.59
Nitrate	mg/L	0.015	SAS	≤50	4	<0.015	0.36	0.21
Nitrite	mg/L	0.004	SAS	≤3	4	<0.004	0.09	0.02
Bromide	mg/L	0.015	SAS	-	4	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	4	0.76	1.92	1.34
Phosphate	mg/L	0.015	SAS	-	4	<0.015	0.2	0.05
Calcium	mg/L	0.5	SAS	-	4	17.76	24.09	19.48
Potassium	mg/L	0.5	SAS	-	4	1.89	2.51	2.19
Magnesium	mg/L	0.5	SAS	-	4	7.75	10.69	8.74
Sodium	mg/L	1	SAS	-	4	26.82	35.33	30.7
Hardness	mg/L	0.25	SAS	-	4	76.25	104.14	84.64
Larson Index	LI	0	SAS	-	4	1	1.63	1.31
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	4	<5	<5	<5
Antimony	µg/L	0.5	SAS	-	4	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	4	<0.5	<0.5	<0.5
Barium	µg/L	1	SAS	≤2000	4	24	40.47	30.51
Beryllium	µg/L	0.5	SAS	≤0.06	2	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	4	24	30.1	26.83
Cadmium	µg/L	0.1	SAS	≤2	4	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	4	<0.1	0.15	<0.1
Cobalt	µg/L	0.2	SAS	-	4	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	4	8.78	73.63	51.6
Iron	µg/L	2	SAS	-	4	<2	2.97	<2
Lead	µg/L	0.5	SAS	≤10	4	<0.5	0.76	<0.5
Manganese	µg/L	1	SAS	≤500	4	1.95	4.55	3.1
Mercury	µg/L	0.5	SAS	≤1	2	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	4	<1	<1	<1
Nickel	µg/L	0.5	SAS	≤20	4	<0.5	0.55	<0.5
Selenium	µg/L	5	SAS	≤10	4	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	4	<0.1	0.1	<0.1
Strontium	µg/L	1	SAS	-	4	173.72	259.72	197.66
Thallium	µg/L	0.5	SAS	-	4	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	4	<0.5	4.81	3.02
Tin	µg/L	0.5 / 1	SAS	-	4	<1	2.66	1.02
Titanium	µg/L	0.5	SAS	-	4	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	4	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	4	0.16	0.31	0.24
Zinc	µg/L	1	SAS	-	4	12.9	21.93	19.32
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	2	60	63	61.5
SVOCs								
All SVOCs	µg/L	0.0001	SAS	various	2	<0.0001	<0.0001	<0.0001

Table 6 - 25 Midge Point reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	77	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	77	<1	2,000.00	59.64
Total Coliforms	cfu/100mL	1	SAS	-	77	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	77	0.02	2.3	1.04
Total Chlorine	mg/L	0.02	SAS	≤5	77	0.02	2.4	1.13
Temperature	°C	0.1	SAS	-	77	21.6	28.9	24.62
pH	pH unit	0 - 14	SAS	-	77	7.11	8.62	7.9
Conductivity	µS/cm	10	SAS	-	77	309	470	391.87
Turbidity	NTU	0.1	SAS	-	77	0.16	2.64	0.48
Dissolved Oxygen	% Sat	0 - 110	SAS	-	77	44.6	92.9	64.92
Colour - True	TCU	1	SAS	-	77	<1	12	1.89
Total Organic Carbon	mg/L	0.3	SAS	-	77	<0.3	2.51	1.78
Inorganic								
Alkalinity	mg/L	1	SAS	-	77	87.4	108.8	95.51
Bicarbonate	mg/L	0.1	SAS	-	77	101.02	126.55	111.5
Carbonate	mg/L	0.1	SAS	-	77	<0.1	2.12	0.59
Hydroxide	mg/L	0.1	SAS	-	77	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	77	0.43	14.63	3.4
Fluoride	mg/L	0.01	SAS	≤1.5	77	0.04	0.15	0.09
Chloride	mg/L	0.005	SAS	-	77	42.02	80.09	60.19
Nitrate	mg/L	0.015	SAS	≤50	77	<0.015	0.58	0.34
Nitrite	mg/L	0.004	SAS	≤3	77	<0.004	0.23	0.01
Bromide	mg/L	0.015	SAS	-	77	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	77	0.68	2.44	1.47
Phosphate	mg/L	0.015	SAS	-	77	<0.015	1.09	0.05
Calcium	mg/L	0.5	SAS	-	77	30.62	45.68	36.55
Potassium	mg/L	0.5	SAS	-	77	2.05	2.93	2.41
Magnesium	mg/L	0.5	SAS	-	77	3.98	10.41	6.43
Sodium	mg/L	1	SAS	-	77	25.95	39.22	31.58
Hardness	mg/L	0.25	SAS	-	77	92.96	149.44	117.75
Larson Index	LI	0	SAS	-	77	0.66	1.22	0.94
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	77	<5	23.33	8.64
Antimony	µg/L	0.5	SAS	-	77	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	77	<0.5	0.75	<0.5
Barium	µg/L	1	SAS	≤2000	77	17.72	38.17	25.49
Beryllium	µg/L	0.5	SAS	≤0.06	42	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	77	19.91	43.01	27.88
Cadmium	µg/L	0.1	SAS	≤2	77	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	77	<0.1	0.36	0.23
Cobalt	µg/L	0.2	SAS	-	77	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	77	<1	4.58	1.4
Iron	µg/L	2	SAS	-	77	<2	19.15	2.94
Lead	µg/L	0.5	SAS	≤10	77	<0.5	<0.5	<0.5
Manganese	µg/L	1	SAS	≤500	77	<1	1.85	<1
Mercury	µg/L	0.5	SAS	≤1	3	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	77	<1	1.8	<1
Nickel	µg/L	0.5	SAS	≤20	77	<0.5	8.31	<0.5
Selenium	µg/L	5	SAS	≤10	77	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	77	<0.1	0.11	<0.1
Strontium	µg/L	1	SAS	-	77	173.37	294.43	218.11
Thallium	µg/L	0.5	SAS	-	77	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	77	<0.5	23.68	3.67
Tin	µg/L	0.5 / 1	SAS	-	77	<0.5	4.88	<1
Titanium	µg/L	0.5	SAS	-	77	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	77	<0.5	1.69	<0.5
Vanadium	µg/L	0.1	SAS	-	77	0.44	1.26	0.81
Zinc	µg/L	1	SAS	-	77	<1	6.67	1.98
Trihalomethanes								
Trihalomethanes (Total)	µg/L	5	TWL	≤250	3	70	133	105.33
SVOCs								
All SVOCs	µg/L	0.0001	SAS	various	3	<0.0001	<0.0001	<0.0001

Table 6 - 26 Midge Point reservoir water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	12	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	12	<1	44	8.08
Total Coliforms	cfu/100mL	1	SAS	-	12	<1	1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	12	0.02	1.15	0.31
Total Chlorine	mg/L	0.02	SAS	≤5	12	0.03	1.24	0.37
Temperature	°C	0.1	SAS	-	12	23	28	24.98
pH	pH unit	0 - 14	SAS	-	12	7.22	8.24	7.66
Conductivity	µS/cm	10	SAS	-	12	333	450	391.08
Turbidity	NTU	0.1	SAS	-	12	0.29	1.4	0.6
Dissolved Oxygen	% Sat	0 - 110	SAS	-	12	51.7	75.8	63.92
Colour - True	TCU	1	SAS	-	12	<1	4	1.33
Total Organic Carbon	mg/L	0.3	SAS	-	12	1.46	2.24	1.75
Inorganic								
Alkalinity	mg/L	1	SAS	-	12	87.8	103	92.99
Bicarbonate	mg/L	0.1	SAS	-	12	103.16	121.32	109.06
Carbonate	mg/L	0.1	SAS	-	12	<0.1	0.87	0.32
Hydroxide	mg/L	0.1	SAS	-	12	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	12	1.02	10.87	5.52
Fluoride	mg/L	0.01	SAS	≤1.5	12	0.06	0.13	0.1
Chloride	mg/L	0.005	SAS	-	12	47.67	77.47	62.19
Nitrate	mg/L	0.015	SAS	≤50	12	<0.015	0.54	0.3
Nitrite	mg/L	0.004	SAS	≤3	12	<0.004	<0.004	<0.004
Bromide	mg/L	0.015	SAS	-	12	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	12	0.92	2.67	1.65
Phosphate	mg/L	0.015	SAS	-	12	<0.015	<0.015	<0.015
Calcium	mg/L	0.5	SAS	-	12	31.66	40.76	34.84
Potassium	mg/L	0.5	SAS	-	12	2.03	2.8	2.43
Magnesium	mg/L	0.5	SAS	-	12	4.67	9.7	6.89
Sodium	mg/L	1	SAS	-	12	27.81	37.01	32.22
Hardness	mg/L	0.25	SAS	-	12	100.63	141.71	115.37
Larson Index	LI	0	SAS	-	12	0.74	1.17	1
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	12	<5	10.83	7.61
Antimony	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	12	<0.5	0.76	<0.5
Barium	µg/L	1	SAS	≤2000	12	19.24	36.87	26.29
Beryllium	µg/L	0.5	SAS	≤0.06	5	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	12	20.74	29.66	25.23
Cadmium	µg/L	0.1	SAS	≤2	12	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	12	0.17	0.46	0.29
Cobalt	µg/L	0.2	SAS	-	12	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	12	<1	2.95	1.43
Iron	µg/L	2	SAS	-	12	<2	2.99	<2
Lead	µg/L	0.5	SAS	≤10	12	<0.5	<0.5	<0.5
Manganese	µg/L	1	SAS	≤500	12	<1	<1	<1
Mercury	µg/L	0.5	SAS	≤1	1	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	12	<1	1.37	<1
Nickel	µg/L	0.5	SAS	≤20	12	<0.5	1.17	<0.5
Selenium	µg/L	5	SAS	≤10	12	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	12	<0.1	0.12	<0.1
Strontium	µg/L	1	SAS	-	12	177	289.79	219.45
Thallium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	12	<0.5	9.06	3.82
Tin	µg/L	0.5 / 1	SAS	-	12	<0.5	2.42	<1
Titanium	µg/L	0.5	SAS	-	12	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	12	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	12	0.48	1.17	0.76
Zinc	µg/L	1	SAS	-	12	<1	3.56	2.04

6.10 SCHEME: SARINA

Table 6 - 27 Sarina reticulation water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	114	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	113	<1	52	3.61
Total Coliforms	cfu/100mL	1	SAS	-	114	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	113	0.23	3.04	1.21
Total Chlorine	mg/L	0.02	SAS	≤5	112	0.3	3.3	1.32
Temperature	°C	0.1	SAS	-	101	19	31.3	25.08
pH	pH unit	0 - 14	SAS	-	113	6.76	8.82	7.65
Conductivity	µS/cm	10	SAS	-	113	112.6	24,209.00	493
Turbidity	NTU	0.1	SAS	-	113	<0.1	4.85	0.34
Dissolved Oxygen	% Sat	0 - 110	SAS	-	113	64.9	99.7	81.33
Colour - True	TCU	1	SAS	-	113	<1	19	1.64
Total Organic Carbon	mg/L	0.3	SAS	-	113	0.38	2.49	1.09
Inorganic								
Alkalinity	mg/L	1	SAS	-	113	40.2	293.18	82.47
Bicarbonate	mg/L	0.1	SAS	-	113	45.37	345.79	96.7
Carbonate	mg/L	0.1	SAS	-	113	<0.1	2.45	0.28
Hydroxide	mg/L	0.1	SAS	-	113	<0.1	0.11	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	113	0.18	92.88	6.73
Fluoride	mg/L	0.01	SAS	≤1.5	113	<0.01	0.11	0.06
Chloride	mg/L	0.005	SAS	-	113	16.8	72.25	31.6
Nitrate	mg/L	0.015	SAS	≤50	113	0.29	12.55	2.06
Nitrite	mg/L	0.004	SAS	≤3	113	<0.004	0.1	<0.004
Bromide	mg/L	0.015	SAS	-	113	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	113	0.62	11.21	4.18
Phosphate	mg/L	0.015	SAS	-	113	<0.015	1.85	0.1
Calcium	mg/L	0.5	SAS	-	113	11.36	50.96	21.95
Potassium	mg/L	0.5	SAS	-	113	0.96	2.81	1.62
Magnesium	mg/L	0.5	SAS	-	113	2.69	29.1	7.46
Sodium	mg/L	1	SAS	-	113	9.61	75.01	20.26
Hardness	mg/L	0.25	SAS	-	113	39.46	247.08	85.55
Larson Index	LI	0	SAS	-	113	0.36	1.09	0.64
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	113	5.18	48.89	17.67
Antimony	µg/L	0.5	SAS	-	113	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	113	<0.5	0.59	<0.5
Barium	µg/L	1	SAS	≤2000	113	8.99	32.68	21.6
Beryllium	µg/L	0.5	SAS	≤0.06	62	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	113	<5	35.04	15.99
Cadmium	µg/L	0.1	SAS	≤2	113	<0.1	0.13	<0.1
Chromium	µg/L	0.1	SAS	≤50	113	<0.1	1.38	0.2
Cobalt	µg/L	0.2	SAS	-	113	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	113	<1	24.24	3.07
Iron	µg/L	2	SAS	-	113	<2	24.74	2.02
Lead	µg/L	0.5	SAS	≤10	113	<0.5	1.39	<0.5
Manganese	µg/L	1	SAS	≤500	113	<1	2.16	<1
Mercury	µg/L	0.5	SAS	≤1	13	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	113	<1	1.97	<1
Nickel	µg/L	0.5	SAS	≤20	113	<0.5	5.84	<0.5
Selenium	µg/L	5	SAS	≤10	113	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	113	<0.1	0.37	<0.1
Strontium	µg/L	1	SAS	-	113	69.87	425.36	153.37
Thallium	µg/L	0.5	SAS	-	113	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	113	<0.5	12.47	3.23
Tin	µg/L	0.5 / 1	SAS	-	113	<0.5	5.78	<1
Titanium	µg/L	0.5	SAS	-	113	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	113	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	113	0.75	14.56	1.47
Zinc	µg/L	1	SAS	-	113	<1	138.64	3.33
Trihalomethanes								
Bromodichloromethane	µg/L	1	TWL	≤250	2	34	42	38
Bromoform	µg/L	5	TWL	≤250	2	<5	<5	<5
Chloroform	µg/L	1	TWL	≤250	2	42	98	70
Dibromochloromethane	µg/L	1	TWL	≤250	2	11	13	12
Trihalomethanes (Total)	µg/L	5	TWL	≤250	14	32	152	73.43

Table 6 - 28 Sarina reservoir water quality data summary

ANALYTE	UNIT OF MEASURE	LIMIT OF REPORTING	LABORATORY NAME	ADWG HEALTH VALUE	NUMBER OF SAMPLES TAKEN	MINIMUM	MAXIMUM	MEAN
Microbiological								
<i>E. coli</i>	MPN/100mL	1	SAS	0	17	<1	<1	<1
Heterotrophic Plate Count	cfu/mL	1	SAS	-	17	<1	45	4.82
Total Coliforms	cfu/100mL	1	SAS	-	17	<1	<1	<1
Physical								
Free Chlorine Residual	mg/L	0.02	SAS	-	19	0.24	1.62	0.94
Total Chlorine	mg/L	0.02	SAS	≤5	18	0.34	1.71	1.07
Temperature	°C	0.1	SAS	-	1	24.9	24.9	24.9
pH	pH unit	0 - 14	SAS	-	13	7.84	8.32	8.12
Conductivity	µS/cm	10	SAS	-	13	108.4	525	287.42
Turbidity	NTU	0.1	SAS	-	13	0.11	4.28	0.79
Dissolved Oxygen	% Sat	0 - 110	SAS	-	13	73.4	99.3	91.14
Colour - True	TCU	1	SAS	-	13	<1	5	1.54
Total Organic Carbon	mg/L	0.3	SAS	-	13	0.59	1.78	0.96
Inorganic								
Alkalinity	mg/L	1	SAS	-	13	55.4	181.56	94.51
Bicarbonate	mg/L	0.1	SAS	-	13	64.18	212.84	110.13
Carbonate	mg/L	0.1	SAS	-	13	0.44	1.1	0.67
Hydroxide	mg/L	0.1	SAS	-	13	<0.1	<0.1	<0.1
Free Carbon Dioxide	mg/L	0.1	SAS	-	13	0.6	5.21	1.61
Fluoride	mg/L	0.01	SAS	≤1.5	13	0.04	0.1	0.07
Chloride	mg/L	0.005	SAS	-	13	18.93	49.01	34.07
Nitrate	mg/L	0.015	SAS	≤50	13	0.44	7.33	2.64
Nitrite	mg/L	0.004	SAS	≤3	13	<0.004	0.14	0.01
Bromide	mg/L	0.015	SAS	-	13	<0.015	<0.015	<0.015
Sulphate	mg/L	0.02	SAS	≤500	13	2.62	7.69	4.44
Phosphate	mg/L	0.015	SAS	-	13	<0.015	<0.015	<0.015
Calcium	mg/L	0.5	SAS	-	13	15	34.24	23.34
Potassium	mg/L	0.5	SAS	-	13	0.93	2.63	1.44
Magnesium	mg/L	0.5	SAS	-	13	4.46	17.77	9.1
Sodium	mg/L	1	SAS	-	13	14.2	46.13	23.74
Hardness	mg/L	0.25	SAS	-	13	55.82	158.41	95.76
Larson Index	LI	0	SAS	-	13	0.44	0.94	0.61
Dissolved Metals								
Aluminium	µg/L	5	SAS	-	13	<5	24.47	11.74
Antimony	µg/L	0.5	SAS	-	13	<0.5	<0.5	<0.5
Arsenic	µg/L	0.5	SAS	≤10	13	<0.5	0.51	<0.5
Barium	µg/L	1	SAS	≤2000	13	14.91	31.35	21.75
Beryllium	µg/L	0.5	SAS	≤0.06	7	<0.5	<0.5	<0.5
Boron	µg/L	5	SAS	≤4000	13	10.53	25.84	17.52
Cadmium	µg/L	0.1	SAS	≤2	13	<0.1	<0.1	<0.1
Chromium	µg/L	0.1	SAS	≤50	13	<0.1	0.32	0.18
Cobalt	µg/L	0.2	SAS	-	13	<0.2	<0.2	<0.2
Copper	µg/L	1	SAS	≤2000	13	<1	3.31	<1
Iron	µg/L	2	SAS	-	13	<2	3.67	<2
Lead	µg/L	0.5	SAS	≤10	13	<0.5	0.55	<0.5
Manganese	µg/L	1	SAS	≤500	13	<1	2.69	<1
Mercury	µg/L	0.5	SAS	≤1	9	<0.5	<0.5	<0.5
Molybdenum	µg/L	1	SAS	≤50	13	<1	1.35	<1
Nickel	µg/L	0.5	SAS	≤20	13	<0.5	<0.5	<0.5
Selenium	µg/L	5	SAS	≤10	13	<5	<5	<5
Silver	µg/L	0.1	SAS	≤100	13	<0.1	<0.1	<0.1
Strontium	µg/L	1	SAS	-	13	102.85	281.57	170.79
Thallium	µg/L	0.5	SAS	-	13	<0.5	<0.5	<0.5
Thorium	µg/L	0.5	SAS	-	13	<0.5	10.51	4.2
Tin	µg/L	0.5 / 1	SAS	-	13	<0.5	4.96	1.33
Titanium	µg/L	0.5	SAS	-	13	<0.5	<0.5	<0.5
Uranium	µg/L	0.5	SAS	≤17	13	<0.5	<0.5	<0.5
Vanadium	µg/L	0.1	SAS	-	13	0.84	8	2.35
Zinc	µg/L	1	SAS	-	13	<1	2.88	<1

7. CAPITAL UPGRADES

7.1 MT PLEASANT RESERVOIR REFURBISHMENT

The \$2.3 million Mt Pleasant Refurbishment Project was completed in May 2018. The project involved the refurbishment of one of three approximately 18 ML Mt Pleasant Reservoirs. The reservoir that was refurbished was constructed in the 1960s.

The project was announced the winner of the Asset Management Category at the 2018 Institute of Public Works Engineering Australasia Queensland (IPWEAQ) Excellence Awards and was also a Project Innovation finalist at the 2018 Australian Water Association Queensland Branch Awards.

7.2 NEW ETON PRODUCTION BORE INSTALLATION

The Eton water supply scheme has historically sourced water from two rural groundwater bores (Eton Bore 1 and Eton Bore 2). Eton Bore 2 was in use up until 2016 when high uranium levels were discovered in water from the bore. Eton Bore 1 had been supplying the Eton scheme since this time.

A new groundwater bore, Eton Bore 3 was installed in May 2018. In September 2018, Eton Bore 3 replaced Eton Bore 1 as the sole groundwater supply to the Eton scheme. Water quality results confirm water from Eton Bore 3 complies with Australian Drinking Water Guideline (ADWG) health guideline values.

7.3 ETON TREATMENT FACILITY UPGRADE

In June 2018, council awarded the contract to CRS Water to supply and install a new water treatment and softening plant for Eton residents. In October 2018, CRS Water commenced the fit out of the containerised process plant at their workshop in Sydney. The upgraded treatment facility will come online in early 2019.

7.4 MRC WATER LABORATORY RELOCATION

MRC Scientific and Analytical Services is an established, National Association of Testing Authority (NATA) accredited environmental laboratory focused on sampling and analysing water quality. The laboratory is currently located within the Nebo Road WTP. In FY 2017 – 2018 Council decided to relocate the laboratory to a much larger space at Connors Road, Paget

The fit out for the new laboratory is scheduled to be completed in FY 2018 – 2019.

8. INCIDENTS REPORTED TO THE REGULATOR

MRC's DWQMP has been approved through an information notice given under the *Water Supply (Safety and Reliability) Act 2008*. As per the standard conditions of the notice, MRC are required to notify non-compliance with ADWG health guideline values to the regulator. A non-compliance with ADWG health guideline values is deemed a drinking water incident.

Details of drinking water incidents reported by MRC to the regulator in the FY 2017 – 2018 have been tabulated in Table 8 - 1.

Table 8 - 1 Drinking water incidents reported in the FY 2017 – 2018

DATE OF INCIDENT	SCHEME	SCHEME COMPONENT	PARAMETER	INCIDENT DETAILS AND ACTION TAKEN
July 24, 2017	Mackay	Mackay reticulation	<i>E. coli</i>	<p><i>E. coli</i> was detected in a sample collected from McEwens Beach as part of the routine drinking water monitoring program.</p> <p>It is believed the <i>E. coli</i> detection was due to frogs found within the sample tap. In response to this incident a plug was installed at the sample tap to ensure no frogs could make their way back in.</p>
October 4, 2017	Mackay	Mackay reticulation	Lead	<p>Lead was detected at a concentration above the ADWG health guideline in a sample collected from Seaforth as part of the routine drinking water monitoring program.</p> <p>Sample tap deterioration was deemed to be the cause of the high lead result. The sample tap has since been replaced and a sample tap cover installed as part of MRC's drinking water sample point refurbishment program.</p>
February 26, 2018	Mackay	Mackay reticulation	Lead	<p>Lead was detected at a concentration above the ADWG health guideline in a sample collected from McEwens Beach as part of the routine drinking water monitoring program.</p> <p>Sample tap deterioration was deemed to be the cause of the high lead result. The sample tap has since been replaced.</p>

9. CUSTOMER COMPLAINTS

MRC provides treated water services to more than 100,000 customers across its ten water supply schemes. Occasionally customers experience issues with their water supply and contact MRC. Any issue raised by the community is investigated to determine the likely cause and, if required, corrective actions are taken. Customer issues and corrective actions are recorded by MRC's Customer Service Centre.

Some issues with water quality and supply relate to maintenance work undertaken within the water supply system. Where customers are likely to be affected by planned maintenance activities, MRC endeavours to notify customers in advance. Customers are urged to contact MRC's 24-hour Customer Service Centre on 1300 MACKAY (1300 622 529) if they have any queries or concerns regarding water supply or quality.

During FY 2017 – 2018 a total of 270 complaints were received, representing a 6% increase compared to the number of complaints received in FY 2016 – 2017. Of the 270 complaints, 28% related to dirty/cloudy water. A summary of the complaint types received in FY 2017 – 2018 are detailed in Table 9 - 1 and Figure 9 - 1.

Table 9 - 1 Summary of FY 2017 – 2018 water complaints

COMPLAINT TYPE	NUMBER OF COMPLAINTS	COMMENTS
Alleged illness due to water	3*	Very rarely customers raise concerns that an alleged illness has been caused by drinking water. These types of complaints are taken very seriously and are investigated thoroughly. As part of these investigations drinking water samples are often collected and tested at Mackay Regional Council Scientific and Analytical Services (a NATA accredited laboratory) to ensure compliance with the Australian Drinking Water Guidelines.
No supply	83	Interruptions to water supply may occur for some customers as part of scheduled maintenance work. In these instances, customers will be notified in advance. Interruptions to water supply outside of scheduled maintenance work periods are investigated and necessary repair work undertaken as soon as possible.
Dirty/cloudy	75	Dirty / discoloured water is often associated with maintenance work but may also be related to internal plumbing. Dirty / discoloured water caused by maintenance work generally clears within a short period, however if a customer continues to experience problems MRC may flush the mains to clear the water. Occasionally, drinking water may have a slight brown tinge to it. This is largely due to elevated concentrations of iron and manganese. There is no cause for alarm as the water is still perfectly safe to drink. Drinking water may sometimes appear cloudy due to air bubbles generated by the flushing of mains, hot water units or aerators on taps. This is not harmful in any way. The appearance of the water may range from a light cloudiness to a very milky/ opaque colour. After a while, the bubbles will disperse and the water will become clear. If this does not occur or if there are concerns, the customer is invited to contact MRC for further advice.
Odour/taste	13	Odour / taste enquiries are investigated individually. These problems are usually short-term. MRC will sometimes flush the mains in response to an odour / taste complaint and will sometimes arrange for sample collection and testing at Mackay Regional Council Scientific and Analytical Services to ensure compliance with the Australian Drinking Water Guidelines.

* these claims were not substantiated

COMPLAINT TYPE	NUMBER OF COMPLAINTS	COMMENTS
Pressure	96	<p>During normal operating periods, water will be provided to the meter at a pressure of 22 m of head (220 kPA), and at rate of 20 L/min.</p> <p>Properties that are part of a Tank Replenishment Scheme are subject to different water service conditions, particularly pressure of supply.</p> <p>Water pressure issues may be caused by water meter problems, internal plumbing issues at the customer's property or blockages within water meters or mains.</p> <p>MRC will often undertake pressure testing in response to a pressure complaint. Actions taken to rectify water pressure problems can include clearance of blockages and repair/replacement of water infrastructure.</p>
TOTAL	270	

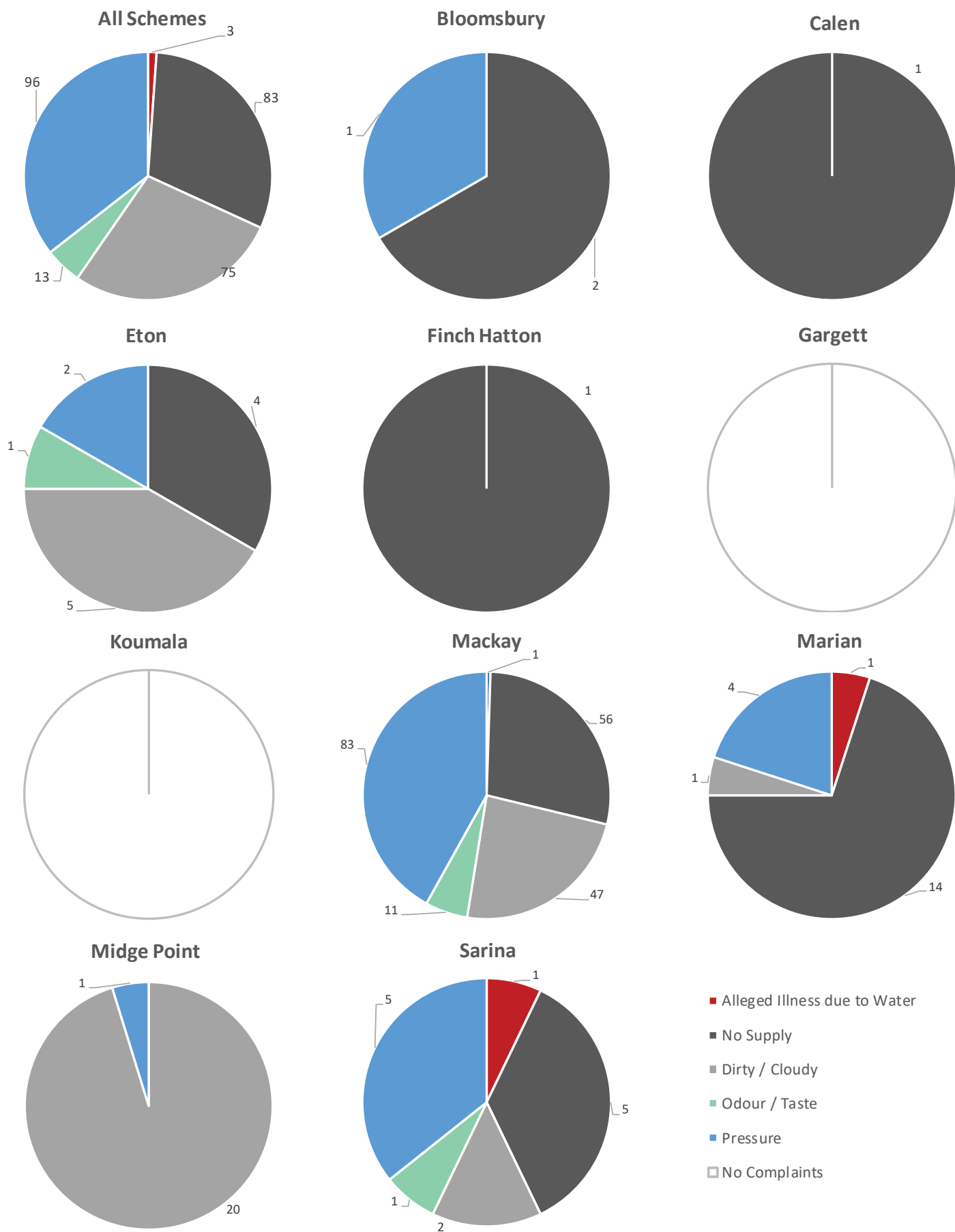


Figure 9 - 1 Summary of FY 2017 – 2018 water complaints



10. DWQMP IMPLEMENTATION

A key part of a DWQMP is the identification and assessment of the hazards that may affect water quality. A detailed drinking water quality risk assessment was undertaken for MRC in November 2010. The latest risk assessment update was undertaken in August 2018, following a risk review workshop facilitated by City Water Technology. The results of the risk assessment process give an indication of the types of risks that need to be managed across the service. The Risk Management Improvement Program (RMIP) is a mechanism used to demonstrate how the risks will be managed.

MRC's RMIP was re-written in August 2018 so that it corresponded to the updated risk assessment. This RMIP was submitted to the regulator in August 2018 as part of MRC's DWQMP amendment application. The RMIP has since been updated to include a target date for completion, a status update and an allocation of responsibility for each improvement action. The updated RMIP is provided as Appendix 1.

11. DWQMP REVIEW OUTCOMES

A review of the DWQMP was conducted during the FY 2017 – 2018. The purpose of the review was to ensure that the DWQMP remains relevant, having regard to the operation of the drinking water service.

A summary of the review outcomes and actions is provided in Table 11 - 1.

The review indicated that the DWQMP required amendment to reflect minor changes in the management of the drinking water supply schemes. An amended DWQMP was submitted to the regulator August 10, 2018.

Table 11 - 1 DWQMP Review Outcomes

REVIEW COMPONENT	FINDINGS	OUTCOMES	STATUS OF ACTIONS	RESPONSIBLE OFFICER / POSITION
Service description	No changes	Not applicable	Not applicable	
Details of infrastructure	<p>The Sarina WTP has been decommissioned.</p> <p>Marwood Bores are no longer in use.</p> <p>Fluoridation is no longer undertaken at any of the water supply schemes.</p>	<p>References to the operation of Sarina WTP in the approved DWQMP need to be removed.</p> <p>References to the use of Marwood Bores in the approved DWQMP need to be updated to reflect the fact the bores are no longer in use. The Sarina water supply scheme schematic layout needs to be updated to remove the Sarina WTP component and a note needs to be added to indicate the Marwood Bores are no longer in use.</p> <p>References to the use of fluoridation in the approved DWQMP need to be removed. The fluoride chemical treatment parts of the process schematics for Nebo Road WTP, Marian WTP and Sarina WTP need to be removed.</p>	<p>The Sarina scheme description and schematic layout has been updated.</p> <p>References to the use of fluoridation have been removed.</p> <p>The process schematics for Nebo Road WTP, Marian WTP and Sarina WTP have been updated.</p>	Environmental Officer
Water quality and catchment characteristics	<p>The surface water catchment for Sarina water supply scheme is no longer utilised (as Sarina WTP has been decommissioned.)</p> <p>New set of water quality data is available for past two years.</p>	<p>The surface water catchment description supplied for Sarina water supply scheme in the approved DWQMP needs to be removed.</p> <p>The water quality summary provided in the approved DWQMP needs to be updated.</p>	<p>The surface water catchment description supplied for the Sarina water supply scheme has been removed.</p> <p>Water quality data from January 1, 2014 to June 30, 2018 was analysed as part of the DWQMP risk review undertaken by City Water Technology. Summaries of this water quality analysis (undertaken per scheme) is included in the amended DWMP and replaces the previous assemblies of water quality data based on data from January 2009 to December 2015.</p>	City Water Technology / Environmental Officer
Risk assessment	<p>The Drinking Water Quality Risk Register included as an appendix to the approved DWQMP is based on a risk assessment workshop undertaken in 2010.</p>	<p>Another risk assessment workshop should be undertaken, and the Drinking Water Quality Risk Register updated.</p>	<p>A risk review workshop facilitated by City Water Technology was undertaken July 25 - 26, 2018.</p> <p>The risk register was updated following the workshop.</p>	Hazard Identification and Risk Assessment Team

REVIEW COMPONENT	FINDINGS	OUTCOMES	STATUS OF ACTIONS	RESPONSIBLE OFFICER / POSITION
Operations and maintenance procedures	<p>Sarina WTP has been decommissioned.</p> <p>CCP's for re-chlorination facilities do not actually meet the definition of a CCP.</p> <p>Operators are no longer working to the targets in the current disinfection CCP's.</p> <p>Fluoridation is no longer undertaken at any of the water supply schemes</p>	<p>References to procedures for Sarina WTP should be removed from the DWQMP.</p> <p>Targets, alerts limits and critical limits should be updated in disinfection CCPs.</p> <p>CCP's for re-chlorination facilities should be re-defined as QCP's to reflect the non-critical nature of re-chlorination.</p> <p>References to Fluoride CCPs should be removed from the DWQMP.</p>	<p>References to Sarina WTP Procedures in DWQMP removed.</p> <p>CCP's have been updated. CCP's for re-chlorination facilities revised to QCP's to reflect non-critical nature of re-chlorination.</p> <p>References to Fluoride CCPs have been removed from the DWQMP.</p>	Environmental Officer
Management of incidents and emergencies	<p>The current Drinking Water Noncompliance Reporting Procedure (included as an appendix to the DWQMP) references superseded government department and does not include procedures relating to the notification of non-compliances to North Queensland Bulk Ports (NQBP), a drinking water service provider that receives water from MRC.</p>	<p>The Drinking Water Noncompliance Reporting Procedure needs to be updated with appropriate departments names and procedures for notification of non-compliance to NQBP.</p>	<p>The Drinking Water Noncompliance Reporting Procedure has been updated.</p>	Environmental Officer
Risk management improvement program (RMIP)	<p>The RMIP includes historical improvement actions that are no longer valid. Some improvement actions are not captured in the RMIP.</p>	<p>The RMIP needs to be updated.</p>	<p>The actions/controls identified in the updated risk register have been provided in the RMIP.</p>	Environmental Officer
Service wide information management	<p>No changes</p>	<p>Not applicable</p>	<p>Not applicable</p>	
Operational monitoring	<p>Current operational monitoring practices are not captured accurately in the drinking water monitoring program.</p>	<p>The drinking water monitoring program needs to be revised.</p>	<p>The drinking water monitoring program has been revised.</p>	Environmental Officer
Verification monitoring	<p>Recent updates to the verification monitoring frequency are not captured in the drinking water monitoring program.</p>	<p>The drinking water monitoring program needs to be revised.</p>	<p>The drinking water monitoring program has been revised.</p>	Environmental Officer

12. DWQMP AUDIT FINDINGS

No DWQMP audit was conducted during the FY 2017 – 2018.

An audit of the DWQMP was undertaken by Daniel Alun Deere (certified under the Drinking Water-Quality Management System Auditor Certification Scheme) in June 2016. The audit was completed June 28, 2016 with a compliant audit finding made. The overview of observations from the 2016 audit report was as follows:

The assets and systems inspected and audited were found to range from good to excellent in terms of their standard and the quality of their maintenance. MRC has made multiple significant improvements in the reliability of its water quality management system and shown some leadership in a range of areas. The depth and breadth of improvements made in recent years has greatly enhanced the ability of MRC to reliably ensure good water quality and to keep up with the rising expectations of its stakeholders and tougher industry standards. The results are paying dividend in that MRC is getting excellent treated water quality results despite very challenging source water conditions.

The next external audit of the DWQMP is scheduled to be completed by July 1, 2020.

13. REFERENCES

- NHMRC, NRMCC (2011) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy*. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.
- *Public Health Regulation 2005*.
- *Water Supply (Safety and Reliability) Act 2008*.

14. ABBREVIATIONS

TERM	DEFINITION
<	Less than
>	Greater than
°C	Degrees Celsius
% Sat	Percentage saturation
µS/cm	Micro siemens per centimetre
µg/L	Micrograms per litre
ADWG	Australian Drinking Water Guidelines (2011)
CCP	Critical Control Point
cfu/100mL	Colony forming units per 100 millilitre
cfu/mL	Colony forming units per millilitre
DNRME	Department of Natural Resources, Mines and Energy
DWQMP	Drinking Water Quality Management Plan
<i>E. coli</i>	<i>Escherichia coli</i>
FY	Financial year
IPWEAQ	Institute of Public Works Engineering Australasia Queensland
kPA	Kilopascal
LI	Larson Index
m	Meter
mg/L	Milligrams per litre
min	Minute
ML	Megalitre
mL	Millilitre
MPN	Most probable number
MRC	Mackay Regional Council
NHMRC	National Health and Medical Research Council
NRMCMC	Natural Resource Management Ministerial Council
NTU	Nephelometric turbidity units
RMIP	Risk Management Improvement Program
SAS	Mackay Water and Waste Services Scientific and Analytical Services Laboratory
SVOC	Semi Volatile Organic Compound
TCU	True Colour Units
TF	Treatment Facility
TWL	Townsville Water Laboratory
UV	Ultraviolet light
WTP	Water Treatment Plant

APPENDIX 1 – DWQMP RISK MANAGEMENT IMPROVEMENT PLAN

ID		HAZARD			ACTION ID	ACTION/ TASK	TARGET DATE	STATUS	RESPONSIBLE POSITION
Risk ID	Scheme	Process Step	Hazardous Event & Source of Hazardous Event	Description of Risk					
M27	Mackay	Clear Water Tanks & Balance Tanks	Chlorine contact time - insufficient contact time provided in clear water tank and balance tanks	Short circuiting in tanks not meeting C.t	1	Ground-truth process flow diagrams & update as required.	2nd half FY 2018 - 2019	In progress	Treatment Engineer
M27	Mackay	Clear Water Tanks & Balance Tanks	Chlorine contact time - insufficient contact time provided in clear water tank and balance tanks	Short circuiting in tanks not meeting C.t	2	Review documentation of open/close manual valves across the three TWSTs and how water is distributed across these.	2nd half FY 2018 - 2019	In progress	Treatment Engineer
M27, MA27	Mackay, Marian	Clear Water Tanks & Balance Tanks	Chlorine contact time - insufficient contact time provided in clear water tank and balance tanks	Short circuiting in tanks not meeting C.t	3	Review C.t calculation for scheme	2nd half FY 2018 - 2019	In progress	Treatment Engineer
M11	Mackay	Coagulation	Underdosing chemicals	Inability to meet treated water quality objectives causing risk to human health	4	Develop SOP for wasting off spec water	2nd half FY 2018 - 2019	In progress	Treatment Engineer
B09, C10, E10, F09, G09, K08, M20, MA20, MA37, MP08, S24	All schemes	Disinfection	Equipment failure	Inability to achieve breakpoint and primary disinfection	5	Review whether SCADA interlocks are in place for these schemes with respect to CCP critical limits	TBC – following January meeting with SCADA team	In progress	Senior SCADA Engineer
B06, C07, E07, F06, G06, K05, M17, MA34, MA17, MP05, S46	All schemes	Disinfection	Underdose or failure to dose	Inability to achieve breakpoint and primary disinfection	6	Review C.t calculation for schemes	2nd half FY 2018 - 2019	In progress	Treatment Engineer
E08	Eton	Disinfection	Overdose	Impact on taste and odour of treated water and health guideline value exceedance (> 5.0 mg/L)	7	Ensure on-line analyser is installed part of Eton treatment upgrades and that SCADA interlocks are in place (following install) with respect to CCP critical limits	2nd half FY 2018 - 2019	In progress	Treatment Engineer / Senior SCADA Engineer / Senior Network Engineer

ID		HAZARD			ACTION ID	ACTION/TASK	TARGET DATE	STATUS	RESPONSIBLE POSITION
Risk ID	Scheme	Process Step	Hazardous Event & Source of Hazardous Event	Description of Risk					
M20	Mackay	Disinfection	Equipment failure	Inability to achieve breakpoint and primary disinfection	8	Consider installing flow sensors on chlorine dosing lines as secondary check that disinfection is occurring	2nd half FY 2018 - 2019	In progress	Treatment Engineer
M17	Mackay	Disinfection	Underdose or failure to dose	Inability to achieve breakpoint and primary disinfection	9	Order and install online chlorine analyser at Mount Pleasant reservoir	TBC - following January meeting with Network team	In progress	Manager Water Network
MA20	Marian	Disinfection (at WTP)	Equipment failure	Inability to achieve breakpoint and primary disinfection	10	Consider installing flow sensors on chlorine dosing lines as secondary check that disinfection is occurring	2nd half FY 2018 - 2019	MRC seeking clarification from City Water Technology on whether this action is necessary	Treatment Engineer
MA18	Marian	Disinfection (at WTP)	Overdose	Impact on taste and odour of treated water and health guideline value exceedance (> 5.0 mg/L)	11	Investigate how out of spec water can be dumped at Marian WTP (SOP)	2nd half FY 2018 - 2019	In progress	Treatment Engineer
M20, MA20, MA37	Mackay, Marian	Disinfection (at WTP's and bores)	Equipment failure	Inability to achieve breakpoint and primary disinfection	12	Formally document installation of chlorine spear spare in event of failure	2nd half FY 2018 - 2019	In progress	Treatment Engineer
B06, C07, E07, F06, G06, K05, MP05, S46	Bloomsbury, Calen, Eton, Finch Hatton, Gargett, Koumala, Midge Point, Sarina	Disinfection (bores)	Underdose or failure to dose	Inability to achieve breakpoint and primary disinfection	13	Consider reviewing the CCP procedures	2nd half FY 2018 - 2019	In progress	Environmental Officer

ID		HAZARD			ACTION ID	ACTION/TASK	TARGET DATE	STATUS	RESPONSIBLE POSITION
Risk ID	Scheme	Process Step	Hazardous Event & Source of Hazardous Event	Description of Risk					
B07, C08, F07, G07, K06, MA35, MP11, S47	Bloomsbury, Calen, Finch Hatton, Gargett, Koumala, Marian, Midge Point, Sarina	Disinfection (bores)	Overdose	Impact on taste and odour of treated water and health guideline value exceedance (> 5.0 mg/L)	14	Review whether SCADA interlocks are in place for these schemes with respect to CCP critical limits	TBC – following January meeting with SCADA team	In progress	Senior SCADA Engineer
MA37	Marian	Disinfection (of Marian and Mirani bores when used as emergency supply)	Equipment failure	Inability to achieve breakpoint and primary disinfection	15	Consider installing flow sensors on chlorine dosing lines as secondary check that disinfection is occurring	TBC	MRC seeking clarification from City Water Technology on whether this action is necessary	Treatment Engineer
M49, MP12, S44	Mackay, Midge Point, Sarina	Disinfection at Re-chlorination Facilities	Equipment failure	Inadequate maintenance of disinfection residual	16	Formalise procedure for changeover to standby cylinder (specifically for those facilities without auto-changeover) in Assetic	TBC – following January meeting with Network team	In progress	Treatment Engineer / Assetic Project Lead Officer
M47, MP10, S42	Mackay, Midge Point, Sarina	Disinfection at Re-chlorination Facilities	Underdose or failure to dose	Inability to meet treated water quality objectives causing risk to human health, including opportunistic pathogen risk	17	Consider interfacing results from operational monitoring from Assetic into MonitorPro	TBC – following January meeting with Assetic Team	In progress	Senior Treatment Engineer / Assetic Project Lead Officer
M47, S42, MP10	Mackay, Sarina, Midge Point	Disinfection at Re-chlorination Facilities	Underdose or failure to dose	Inability to meet treated water quality objectives causing risk to human health, including opportunistic pathogen risk	18	Formalise monitoring frequency and tasks as part of implementation of Assetic AMS	TBC – following January meeting with Network team	In progress	Senior Network Engineer / Assetic Project Lead Officer
S42	Sarina	Disinfection at Re-chlorination Facilities	Underdose or failure to dose	Inability to meet treated water quality objectives causing risk to human health, including opportunistic pathogen risk	19	Develop QCP procedure for Sarina rechlorination facilities	2nd half FY 2018 - 2019	In progress	Environmental Officer

ID		HAZARD			ACTION ID	ACTION/TASK	TARGET DATE	STATUS	RESPONSIBLE POSITION
Risk ID	Scheme	Process Step	Hazardous Event & Source of Hazardous Event	Description of Risk					
GL01	Water Services	General	Security of assets	Contamination of treated water from malicious act	20	Better understand how keys are issued and controlled	TBC – following January meeting with Treatment / Network teams	In progress	Manager Water Treatment / Manager Water Network / Senior Network Engineer
GL08	Water Services	General - Reticulation	Main breaks - both water and sewer	Contamination of treated water with external material and disturbance of pipe biofilms	21	Consider implementing mains repair hygiene program	TBC – following January meeting with Network team	In progress	Manager Water Network / Senior Network Engineer
GL08	Water Services	General - Reticulation	Main breaks - both water and sewer	Contamination of treated water with external material and disturbance of pipe biofilms	22	Ground-truth GIS layers	TBC – following January meeting with Network team	In progress	Manager Water Network
GL08	Water Services	General - Reticulation	Main breaks - both water and sewer	Contamination of treated water with external material and disturbance of pipe biofilms	23	Review how mains repair jobs are audited	TBC – following January meeting with Network team	In progress	Manager Water Network
ORB6, PRB10, PB06	Bloomsbury, Mackay, Marian, Midge Point	O'Connell River Basin, Pioneer River Basin, Proserpine Basin	Illegal dumping in the catchment	Inability to meet treated water quality objectives causing risk to human health	24	Review communication via Local Disaster Management Group (LDMG) in event of spills or identified dumping	2nd half FY 2018 - 2019	In progress	Manager Water Treatment
ORB6, PRB10, PB06	Bloomsbury, Mackay, Marian, Midge Point	O'Connell River Basin, Pioneer River Basin, Proserpine Basin	Illegal dumping in the catchment	Inability to meet treated water quality objectives causing risk to human health	25	Review internal protocols for escalating information and corrective actions relating to illegal dumping	2nd half FY 2018 - 2019	In progress	Manager Water Treatment
ORB6, PRB10, PB06	Bloomsbury, Mackay, Marian, Midge Point	O'Connell River Basin, Pioneer River Basin, Proserpine Basin	Illegal dumping in the catchment	Inability to meet treated water quality objectives causing risk to human health	26	Review website information directing members of the public to report illegal dumping	2nd half FY 2018 - 2019	In progress	Manager Water Treatment
M25	Mackay	pH/Alkalinity Post-adjustment	Overdose caustic	Inadequate disinfection	27	Review effectiveness of the retreatment option	2nd half FY 2018 - 2019	In progress	Treatment Engineer

ID		HAZARD			ACTION ID	ACTION/TASK	TARGET DATE	STATUS	RESPONSIBLE POSITION
Risk ID	Scheme	Process Step	Hazardous Event & Source of Hazardous Event	Description of Risk					
PRB15	Mackay & Marian	Pioneer River Basin	Public recreation - boating and skiing on Marian Weir Club house and recreational area on Marian Weir bank and Platypus beach on Pioneer River (Mirani) Use of 2 stroke engines for ski boats and other water craft	Inability to meet treated water quality objectives causing risk to human health	28	Discuss impacts of developments on water quality with planning department	2nd half FY 2018 - 2019	In progress	Manager Water Treatment / Manager Planning and Sustainability
PB07	Midge Point	Proserpine Basin	Turnover/ stratification in Peter Faust Dam	Inability to meet treated water quality objectives causing risk to human health	29	Review communication/ notification protocols between SunWater and MRC for Peter Faust Dam	2nd half FY 2018 - 2019	In progress	Manager Water Treatment
B12, C13, E12, F12, G12, K13, M45, MA43, MP02, S49	All schemes	Raw Water Intake - Bores	Tampering and Vandalism	Inability to meet treated water quality objectives causing risk to human health	30	Ensure that inspections of bore heads and casings integrity is captured in Assetic	2nd half FY 2018 - 2019	In progress	Environmental Officer / Assetic Project Lead Officer
B12, C13, E12, F12, G12, K13, M45, MA43, MP02, S49	All schemes	Raw Water Intake - Bores	Tampering and Vandalism	Inability to meet treated water quality objectives causing risk to human health	31	Review monitoring requirements for bore water quality in light of health-based targets (HBTs)	2nd half FY 2018 - 2019	In progress	Environmental Officer
B11, C12, E11, F11, G11, K10, M51, MA42, MP09, S29, S31, S41	All schemes	Reticulation	Inadequate maintenance of disinfection residual	Inability to meet treated water quality objectives causing risk to human health, including opportunistic pathogen risk	32	Review how online monitoring is captured (e.g. on process flow diagrams)	2nd half FY 2018 - 2019	In progress	Environmental Officer
B05	Blooms-bury	Reticulation	Sediments and biofilms on pipes	Inability to meet treated water quality objectives causing risk to human health	33	Retrain customer service/call centre team regarding response to customer complaints	2nd half FY 2018 - 2019	In progress	Environmental Officer / Customer Call Centre
B05	Blooms-bury	Reticulation	Sediments and biofilms on pipes	Inability to meet treated water quality objectives causing risk to human health	34	Review FAQs on website regarding water quality issues in the network	2nd half FY 2018 - 2019	In progress	Environmental Officer
B05	Blooms-bury	Reticulation	Sediments and biofilms on pipes	Inability to meet treated water quality objectives causing risk to human health	35	Update scripts for responding to customer complaints	2nd half FY 2018 - 2019	In progress	Environmental Officer / Customer Call Centre

ID		HAZARD			ACTION ID	ACTION/TASK	TARGET DATE	STATUS	RESPONSIBLE POSITION
Risk ID	Scheme	Process Step	Hazardous Event & Source of Hazardous Event	Description of Risk					
M51, MP09, S29, S31, S41	Mackay, Midge Point, Sarina	Reticulation	Inadequate maintenance of disinfection residual	Inability to meet treated water quality objectives causing risk to human health, including opportunistic pathogen risk	36	Review design of chlorine boosters to achieve effective dosing, including duty/standby equipment	TBC – following January meeting with Network team	In progress	Manager Water Network / Senior Network Engineer
S39	Sarina	Reticulation	Long retention/contact time in system	Inability to meet treated water quality objectives causing risk to human health	37	Review operational management of Sarina distribution system to optimise rechlorination and free chlorine residual	TBC – following January meeting with Network team	In progress	Manager Water Network / Senior Network Engineer
GL14	Water Services	Source Water	PFAS contamination of source water	Inability to meet treated water quality objectives causing risk to human health	38	MRC to liaise with Queensland Health regarding state approach to PFAS	2nd half FY 2018 - 2019	In progress	Manager Water Treatment / Principal Scientist
GL14	Water Services	Source Water	PFAS contamination of source water	Inability to meet treated water quality objectives causing risk to human health	39	Based on outcomes of liaison, decide on best approach for assessing PFAS significance for MRC	2nd half FY 2018 - 2019	In progress	Manager Water Treatment
GL14	Water Services	Source Water	PFAS contamination of source water	Inability to meet treated water quality objectives causing risk to human health	40	Review PFAS results when received and decide on course of action	2nd half FY 2018 - 2019	In progress	Manager Water Treatment / Principal Scientist
NA	NA	NA	NA	NA	41	Once Water System sub AMPs have been developed add the relevant sub-AMPs to the DWQMP appendix list and update sub-AMP references in the body of the DWQMP.	2nd half FY 2018 - 2019	In progress	Environmental Officer
GL15	Water Services	General - Reticulation	Introduction of fire-brake foam into the reticulation due to backflow from fire trucks	Contamination of treated water	42	MRC CEO to provide written letter to Queensland Health regarding the need for investigation into the risk to health from the ingestion of fire-brake foam and concerns regarding the lack of actions to prevent fire-brake foam introduction to the reticulation from QFES fire trucks.	2nd half FY 2018 - 2019	In progress	CEO

APPENDIX 2 – E. COLI COMPLIANCE WITH ANNUAL VALUE

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Bloomsbury

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	4	4	2	5	2	6	2	4	4	4	6	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	45	46	45	47	46	49	47	47	47	47	49	47
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%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Calen

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	5	5	4	7	2	6	5	4	4	5	6	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	63	63	61	63	61	61	60	60	59	58	59	57
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%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Eton

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	5	6	6	5	5	4	6	5	6	5	4	6
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	68	70	69	69	67	67	67	68	65	63	63
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%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Finch Hatton

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	2	2	3	3	2	3	3	3	3	3	3	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	31	32	30	31	30	30	30	30	30	32	32	32
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%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Gargett

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	3	2	3	3	2	3	3	3	3	3	3	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	32	33	31	32	31	31	32	32	32	34	34	33
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%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Koumala

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	2	2	2	3	2	2	2	2	2	3	3	3
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	25	24	24	25	25	25	25	25	25	26	27	28
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%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Mackay

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	39	46	37	43	37	34	37	40	32	36	46	36
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	1	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	477	485	481	483	484	472	468	470	465	462	464	463
No. of failures for previous 12 month period	1	1	1	1	1	1	1	1	1	1	1	1
% of samples that comply	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Marian

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	27	26	15	25	22	20	24	20	20	20	25	21
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	264	271	266	264	267	267	271	266	267	266	263	265
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%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Midge Point

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	6	8	7	11	4	11	8	7	7	8	10	6
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	83	84	84	88	82	87	87	88	88	92	96	93
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%	100%	10.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Sarina

YEAR	2017 TO 2018											
MONTH	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	12	14	11	14	12	11	15	11	11	11	14	11
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	169	168	166	163	160	156	157	153	150	147	147	147
No. of failures for previous 12 month period	1	1	1	1	1	1	1	1	0	0	0	0
% of samples that comply	99.4%	99.4%	99.4%	99.4%	99.4%	99.4%	99.4%	99.3%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

DRINKING WATER QUALITY MANAGEMENT PLAN

ANNUAL REPORT