



Drinking Water Quality Management Plan (DWQMP)
Annual Report 2020-2021

Mount Isa Water Board

Drinking Water Quality Management Plan

Annual Report 2020-2021

Table of Contents

1. Introduction	5
Overview of 2020 – 2021 Outcomes.....	5
2. Summary of scheme operated.....	7
3. DWQMP Implementation	8
Security	10
Table 1 – Progress against the Risk Management Improvement Program (DWQMP).....	11
4. Verification monitoring.....	12
4.1 <i>Escherichia coli</i>	12
4.2 Cryptosporidium and Giardia.....	12
4.3 Cyanobacteria Counts	12
4.4 Cyanotoxins.....	12
4.5 Disinfection By-products.....	13
4.6 Chlorine, physical parameters and metals.....	13
5. Notifications to the Regulator under sections 102 and 102A of the Act.....	13
6. Customer Complaints.....	14
7. Findings and recommendations of the DWQMP auditor	14
8. Outcome of the review of the DWQMP and how issues raised have been addressed.	14
Appendix A.....	15
Details of compliance with water quality criteria.....	15
Table 2A - Verification monitoring results Drinking Water Supply (Microbiology and algal toxins)	15
Table 2B - Verification monitoring results Drinking Water Supply (Nitrogen species and metals) ..	16
Table 2C - Verification monitoring results Drinking Water Supply (Non-metals, DBP's and Physicals)	17
Table 3A – Reticulation <i>E. coli</i> verification monitoring 2019-2020	18
Drinking water scheme:	18
Mount Isa Water Board - Lake Moondarra and Lake Julius.....	18
Table 3B – Reticulation <i>E. coli</i> verification monitoring 2020-2021.....	18

Table 4A – Raw Water monitoring results Lake Julius (Microbiology and Metals)	19
Table 4B - Raw Water monitoring results Lake Julius (Organics and Physicals)	20
Table 4C - Raw Water monitoring results Lake Julius (Algal Counts)	21
Table 5A - Raw Water monitoring results Lake Moondarra (Microbiology and Metals)	22
Table 5B - Raw Water monitoring results Lake Moondarra (Organics and Physicals)	23
Table 5C - Raw Water monitoring results Lake Moondarra (Algal Counts)	24
Table 5D - Raw Water monitoring results Lake Moondarra (Microbiology and Physicals)	25
Table 5E - Raw Water monitoring results Lake Moondarra (Algal Counts)	26
Table 6A - Raw Water monitoring results Clear Water Lagoon (Microbiology, Metals, Non-metals and Organics)	27
Table 6B - Raw Water monitoring results Clear Water Lagoon (Physicals)	28
Table 6C - Raw Water monitoring results Clear Water Lagoon (Algal Counts)	29
Table 6D - Raw Water monitoring results Clear Water Lagoon (Metals, Non-metals, Organics and Physicals)	30
Table 6E - Raw Water monitoring results Clear Water Lagoon (Microbiology and Metals)	31
Table 6F - Raw Water monitoring results Clear Water Lagoon (Physicals)	32
Table 7A - Operational monitoring results Drinking Water Supply (Microbiology and DBP's)	33
Table 7B - Operational monitoring results Drinking Water Supply (Nitrogen species and Metals)	34
Table 7B - Operational monitoring results Drinking Water Supply (Metals Continued...)	35
Table 7C - Operational monitoring results Drinking Water Supply (Non-metals, Organics, DBP's)	36
Table 7D - Operational monitoring results Drinking Water Supply (Physicals)	37
Table 7D - Operational monitoring results Drinking Water Supply (Physicals continued...)	38
Table 7D - Operational monitoring results Drinking Water Supply (Physicals continued...)	39
Table 7E - Operational monitoring results Drinking Water Supply (Algal counts)	40

Table 1: Service provider details:

DETAIL	INFORMATION
SPID	199
Name	Mount Isa Water Board
Address	PO Box 1712 Mount Isa QLD 4825
Telephone	0434 094 743
Email	info@mountisawater.qld.gov.au
Website	www.mountisawater.qld.gov.au
Water Supply Schemes covered by this plan	Mount Isa

Glossary of terms

ADWG	Australian Drinking Water Guidelines (2011) Published by the National Health and Medical Research Council of Australia
CCP	Critical control point is the process step to which control can be applied and is essential to prevent a safety hazard
CFU/100mL	Colony forming units per 100 millilitres
CWL	Clear Water Lagoon
DBP's	Disinfection by-products
DNRME	Department of Natural Resources, Mines and Energy, the agency administering the Water Supply (Safety and Reliability) Act 2008
<i>E coli</i>	<i>Escherichia coli</i> , a bacterium which is considered to indicate the presence of faecal contamination and therefore potential health risk
ELISA	Enzyme linked immunosorbent assay, used for cyanotoxin testing
HAA	Haloacetic acid, a disinfection by-product formed by the reaction of halogens and organic acids
HU	Hazen units
>	Greater than
<	Less than
mg/L	Milligrams per litre
NHMRC	National Health and Medical Research Council
NTU	Nephelometric Turbidity Units
MPN/100mL	Most probable number of microorganisms per 100 millilitres
PFAS	Per- and polyfluoroalkyl substances
SCADA	Supervisory Control And Data Acquisition
µg/l	Micrograms per litre
THMs	Trihalomethanes, a disinfection by-product formed by the reaction of halogens and organic compounds

1. Introduction

This annual report documents the performance of the Mount Isa Water Board (MIWB) water service provider, with respect to its Drinking Water Quality Management Plan (DWQMP) as required under the *Water Supply (Safety and Reliability) Act 2008* (the Act) for the Financial Year 2020 – 2021.

Using the Australian Drinking Water Guidelines and a risk-based approach, the MIWB DWQMP has been developed with the goal of protecting public health through the identification and minimisation of any public health related risks associated with drinking water.

A number of physical and chemical parameters have been monitored throughout the year inclusive of *Escherichia coli*, cryptosporidium, giardia, soluble metals and disinfection by-products; and are summarised below. A more detailed review of verification monitoring results is given in [Appendix A](#)

[Details of compliance with water quality criteria](#)

Overview of 2020 – 2021 Outcomes

Drinking water treated by MIWB for Mount Isa continued to be improved in quality over the reporting period. The installation of the new Clean Water Tanks at the Mount Isa Terminal Reservoir (MITR) has allowed chlorine dosing to stabilise at a lower level whilst maintaining contact times. This has also contributed to an improvement in disinfection by-product formation. The concentrations of disinfection by-products are continuing to decrease within the drinking water supply year-on-year. The moving averages over the last five years for both total trihalomethanes (THM's) and total haloacetic acids (HAA's) is shown below.

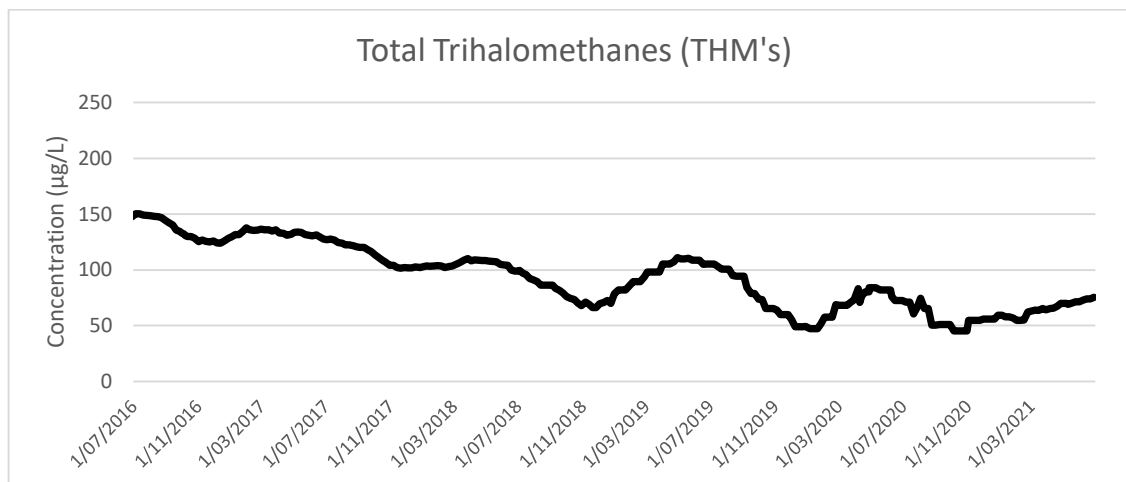


Figure 1: Moving average of Total Trihalomethane (THM) concentrations in drinking water supply

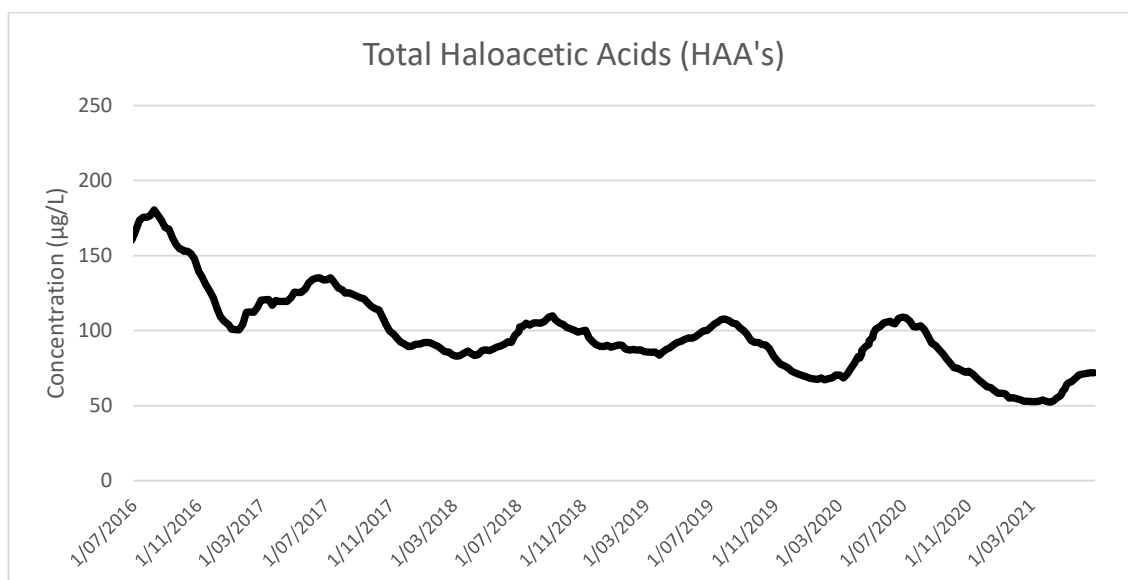


Figure 2: Moving average of Total Haloacetic Acid (HAA) concentrations in drinking water supply

All drinking water test samples were free from *E.coli*. Despite the on-going blue-green algae bloom, cyanotoxins were controlled by oxidation with chlorine to below the limit of detection when using a NATA accredited method.

The two-yearly review of the DWQMP for MIWB was completed in June 2021; and submitted to the Water Supply Regulation group within the Department of Regional Development, Manufacturing and Water (DRDMW) in August 2021.

2. Summary of scheme operated

MIWB provides bulk water treatment services to the local council and industrial customers. MIWB is a Category 1 Water Authority and Registered Service Provider (ID 199) established under the *Water Act 2000 (Qld)*. The Board operates as a commercialised statutory authority.

There are two sources of raw water that can be utilised: Lake Moondarra and Lake Julius. Water from either source is pumped via an aeration flume to oxygenate the water prior to entering a settling pond which utilises reed beds for natural filtration and sedimentation. Water follows from the Settling Pond into Clear Water Lagoon (CWL), a storage lagoon of approximately 2,300ML capacity. The CWL allows for residual suspended solids to be removed including any residual lead which has never been detected in product water. The Clear Water Lagoon is fully fenced against cattle ingress and along the access roads to minimise access by trespassers.

Water is pumped to the Mount Isa Terminal Reservoir (MITR) from the Col Popple Pump Station located at Clear Water Lagoon, or additionally via a booster station.

The water at MITR undergoes a microfiltration treatment stage and chlorination before delivery to MIWB's sole drinking water customer, the Mount Isa City Council (MICC). The daily demand of MIWB's three major customers is approximately 40-55 ML/day depending on seasonal changes (i.e. temperature and rainfall) and industrial customer's operational requirements.

A schematic for the water supply is presented in Figure 3:

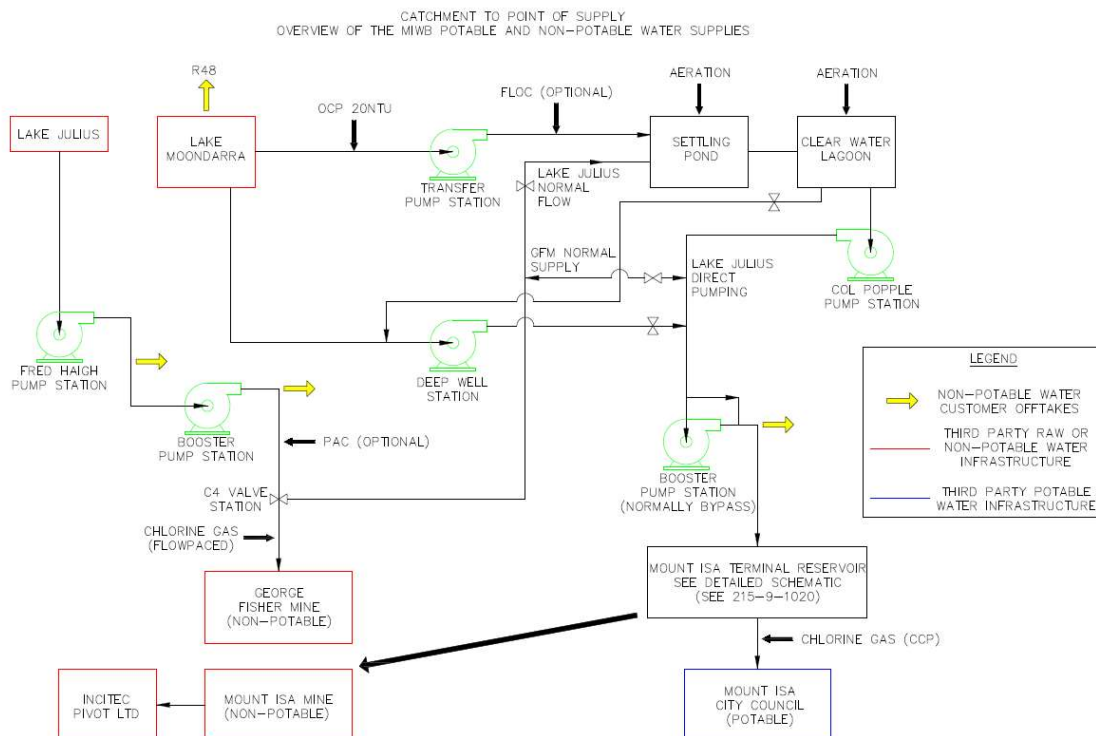


Figure 3: MIWB Drinking Water Supply Scheme

3. DWQMP Implementation

A number of critical control points (CCPs) have been identified within the system which are monitored. These CCPs can be actioned to prevent process excursions leading to non-compliant water. In the reporting period FY2020 - 2021 there were no CCP events.

Governance and Change Management

The Operations Superintendent, Chief Executive Officer, Maintenance Superintendent and Engineering Superintendent meet on a regular and periodic basis via the Water Quality Meeting to consider water quality processes, circumstances and outcomes.

The Operations Superintendent is involved in Change Management Risk Assessments for operational and infrastructure changes as necessary to identify any implications for water quality and how these risks (if any) will be mitigated. Refer to [Table 1 – Progress against the Risk Management Improvement](#) for further details of risk management and improvement processes.

Microbiological Contamination

MIWB has historically identified that protozoa such as cryptosporidium and giardia have been present at random times within the source water. However, no positive detections occurred during the reporting period in either Lake Moondarra or Lake Julius.

Capital projects such as the replacement of the North, South and Header Tanks had been identified in the risk assessment. The construction of the Clean Water tanks was completed and commissioned in November 2020. The South Tank was demolished for the construction of the Clean Water Tanks, and the Header Tank and North Tank were taken off-line in late November 2020 and have been mothballed.

A significant improvement in heterotrophic plate counts (HPC's) in potable water was observed very soon after the new tanks were commissioned, indicating a significant improvement in microbial control. The data is shown in Figure 4.

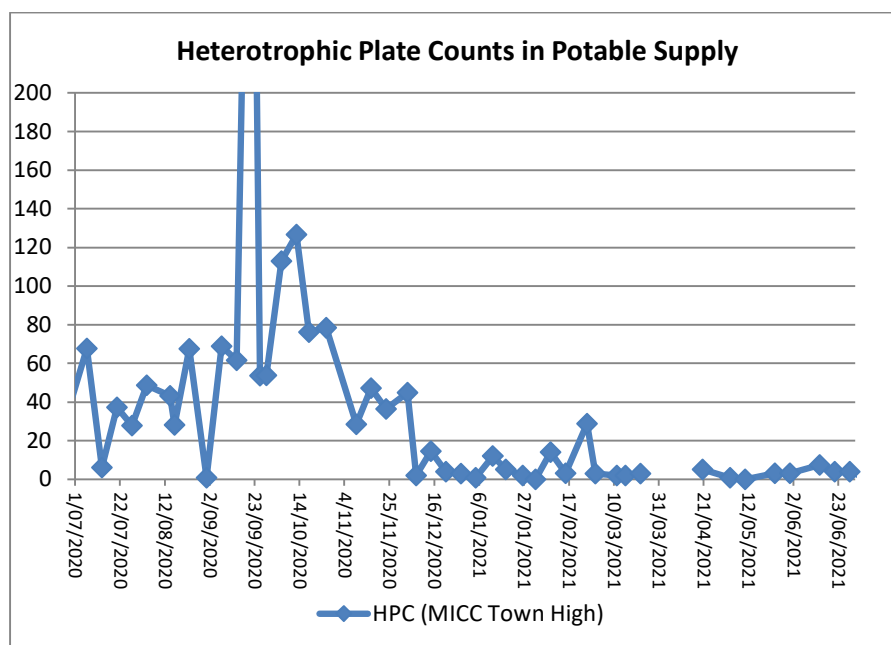


Figure 4: HPC's in potable water supply

A trial configuration using a single pumping scenario was completed in 2018 which improved contact times (CT's) to and chlorine residuals with Mount Isa City Council system. The trial proved successful and a project to facilitate a sustainable single pumping configuration was progressed during the reporting period. All pipework and infrastructure installation was completed by June 30, 2021.

Disinfection By-Products

Disinfection by-products are influenced by the organic load in the source water. Lake Julius water at times has a lower disinfection by-product forming potential than Lake Moondarra. However, current operation of the Lake Julius scheme does not allow for sufficient volumes to influence the overall organic loading in Clear Water Lagoon and to date no extended trials have been negotiated with customers. This continues to be on hold pending electrical system reliability improvements.

Installation of Backflow Prevention Devices from Customer Lines

The initial project for the installation of the backflow prevention devices has seen the installation of all scoped devices except one where supply pressure issues are evident.

Comprehensive Review of Operational Procedures

Immediately prior to the start of this reporting period all operating procedures were comprehensively reviewed and updated by management to align with MIWB's current operating requirements. During the current reporting period, management commenced a project to convert certain operating procedures to Safe Work Method Statements (SWMS). A large body of work has been completed; and will be finalised in the next reporting period.

Security

MIWB has considered the Queensland Audit Office (QAO) "*Report 19: Security of critical water infrastructure (2016-17)*" and implemented several physical and cyber security measures in the previous reporting period to improve the safeguarding of critical water infrastructure and reliability dependance.

As at 30 June 2021, MIWB continue to have:

- a governance structure;
- vulnerability risk assessments of water assets;
- multiple cyber security safeguards;
- cyber security control processes, including a threat detection system; and
- a back-up recovery system which is routinely updated.

During the period, MIWB completed a test of back-up SCADA system measures.

Table 1 – Progress against the Risk Management Improvement Program (DWQMP)

Item No.	Scheme Component / Sub-component	Hazard	Target date/s	Status as at 30/06/20	(If implementing these actions will take longer than anticipated, please provide detail, as it may affect the approved DWQMP)
1	MITR – Storage Tanks	Ingress of foreign matter including vermin and stormwater; Poor turnover and mixing resulting in low chlorine.	June 2019	<p>ONGOING A trial to reduce pump rates to MICC to improve contact times was completed and design of permanent pipework completed by June 2019. Practical completion of permanent pipework was achieved during 2020-21</p> <p>COMPLETED A project for the procurement and installation of new fully enclosed tanks was completed and commissioned in November 2020</p>	Utilisation of the arrangement is at the discretion of Mount Isa City Council who are currently considering alternative configurations of their system.
2	Whole of System	Backflow of contaminated water from customer points of connection	October 2018	<p>ONGOING The original project has been completed except one device where supply pressure issues are being resolved.</p>	A concept design to address the pressure issues for one remaining back flow prevention device has been carried forward
3	MITR	Disinfection by-products (e.g. THMs & HAAs) above ADWG limits	June 2019	<p>ONGOING An initial short trial was completed in early 2019, however the results were inconclusive.</p>	A longer trial period in 2020 was not completed due to Fred Haigh Pump Station reliability issues which are expected to be resolved by the current upgrade project. Source selection will be trialled when customer agreement can be obtained
4	Whole of System	Procedures not implemented as required	January 2019	<p>COMPLETED The update of the procedures listed in the DWQMP has been completed</p>	

4. Verification monitoring

During the reporting period, a verification monitoring program was undertaken for multiple parameters (outlined below). All results from the verification monitoring program are contained in [Table 2A - Verification monitoring results Drinking Water Supply](#)

4.1 *Escherichia coli*

MIWB's water quality results met the Australian Drinking Water Guidelines for *Escherichia coli*.

Fifty-two samples were tested for *E. coli* in the product for reticulation, and no samples were observed to contain any colony forming units. A 100% compliance was observed for this parameter. Full details on monthly verification results are shown in Appendix A [Table 3B – Reticulation E. coli verification monitoring 2020-2021](#).

For Lake Moondarra source water, twenty-eight samples were collected with a maximum *E. coli* count of 19 CFU MPN/100mL. Lake Julius source water had thirty-nine samples collected resulting in a maximum of 10 CFU MPN/100mL. The minima for both source waters equated to below the detection limit of 1MPN. Lake Moondarra results are given in [Table 5A - Raw Water monitoring results Lake Moondarra \(Microbiology and Metals\)](#), and Lake Julius results are given in [Table 4A – Raw Water monitoring results Lake Julius \(Microbiology and Metals\)](#)

4.2 *Cryptosporidium* and *Giardia*

During the reporting period, twenty-five samples from Lake Moondarra and twenty-three Lake Julius were collected for cryptosporidium and giardia testing by the NATA certified laboratory. No Lake Moondarra or Lake Julius samples returned positive detections of cryptosporidium cysts or giardia oocyst. Full details for Lake Moondarra are provided in [Table 5A - Raw Water monitoring results Lake Moondarra \(Microbiology and Metals\)](#), and Lake Julius results are provided in [Table 4A – Raw Water monitoring results Lake Julius \(Microbiology and Metals\)](#)

4.3 Cyanobacteria Counts

A total of ninety-four samples were collected during the reporting period for cyanobacteria identification and counting. Of the ninety-four samples, fifteen were from Lake Julius and seventy-nine from Lake Moondarra. None of the samples showed evidence of *Nodularia spumigena* with all having levels below the detection limit which is 1cell/ml. All samples taken from Lake Julius and Lake Moondarra had varying amounts of *Raphidiopsis raciborskii* present. At Lake Julius, blue-green algae counts varied from below detection, to over 270,000 cells/ml. Lake Moondarra counts were less; from below detection to 10,800 cells/ml. *Microcystis aeruginosa* was not evident in any samples from Lake Julius or Lake Moondarra.

4.4 Cyanotoxins

A total of 315 samples were collected during the year for cyanotoxin testing; specifically, cylindrospermopsin. As scientific data is insufficient to establish a guideline value, the WHO health alert level of 1 µg/l has been adopted for reticulated samples.

Of the 315 samples, 99 were from Lake Moondarra, 13 from Lake Julius and 213 from MITR. 220 samples were analysed for cylindrospermopsin with an ELISA, whilst 95 were sent for verification analysis at a NATA accredited laboratory for cylindrospermopsin and de-

oxycylindrospermopsin. Of the samples sent to the NATA laboratory, 12 were for raw water and 83 were for treated and chlorinated samples. The twelve raw water samples tested positive, however no samples from chlorinated water throughout the treatment plant returned detectable amounts of toxin. These results indicate that the cyanotoxin continues to be successfully destroyed by oxidation with chlorine.

4.5 Disinfection By-products

As a secondary consequence of disinfection by chlorination, organic material can react with the chlorine and form disinfection by-products. Disinfection byproducts have been identified in drinking water including trihalomethanes and haloacetic acids for which regulations have been established by NMRC and Queensland Health (as outlined below).

As part of the verification monitoring program, these groups of compounds are regularly monitored. For the reporting period, 22 samples for trihalomethanes (THMs) and 54 samples for haloacetic acids (HAAs) were collected from MITR. All samples were tested at a NATA accredited laboratory. The THM results ranged from 0.036 to 0.094mg/l. No sample exceeded the ADWG health limit of 0.25mg/l for the year.

Of the samples collected for HAAs, none exceeded the ADWG limit for chloroacetic acid (0.15mg/l), dichloroacetic acid (0.1mg/l) or trichloroacetic acid (0.1mg/l). The results ranged from 0.002 to 0.005mg/l for chloroacetic acid, dichloroacetic acid from 0.016 to 0.038mg/l; and trichloroacetic acid from 0.008 to 0.018mg/l.

In November 2017 Queensland Health published a new guideline limit for Total HAAs and no samples exceeded the limit during the reporting period.

4.6 Chlorine, physical parameters and metals

Free and total chlorine was monitored throughout the financial year at the MITR. A total of 654 samples were tested, and none exceeded the ADWG limit of 5mg/l. Physical parameters such as pH and turbidity were also monitored as well as metals. There were no limit exceedances for any metals throughout the system. All results are shown in [Table 7D - Operational monitoring results Drinking Water Supply \(Physicals\)](#)

5. Notifications to the Regulator under sections 102 and 102A of the Act

There were two notifiable events reported to the Water Supply Regulator during the reporting period. Both events related to physical access security, and did not result in any impact to water quality. Improvements to physical access security, including through the Critical Infrastructure Management Plan, have been made during the reporting period to mitigate these risks.

6. Customer Complaints

MIWB did not receive any formal water quality complaints from its drinking water customer for the 2020 - 2021 financial year.

Table 1 - Complaints about water quality, (including per 1000 customers)

	Suspected Illness	Discoloured water	Taste and odour	Total
Scheme 1	0	0	0	0
Total	0	0	0	0

7. Findings and recommendations of the DWQMP auditor

No audits were undertaken during the 2020-21 reporting period.

8. Outcome of the review of the DWQMP and how issues raised have been addressed.

A comprehensive revision of the DWQMP was undertaken during the reporting period including addressing recommendations from the previous years' audit. The revised DWQMP was submitted to the Regulator on August 11, 2021 for approval.

Appendix A

Details of compliance with water quality criteria

The results from the verification monitoring program have been compared against the levels of the water quality criteria specified by the Regulator in the *Water Quality and Reporting Guideline for a Drinking Water Service*.

The reported statistics do not include results derived from repeat samples, or from emergency or investigative samples undertaken in response to an elevated result.

Verification monitoring has been carried out as per the monitoring program stated in the DWQMP. In some cases, increased frequencies for some parameters have been undertaken for seasonal variation and for data-gathering. The validation program is appropriate as both source waters and treated water is monitored routinely. Validation analyses are also carried out by a NATA accredited laboratory to ensure inter-laboratory correlations are maintained.

Table 2A - Verification monitoring results Drinking Water Supply (Microbiology and algal toxins)

Scheme name	Scheme component	Parameter	Frequency of sampling	Total No. of samples collected	Water Quality Criteria	Number of Non-Compliant Samples	Comments
Microbiology and algal toxins							
Lake Julius and Lake Moondarra	Drinking Water Supply	<i>Escherichia coli</i>	Weekly	52	< 1 MPN/100mL	0	
	Drinking Water Supply	Total Coliforms	Weekly	52	N/A	0	
	Drinking Water Supply	Cyanotoxins	Weekly (if required)	8	<1 µg/L	0	

Table 2B - Verification monitoring results Drinking Water Supply (Nitrogen species and metals)

Scheme name	Scheme component	Parameter	Frequency of sampling	Total No. of samples collected	Water Quality Criteria	Number of Non-Compliant Samples	Comments
Nitrogen Species							
Lake Julius and Lake Moondarra	Drinking Water Supply	Ammonia	Quarterly	3	<0.5 mg/L *	0	
	Drinking Water Supply	Cyanide	Yearly	1	<0.08 mg/L	0	
	Drinking Water Supply	Nitrate	Quarterly	3	<50 mg/L	0	
	Drinking Water Supply	Nitrite	Quarterly	3	<3 mg/L	0	
Metals							
Lake Julius and Lake Moondarra	Drinking Water Supply	Aluminium	Weekly	51	<0.2 mg/L *	0	
	Drinking Water Supply	Antimony	Quarterly	3	<0.003 mg/L	0	
	Drinking Water Supply	Arsenic	Quarterly	3	<0.01 mg/L	0	
	Drinking Water Supply	Cadmium	Quarterly	3	<0.002 mg/L	0	
	Drinking Water Supply	Chromium	Quarterly	3	<0.05 mg/L	0	
	Drinking Water Supply	Copper	Monthly	12	<2 mg/L *	0	
	Drinking Water Supply	Iron	Weekly	51	<0.3 mg/L *	0	
	Drinking Water Supply	Lead	Weekly	51	<0.01 mg/L	0	
	Drinking Water Supply	Manganese	Weekly	51	<0.5 mg/L	0	
	Drinking Water Supply	Nickel	Quarterly	3	<0.02 mg/L	0	
	Drinking Water Supply	Zinc	Monthly	12	<3 mg/L *	0	

*Note: Aesthetic guideline values only

Table 2C - Verification monitoring results Drinking Water Supply (Non-metals, DBP's and Physicals)

Scheme name	Scheme component	Parameter	Frequency of sampling	Total No. of samples collected	Water Quality Criteria	Number of Non-Compliant Samples	Comments
Non-Metal							
Lake Julius and Lake Moondarra	Drinking Water Supply	Chloride	Quarterly	3	<250 mg/L*	0	
	Drinking Water Supply	Fluoride	Quarterly	3	<1.5 mg/L	0	
	Drinking Water Supply	Hydrogen Sulphide	Quarterly	3	<0.05 mg/L*	0	
	Drinking Water Supply	Sodium	Quarterly	3	<180 mg/L*	0	
	Drinking Water Supply	Sulphate	Quarterly	3	<250 mg/L*	0	
Organic Disinfection By-Products							
Lake Julius and Lake Moondarra	Drinking Water Supply	Total Trihalomethanes	Monthly	12	<0.250 mg/L	0	
	Drinking Water Supply	Total Halo Acetic Acids	Monthly	52	<0.1 mg/L**	0	
Physical							
Lake Julius and Lake Moondarra	Drinking Water Supply	Taste and Odour	Yearly	1	N/A	0	2-Methylisoborneol (MIB) and Geosmin analysis
	Drinking Water Supply	Total Dissolved Solids	Quarterly	3	<600 mg/L*	0	
	Drinking Water Supply	Conductivity	Weekly	52	N/A	0	
	Drinking Water Supply	Hardness	Quarterly	3	<200 mg/L*	0	

*Note: Aesthetic guideline values only

**Note: No ADWG limit; Queensland Health Department advisory limit

Table 3A – Reticulation *E. coli* verification monitoring 2019-2020

Drinking water scheme:

Mount Isa Water Board - Lake Moondarra and Lake Julius

Year												
Month	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No of samples collected	5	4	5	4	4	5	4	4	5	4	5	4
No of samples collected in which <i>E coli</i> is detected (ie a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No of samples collected in previous 12-month period	52	52	53	52	52	52	52	52	53	52	53	53
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

Table 3B – Reticulation *E. coli* verification monitoring 2020-2021

Drinking water scheme:

Mount Isa Water Board - Lake Moondarra and Lake Julius

Year												
Month	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No of samples collected	4	4	4	4	5	4	5	4	5	4	5	4
No of samples collected in which <i>E coli</i> is detected (ie a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No of samples collected in previous 12-month period	52	52	51	51	52	51	52	52	52	52	52	52
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

Table 4A – Raw Water monitoring results Lake Julius (Microbiology and Metals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Microbiology												
Lake Julius and Lake Moondarra	Lake Julius	<i>Escherichia coli</i>	MPN/100mL	Fortnightly /Weekly	39	18	N/A	<1	10	1	1 MPN/100mL	MIWB
	Lake Julius	Cryptosporidium	Oocysts/L	Fortnightly	22	0	N/A	<0.1	<0.2	<0.1	0.1 oocyst/L	ALS
	Lake Julius	Giardia	Cysts/L	Fortnightly	22	0	N/A	<0.1	<0.2	<0.1	0.1 cyst/L	ALS
Metals												
Lake Julius and Lake Moondarra	Lake Julius	Aluminium	mg/L	Monthly	21	11	0	<0.005	0.098	0.012	0.005 mg/L	ALS
	Lake Julius	Arsenic	mg/L	Quarterly	3	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Lake Julius	Barium	mg/L	Yearly	1	1	0	0.022	0.022	0.022	0.001 mg/L	ALS
	Lake Julius	Beryllium	mg/L	Yearly	1	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Lake Julius	Boron	mg/L	Yearly	1	0	0	<0.05	<0.05	<0.05	0.05 mg/L	ALS
	Lake Julius	Iodide	mg/L	Yearly	1	0	0	<0.01	<0.01	<0.01	0.01 mg/L	ALS
	Lake Julius	Iron	mg/L	Monthly	22	19	5	<0.05	2.69	0.36	0.05mg/L	ALS
	Lake Julius	Lead	mg/L	Monthly	22	11	0	<0.001	0.005	0.001	0.001 mg/L	ALS
	Lake Julius	Manganese	mg/L	Monthly	22	22	0	0.017	0.556	.115	0.001 mg/L	ALS
	Lake Julius	Mercury	mg/L	Quarterly	3	0	0	<0.0001	<0.0001	<0.0001	0.0001 mg/L	ALS
	Lake Julius	Molybdenum	mg/L	Quarterly	3	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Lake Julius	Nickel	mg/L	Quarterly	3	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Lake Julius	Selenium	mg/L	Yearly	1	0	0	<0.01	<0.01	<0.01	0.01 mg/L	ALS
	Lake Julius	Silver	mg/L	Yearly	1	0	0	<0.0001	<0.0001	<0.0001	0.0001 mg/L	ALS
	Lake Julius	Tin	mg/L	Yearly	1	0	0	<0.01	<0.01	<0.01	0.01 mg/L	ALS
	Lake Julius	Zinc	mg/L	Quarterly	3	2	0	<0.005	0.011	0.007	0.005 mg/L	ALS

Table 4B - Raw Water monitoring results Lake Julius (Organics and Physicals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Organics												
Lake Julius and Lake Moondarra	Lake Julius	Total Organic Carbon	mg/L	Monthly	12	12	0	5.65	9.71	7.63	0.01 ppm	MIWB/ALS
	Lake Julius	Organochlorides	mg/L	6 Monthly	2	0	0	<0.010	<0.010	<0.010	0.010 µg/L	ALS
	Lake Julius	Organophosphates	mg/L	6 Monthly	2	0	0	<0.01	<10	<0.002	0.002 µg/L	ALS
	Lake Julius	PFAS	mg/L	6 Monthly	2	0	0	<0.002	<0.002	<0.002	0.002 µg/L	ALS
Physicals												
	Lake Julius	Dissolved Oxygen	% Saturation	Weekly	41	41	22	61.4	107.6	88.68	0.10%	Field
	Lake Julius	pH	Standard	Weekly	41	41	16	6.91	9.25	7.93	0.1	Field
	Lake Julius	Conductivity	µS/cm	Weekly	27	27	4	60	275	141	1 µS/cm	Field
	Lake Julius	Temperature	°C	Weekly	25	25	N/A	20.73	33.28	26.38	0.1 °C	Field
	Lake Julius	Turbidity	NTU	Weekly	41	41	N/A	1.28	35.2	5.8	0.1 NTU	Field
	Lake Julius	Alkalinity	mg/L	Monthly	12	12	N/A	35	54	47	1 mg/L	ALS
	Lake Julius	Hardness	mg/L	Monthly	12	12	N/A	26	44	37	1 mg/L	ALS

Table 4C - Raw Water monitoring results Lake Julius (Algal Counts)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Algae Counts												
Lake Julius and Lake Moondarra	Lake Julius	<i>Anabaena circinalis</i> / <i>Anabaena</i> coiled or straight	cells/ml	Monthly/In use	15	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Julius	<i>Chrysosporum</i>	cells/ml	Monthly/In use	15	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Julius	<i>Chrysosporum c.f. bergii</i>	cells/ml	Monthly/In use	15	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Julius	<i>Chrysosporum c.f. ovalisporum</i>	cells/ml	Monthly/In use	15	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Julius	<i>Cylindrospermum</i>	cells/ml	Monthly/In use	15	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Julius	<i>Microcystis</i>	cells/ml	Monthly/In use	15	8	N/A	0	398	94	1 Cell/mL	ALS
	Lake Julius	<i>Microcystis c.f. aeruginosa</i>	cells/ml	Monthly/In use	15	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Julius	<i>Nodularia spumigena</i>	cells/ml	Monthly/In use	15	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Julius	<i>Raphidiopsis raciborskii</i>	cells/ml	Monthly/In use	15	13	N/A	0	270849	35482	1 Cell/mL	ALS
	Lake Julius	Cyanotoxin	µg/L	In Use	3	3	N/A	0.07	0.3187	0.225	0.05µg/L	MIWB/ALS

Table 5A - Raw Water monitoring results Lake Moondarra (Microbiology and Metals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Microbiology												
Lake Julius and Lake Moondarra	Lake Moondarra	<i>Escherichia coli</i>	MPN/100mL	Fortnightly /Weekly	28	11	N/A	<1	19	2	1 MPN/100mL	MIWB
	Lake Moondarra	Cryptosporidium	Oocysts/L	Fortnightly	25	0	N/A	<0.1	<0.2	<0.1	0.1 oocyst/L	ALS
	Lake Moondarra	Giardia	Cysts/L	Fortnightly	25	0	N/A	<0.1	<0.2	<0.1	0.1 cyst/L	ALS
Metals												
Lake Julius and Lake Moondarra	Lake Moondarra	Aluminium	mg/L	Weekly	52	45	0	<0.005	0.032	0.009	0.005 mg/L	ALS
	Lake Moondarra	Arsenic	mg/L	Quarterly	4	4	0	0.002	0.002	0.002	0.001 mg/L	ALS
	Lake Moondarra	Barium	mg/L	Yearly	1	1	0	0.034	0.034	0.034	0.001 mg/L	ALS
	Lake Moondarra	Beryllium	mg/L	Yearly	1	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Lake Moondarra	Boron	mg/L	Yearly	1	0	0	<0.05	<0.05	<0.05	0.05 mg/L	ALS
	Lake Moondarra	Iodide	mg/L	Yearly	1	0	0	<0.01	<0.01	<0.01	0.01 mg/L	ALS
	Lake Moondarra	Iron	mg/L	Weekly	52	52	0	0.06	0.33	0.15	0.05mg/L	ALS
	Lake Moondarra	Lead	mg/L	Weekly	52	43	0	<0.001	0.004	0.001	0.001 mg/L	ALS
	Lake Moondarra	Manganese	mg/L	Weekly	52	52	0	0.022	0.185	0.049	0.001 mg/L	ALS
	Lake Moondarra	Mercury	mg/L	Quarterly	4	0	0	<0.0001	<0.0001	<0.0001	0.0001 mg/L	ALS
	Lake Moondarra	Molybdenum	mg/L	Quarterly	4	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Lake Moondarra	Nickel	mg/L	Quarterly	4	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Lake Moondarra	Selenium	mg/L	Yearly	1	0	0	<0.01	<0.01	<0.01	0.01 mg/L	ALS
	Lake Moondarra	Silver	mg/L	Yearly	1	0	0	<0.0001	<0.0001	<0.0001	0.0001 mg/L	ALS
	Lake Moondarra	Tin	mg/L	Yearly	1	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Lake Moondarra	Zinc	mg/L	Quarterly	4	0	0	<0.005	<0.005	<0.005	0.005 mg/L	ALS

Table 5B - Raw Water monitoring results Lake Moondarra (Organics and Physicals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Organics												
Lake Julius and Lake Moondarra	Lake Moondarra	Total Organic Carbon	mg/L	Monthly	12	12	0	7	9.98	8.34	0.01 ppm	MIWB
	Lake Moondarra	Organochlorides	mg/L	6 Monthly	2	0	0	<0.005	<0.010	<0.005	0.005 µg/L	ALS
	Lake Moondarra	Organophosphates	mg/L	6 Monthly	2	0	0	<0.002	<2	<2	0.002 µg/L	ALS
	Lake Moondarra	PFAS	mg/L	6 Monthly	2	0	0	<0.002	0.004	0.004	0.002 µg/L	ALS
Physicals												
Lake Julius and Lake Moondarra	Lake Moondarra	Colour	HU	Weekly	52	52	N/A	8	85	45	1HU	MIWB
	Lake Moondarra	Dissolved Oxygen	% Saturation	Weekly	52	52	18	72.7	107	91.70	0.10%	Field
	Lake Moondarra	pH	Standard	Weekly	52	52	24	7.2	9.1	8.11	0.1	Field
	Lake Moondarra	Conductivity	µS/cm	Weekly	52	52	0	239	404	301	1 µS/cm	Field
	Lake Moondarra	Temperature	°C	Weekly	52	52	N/A	16.85	32.04	25.15	0.1 °C	Field
	Lake Moondarra	Turbidity	NTU	Daily	255	255	N/A	0.6	85	3.9	0.1 NTU	Field
	Lake Moondarra	Alkalinity	mg/L	Monthly	12	12	0	65	82	74	1 mg/L	ALS
	Lake Moondarra	Hardness	mg/L	Monthly	12	12	0	55	78	66	1 mg/L	ALS

Table 5C - Raw Water monitoring results Lake Moondarra (Algal Counts)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Algae Counts												
	Lake Moondarra	<i>Anabaena Circinalis/ Anabaena coiled or straight</i>	cells/ml	Fortnightly	27	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Moondarra	<i>Chrysosporum</i>	cells/ml	Fortnightly	27	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Moondarra	<i>Chrysosporum c.f. bergii</i>	cells/ml	Fortnightly	27	1	N/A	0	76	3	1 Cell/mL	ALS
	Lake Moondarra	<i>Chrysosporum c.f. ovalisporum</i>	cells/ml	Fortnightly	27	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Moondarra	<i>Cylindrospermum</i>	cells/ml	Fortnightly	27	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Moondarra	<i>Microcystis</i>	cells/ml	Fortnightly	27	9	N/A	0	740	87	1 Cell/mL	ALS
	Lake Moondarra	<i>Microcystis c.f. aeruginosa</i>	cells/ml	Fortnightly	27	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Moondarra	<i>Nodularia spumigena</i>	cells/ml	Fortnightly	27	0	N/A	0	0	0	1 Cell/mL	ALS
	Lake Moondarra	<i>Raphidiopsis Raciborskii</i>	cells/ml	Fortnightly	27	26	N/A	0	7934	2411	1 Cell/mL	ALS
	Lake Moondarra	Cyanotoxin	µg/L	In Use	1	1	N/A	0.24	0.24	0.24	0.05µg/L	MIWB

Table 5D - Raw Water monitoring results Lake Moondarra (Microbiology and Physicals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Microbiology												
Lake Julius and Lake Moondarra	Transport Bay	Faecal Coliform	MPN/100mL	Fortnightly	52	35	N/A	<1	201	8	1 MPN/100mL	MIWB
	Warrina Park	Faecal Coliform	MPN/100mL	Fortnightly	52	16	N/A	<1	24	1	1 MPN/100mL	MIWB
Physicals												
Lake Julius and Lake Moondarra	Transport Bay	Dissolved Oxygen	% Saturation	Weekly	52	52	31	55.7	107.3	87.25	0.10%	Field
	Transport Bay	pH	Standard	Weekly	52	52	23	7.28	9.01	8.02	0.1	Field
	Transport Bay	Conductivity	µS/cm	Weekly	52	52	N/A	140	408	298	1 µS/cm	Field
	Transport Bay	Temperature	°C	Weekly	52	52	N/A	15.49	34.81	25.80	0.1 °C	Field
	Transport Bay	Turbidity	NTU	Weekly	52	52	N/A	0.62	8.33	1.68	0.1 NTU	Field
	Warrina Park	Colour	HU	Weekly	52	52	N/A	7	96	27	1HU	MIWB
	Warrina Park	Dissolved Oxygen	% Saturation	Weekly	52	52	N/A	63.5	100.9	88.16	0.10%	Field
	Warrina Park	pH	Standard	Weekly	52	52	N/A	7.28	8.73	7.85	0.1	Field
	Warrina Park	Conductivity	µS/cm	Weekly	52	52	N/A	209	397	298	1 µS/cm	Field
	Warrina Park	Temperature	°C	Weekly	52	52	N/A	14.29	31.51	24.11	0.1 °C	Field
	Warrina Park	Turbidity	NTU	Weekly	52	52	N/A	0.45	6.54	1.44	0.1 NTU	Field

Table 5E - Raw Water monitoring results Lake Moondarra (Algal Counts)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Algae Counts												
Lake Julius and Lake Moondarra	Transport Bay	<i>Anabaena circinalis/ Anabaena coiled or straight</i>	cells/ml	Fortnightly	26	1	N/A	0	14	<1	1 Cell/mL	ALS
	Transport Bay	<i>Chrysosporum</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Transport Bay	<i>Chrysosporum c.f. bergii</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Transport Bay	<i>Chrysosporum c.f. ovalisporum</i>	cells/ml	Fortnightly	26	1	N/A	0	76	3	1 Cell/mL	ALS
	Transport Bay	<i>Cylindrospermum</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Transport Bay	<i>Microcystis</i>	cells/ml	Fortnightly	26	15	N/A	0	1453	208	1 Cell/mL	ALS
	Transport Bay	<i>Microcystis c.f. aeruginosa</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Transport Bay	<i>Nodularia spumigena</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Transport Bay	<i>Raphidiopsis raciborskii</i>	cells/ml	Fortnightly	26	26	N/A	17	10859	1558	1 Cell/mL	ALS
	Dam Wall	<i>Anabaena circinalis/ Anabaena coiled or straight</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Dam Wall	<i>Chrysosporum</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Dam Wall	<i>Chrysosporum c.f. bergii</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Dam Wall	<i>Chrysosporum c.f. ovalisporum</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Dam Wall	<i>Cylindrospermum</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Dam Wall	<i>Microcystis</i>	cells/ml	Fortnightly	26	14	N/A	0	920	127	1 Cell/mL	ALS
	Dam Wall	<i>Microcystis c.f. aeruginosa</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Dam Wall	<i>Nodularia spumigena</i>	cells/ml	Fortnightly	26	0	N/A	0	0	0	1 Cell/mL	ALS
	Dam Wall	<i>Raphidiopsis raciborskii</i>	cells/ml	Fortnightly	26	24	N/A	0	6134	966	1 Cell/mL	ALS

Table 6A - Raw Water monitoring results Clear Water Lagoon (Microbiology, Metals, Non-metals and Organics)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Microbiology												
Lake Julius and Lake Moondarra	Clear Water Lagoon (In)	<i>Escherichia coli</i>	MPN/100mL	Fortnightly	51	37	N/A	<1	24	2	1 MPN/100mL	MIWB
	Clear Water Lagoon (In)	Cryptosporidium	Oocysts/L	Fortnightly	25	0	N/A	<0.1	<0.4	<0.1	0.1 oocyst/L	ALS
	Clear Water Lagoon (In)	Giardia	Cysts/L	Fortnightly	25	0	N/A	<0.1	<0.4	<0.1	0.1 cyst/L	ALS
Metals												
Lake Julius and Lake Moondarra	Clear Water Lagoon (In)	Aluminium	mg/L	Weekly	52	19	0	<0.005	0.010	0.003	0.005 mg/L	ALS
	Clear Water Lagoon (In)	Iron	mg/L	Weekly	52	52	0	0.06	0.16	0.10	0.05mg/L	ALS
	Clear Water Lagoon (In)	Lead	mg/L	Weekly	52	9	0	<0.001	0.003	<0.001	0.001 mg/L	ALS
	Clear Water Lagoon (In)	Manganese	mg/L	Weekly	52	52	0	0.029	0.087	0.050	0.001 mg/L	ALS
Non-Metals and Organics												
Lake Julius and Lake Moondarra	Clear Water Lagoon (In)	Total Nitrogen	mg/L	Monthly	12	12	0	0.41	0.67	0.55	0.05 mg/L	ALS
	Clear Water Lagoon (In)	Total Phosphorus	mg/L	Monthly	12	11	0	<0.005	0.028	0.016	0.005 mg/L	ALS
	Clear Water Lagoon (In)	Total Organic Carbon	mg/L	Monthly	12	12	0	7.00	11.52	9.39	0.01 ppm	MIWB/ALS

Table 6B - Raw Water monitoring results Clear Water Lagoon (Physicals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Physicals												
Lake Julius and Lake Moondarra	Clear Water Lagoon (In)	Colour	HU	Weekly	52	52	N/A	8	106	67	1HU	MIWB
	Clear Water Lagoon (In)	Dissolved Oxygen	% Saturation	Weekly	52	52	11	80	112.8	95.14	0.10%	Field
	Clear Water Lagoon (In)	pH	Standard	Weekly	52	52	11	7.01	9.03	8.07	0.1	Field
	Clear Water Lagoon (In)	Conductivity	µS/cm	Weekly	52	52	N/A	132	403	300	1 µS/cm	Field
	Clear Water Lagoon (In)	Temperature	°C	Weekly	52	52	N/A	16.83	31.97	24.73	0.1 °C	Field
	Clear Water Lagoon (In)	Turbidity	NTU	Daily	330	330	N/A	1.5	4.3	2.9	0.1 NTU	Field
	Clear Water Lagoon (In)	Alkalinity	mg/L	Monthly	12	12	0	35	84	73	1 mg/L	ALS
	Clear Water Lagoon (In)	Hardness	mg/L	Monthly	12	12	0	35	78	67	1 mg/L	ALS

Table 6C - Raw Water monitoring results Clear Water Lagoon (Algal Counts)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Algae Counts												
Lake Julius and Lake Moondarra	Clear Water Lagoon (In)	<i>Anabaena circinalis/ Anabaena coiled or straight</i>	cells/ml	Weekly	51	2	N/A	0	1165	24	1 Cell/mL	ALS
	Clear Water Lagoon (In)	<i>Chrysosporum</i>	cells/ml	Weekly	51	0	N/A	0	0	0	1 Cell/mL	ALS
	Clear Water Lagoon (In)	<i>Chrysosporum c.f. bergii</i>	cells/ml	Weekly	51	23	N/A	0	2990	309	1 Cell/mL	ALS
	Clear Water Lagoon (In)	<i>Chrysosporum c.f. ovalisporum</i>	cells/ml	Weekly	51	12	N/A	0	2997	99	1 Cell/mL	ALS
	Clear Water Lagoon (In)	<i>Cylindrospermum</i>	cells/ml	Weekly	51	0	N/A	0	0	0	1 Cell/mL	ALS
	Clear Water Lagoon (In)	<i>Microcystis</i>	cells/ml	Weekly	51	48	N/A	0	5087	1001	1 Cell/mL	ALS
	Clear Water Lagoon (In)	<i>Microcystis c.f. aeruginosa</i>	cells/ml	Weekly	51	0	N/A	0	0	0	1 Cell/mL	ALS
	Clear Water Lagoon (In)	<i>Nodularia spumigena</i>	cells/ml	Weekly	51	0	N/A	0	0	0	1 Cell/mL	ALS
	Clear Water Lagoon (In)	<i>Raphidiopsis raciborskii</i>	cells/ml	Weekly	51	51	N/A	3397	218649	52267	1 Cell/mL	ALS
	Clear Water Lagoon (In)	Cyanotoxin	µg/L	Weekly	50	50	N/A	0.23	1.13	0.49	µg/L	MIWB/ALS

Table 6D - Raw Water monitoring results Clear Water Lagoon (Metals, Non-metals, Organics and Physicals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Metals												
Lake Julius and Lake Moondarra	Clear Water Lagoon (Out)	Aluminium	mg/L	Weekly	52	12	0	<0.005	0.009	0.002	0.005 mg/L	ALS
	Clear Water Lagoon (Out)	Iron	mg/L	Weekly	52	52	0	0.05	0.13	0.09	0.05mg/L	ALS
	Clear Water Lagoon (Out)	Lead	mg/L	Weekly	52	1	0	<0.001	0.001	<0.001	0.001 mg/L	ALS
	Clear Water Lagoon (Out)	Manganese	mg/L	Weekly	52	52	0	0.022	0.071	0.046	0.001 mg/L	ALS
Non-Metals and Organics												
Lake Julius and Lake Moondarra	Clear Water Lagoon (Out)	Total Organic Carbon	mg/L	Monthly	12	12	0	7	11.55	9.21	0.01 ppm	MIWB
Physicals												
Lake Julius and Lake Moondarra	Clear Water Lagoon (Out)	Colour	HU	Weekly	52	52	N/A	29	109	65	1HU	MIWB
	Clear Water Lagoon (Out)	Dissolved Oxygen	% Saturation	Weekly	52	52	17	65.8	118	92.19	0.10%	Field
	Clear Water Lagoon (Out)	pH	Standard	Weekly	52	52	25	7.1	9.1	8.09	0.1	Field
	Clear Water Lagoon (Out)	Conductivity	µS/cm	Weekly	52	52	N/A	142	407	305	1 µS/cm	Field
	Clear Water Lagoon (Out)	Temperature	°C	Weekly	52	52	N/A	17.35	31.82	25.24	0.1 °C	Field
	Clear Water Lagoon (Out)	Turbidity	NTU	Weekly	52	52	N/A	1.28	6.99	3.08	0.1 NTU	Field
	Clear Water Lagoon (Out)	Alkalinity	mg/L	Monthly	12	12	0	71	83	78	1 mg/L	ALS

Table 6E - Raw Water monitoring results Clear Water Lagoon (Microbiology and Metals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Microbiology												
Lake Julius and Lake Moondarra	End of Flume	<i>Escherichia coli</i>	MPN/100mL	Fortnightly	28	28	N/A	1	2223	145	1 MPN/100mL	MIWB
	Bridge Settling Pond	<i>Escherichia coli</i>	MPN/100mL	Fortnightly	26	26	N/A	1	663	72	1 MPN/100mL	MIWB
Metals												
Lake Julius and Lake Moondarra	End of Flume	Aluminium	mg/L	Weekly	49	43	N/A	<0.005	0.038	0.009	0.005 mg/L	ALS
	End of Flume	Iron	mg/L	Weekly	49	48	N/A	<0.05	0.45	0.17	0.05mg/L	ALS
	End of Flume	Lead	mg/L	Weekly	49	36	N/A	<0.001	0.003	0.001	0.001 mg/L	ALS
	End of Flume	Manganese	mg/L	Weekly	49	49	N/A	0.027	0.148	0.060	0.001 mg/L	ALS
	Bridge Settling Pond	Aluminium	mg/L	Weekly	49	9	N/A	<0.005	0.015	0.0013	0.005 mg/L	ALS
	Bridge Settling Pond	Iron	mg/L	Weekly	49	49	N/A	0.06	0.38	0.14	0.05mg/L	ALS
	Bridge Settling Pond	Lead	mg/L	Weekly	49	3	N/A	<0.001	0.001	<0.001	0.001 mg/L	ALS
	Bridge Settling Pond	Manganese	mg/L	Weekly	49	49	N/A	0.007	0.456	0.078	0.001 mg/L	ALS

Table 6F - Raw Water monitoring results Clear Water Lagoon (Physicals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Physicals												
Lake Julius and Lake Moondarra	End of Flume	Colour	HU	Weekly	50	50	N/A	21	101	45	1HU	MIWB
	End of Flume	Dissolved Oxygen	% Saturation	Weekly	50	50	N/A	54	113.9	92.86	0.10%	Field
	End of Flume	pH	Standard	Weekly	50	50	N/A	7.5	9.3	8.10	0.1	Field
	End of Flume	Conductivity	µS/cm	Weekly	50	50	N/A	76	394	284	1 µS/cm	Field
	End of Flume	Temperature	°C	Weekly	50	50	N/A	16.39	32.13	25.35	0.1 °C	Field
	End of Flume	Turbidity	NTU	Weekly	50	50	N/A	0.99	9.35	2.56	0.1 NTU	Field
	Bridge Settling Pond	Colour	HU	Weekly	50	50	N/A	20	92	41	1HU	MIWB
	Bridge Settling Pond	Dissolved Oxygen	% Saturation	Weekly	50	50	N/A	42.2	110.2	84.26	0.10%	Field
	Bridge Settling Pond	pH	Standard	Weekly	50	50	N/A	7.3	9.1	7.99	0.1	Field
	Bridge Settling Pond	Conductivity	µS/cm	Weekly	50	50	N/A	127	387	284	1 µS/cm	Field
	Bridge Settling Pond	Temperature	°C	Weekly	50	50	N/A	16.14	31.7	24.63	0.1 °C	Field
	Bridge Settling Pond	Turbidity	NTU	Weekly	50	50	N/A	0.85	4.59	1.83	0.1 NTU	Field

Table 7A - Operational monitoring results Drinking Water Supply (Microbiology and DBP's)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Microbiology												
Lake Julius and Lake Moondarra	Semi-Treated Water Supply	<i>Escherichia coli</i>	MPN/100mL	Weekly	52	0	0	<1	<1	<1	1 MPN/100mL	MIWB
	Semi-Treated Water Supply	Thermotolerant Coliforms	MPN/100mL	Weekly	52	9	0	<1	1	<1	1 MPN/100mL	MIWB
	50ML Tank	Thermotolerant Coliforms	MPN/100mL	Weekly	52	49	N/A	<1	1152	55	1 MPN/100mL	MIWB
	North Tank	Thermotolerant Coliforms	MPN/100mL	Weekly	29	17	N/A	<1	>2420	87	1 MPN/100mL	MIWB
	South tank (East)	Thermotolerant Coliforms	MPN/100mL	Weekly	37	1	N/A	<1	1	<1	1 MPN/100mL	MIWB
	South tank (West)	Thermotolerant Coliforms	MPN/100mL	Weekly	35	1	N/A	<1	1	<1	1 MPN/100mL	MIWB
	50ML Tank	Heterotrophic Plate Count	MPN/100mL	Weekly	49	49	N/A	1203	>2420	2791	1 MPN/100mL	MIWB
	North Tank	Heterotrophic Plate Count	MPN/100mL	Weekly	28	28	N/A	2	>2420	1031	1 MPN/100mL	MIWB
	South tank (East)	Heterotrophic Plate Count	MPN/100mL	Weekly	34	33	N/A	<1	>2420	615	1 MPN/100mL	MIWB
	South tank (West)	Heterotrophic Plate Count	MPN/100mL	Weekly	32	31	N/A	<1	>2420	476	1 MPN/100mL	MIWB
	Drinking Water Supply	Heterotrophic Plate Count	MPN/100mL	Weekly	50	48	N/A	<1	461	35	1 MPN/100mL	MIWB
Disinfection Residual												
Lake Julius and Lake Moondarra	Semi-Treated Water Supply	Free Chlorine	mg/L	Daily	362	358	0	<0.01	2.50	1.79	0.01 mg/L	Field
	50ML Tank	Free Chlorine	mg/L	Daily	362	339	0	<0.01	0.9	0.09	0.01 mg/L	Field
	North Tank	Free Chlorine	mg/L	Daily	213	197	0	<0.01	2.20	0.3	0.01 mg/L	Field
	South tank (East)	Free Chlorine	mg/L	Daily	268	258	0	<0.01	0.40	0.09	0.01 mg/L	Field
	South tank (West)	Free Chlorine	mg/L	Daily	267	263	0	<0.01	0.36	0.08	0.01 mg/L	Field
	Drinking Water Supply	Free Chlorine	mg/L	Daily	654	654	0	0.88	2.20	1.64	0.01 mg/L	Field

Table 7B - Operational monitoring results Drinking Water Supply (Nitrogen species and Metals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Nitrogen Species												
Lake Julius and Lake Moondarra	Semi-Treated Water Supply	Ammonia	mg/L	Monthly	12	10	0	<0.01	0.086	0.01	0.01 mg/L	ALS
	Semi-Treated Water Supply	Cyanide	mg/L	Yearly	1	0	0	<0.004	<0.004	<0.004	0.004 mg/L	ALS
	Semi-Treated Water Supply	Nitrate	mg/L	Quarterly	3	2	0	<0.01	0.02	0.01	0.01 mg/L	ALS
	Semi-Treated Water Supply	Nitrite	mg/L	Quarterly	3	0	0	<0.01	<0.01	<0.01	0.01 mg/L	ALS
Metals												
Lake Julius and Lake Moondarra	North Tank	Lead	mg/L	Weekly	18	9	0	<0.001	0.005	<0.001	0.001 mg/L	ALS
	South tank (East)	Lead	mg/L	Weekly	35	1	0	<0.001	0.002	<0.001	0.001 mg/L	ALS
	South tank (West)	Lead	mg/L	Weekly	35	1	0	<0.001	0.002	<0.001	0.001 mg/L	ALS
	Semi-Treated Water Supply	Aluminium	mg/L	Weekly	49	25	0	<0.005	0.010	0.004	0.003 mg/L	ALS
	Semi-Treated Water Supply	Antimony	mg/L	Quarterly	3	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Semi-Treated Water Supply	Arsenic	mg/L	Quarterly	3	3	0	0.002	0.002	0.002	0.001 mg/L	ALS
	Semi-Treated Water Supply	Cadmium	mg/L	Quarterly	3	0	0	<0.0001	<0.0001	<0.0001	0.0001 mg/L	ALS
	Semi-Treated Water Supply	Chromium	mg/L	Quarterly	3	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Semi-Treated Water Supply	Copper	mg/L	Monthly	12	12	0	0.002	0.004	0.003	0.001 mg/L	ALS
	Semi-Treated Water Supply	Iron	mg/L	Weekly	49	49	0	0.06	0.11	0.08	0.05 mg/L	ALS

Table 7B - Operational monitoring results Drinking Water Supply (Metals Continued...)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Metals												
	Semi-Treated Water Supply	Lead	mg/L	Weekly	49	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Semi-Treated Water Supply	Manganese	mg/L	Weekly	49	49	0	0.030	0.081	0.046	0.001 mg/L	ALS
	Semi-Treated Water Supply	Nickel	mg/L	Quarterly	3	0	0	<0.001	<0.001	<0.001	0.001 mg/L	ALS
	Semi-Treated Water Supply	Zinc	mg/L	Monthly	12	0	0	<0.005	<0.005	<0.005	0.005 mg/L	ALS

Table 7C - Operational monitoring results Drinking Water Supply (Non-metals, Organics, DBP's)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Non-Metals and Organics												
Lake Julius and Lake Moondarra	Semi-Treated Water Supply	Total Chloride	mg/L	Quarterly	3	3	0	26	32	28	1 mg/L	ALS
	Semi-Treated Water Supply	Fluoride	mg/L	Quarterly	3	3	0	0.3	0.30	0.3	0.1 mg/L	ALS
	Semi-Treated Water Supply	Hydrogen Sulphide	mg/L	Quarterly	3	0	0	<0.01	<0.01	<0.01	0.01 mg/L	ALS
	Semi-Treated Water Supply	Sodium	mg/L	Quarterly	3	3	0	18	24	21	1 mg/L	ALS
	Semi-Treated Water Supply	Sulphate	mg/L	Quarterly	3	3	0	12	14	13	1 mg/L	ALS
Organic Disinfection By-Products												
Lake Julius and Lake Moondarra	Semi-Treated Water Supply	Total Trihalomethanes	mg/L	Monthly	12	12	0	0.041	0.077	0.055	0.001 mg/L	ALS
	Semi-Treated Water Supply	Total Halo Acetic Acids	mg/L	Monthly	12	12	0	0.033	0.074	0.056	0.001 mg/L	ALS

Table 7D - Operational monitoring results Drinking Water Supply (Physicals)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Physicals												
Lake Julius and Lake Moondarra	Semi-Treated Water Supply	Colour	HU	Weekly	52	52	N/A	26	94	50.29	1HU	MIWB
	Semi-Treated Water Supply	Dissolved Oxygen	% Saturation	Weekly	52	52	23	71.6	103.1	89.69	0.10%	Field
	Semi-Treated Water Supply	pH	Standard	Weekly	52	52	0	6.8	8.1	7.63	0.1	Field
	Semi-Treated Water Supply	2-Methylisoborneol (MIB)	ng/l	Annually	1	1	N/A	0	8.9	8.9	0.1 ng/L	ALS
	Semi-Treated Water Supply	Geosmin	ng/l	Annually	1	1	N/A	2.8	2.8	2.8	0.1 ng/L	ALS
	Semi-Treated Water Supply	Total Dissolved Solids	mg/L	Quarterly	3	3	N/A	152	158	155	1mg/L	ALS
	Semi-Treated Water Supply	Conductivity	µS/cm	Weekly	51	51	N/A	38	403	294	1 µS/cm	Field
	Semi-Treated Water Supply	Temperature	°C	Weekly	52	52	N/A	14.98	30.77	24.32	0.1 °C	Field
	Semi-Treated Water Supply	Turbidity	NTU	Weekly	52	52	N/A	1.21	4.79	2.63	0.1 NTU	Field
	Semi-Treated Water Supply	Hardness	Standard	Quarterly	3	3	N/A	50	74	64	1 mg/L	ALS
	50ML Tank	Cyanotoxin	µg/L		53	1	0	<0.05	0.07	<0.05	0.05 µg/L	ALS
	50ML Tank	Colour	HU	Weekly	52	52	N/A	23	201	56	1HU	MIWB
	50ML Tank	Dissolved Oxygen	% Saturation	Weekly	52	52	11	76.10	101.9	90.59	0.10%	Field

Table 7D - Operational monitoring results Drinking Water Supply (Physicals continued...)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Physicals												
Lake Julius and Lake Moondarra	50ML Tank	pH	Standard	Weekly	52	52	1	7.11	8.52	7.72	0.1	Field
	50ML Tank	Conductivity	µS/cm	Weekly	52	52	N/A	135	397	293	1 µS/cm	Field
	50ML Tank	Temperature	°C	Weekly	52	52	N/A	14.95	30.67	24.12	0.1 °C	Field
	50ML Tank	Turbidity	NTU	Weekly	52	52	N/A	0.03	9.33	2.87	0.1 NTU	Field
	North Tank	Colour	HU	Weekly	30	30	N/A	<1	45	9.3	1HU	MIWB
	North Tank	Dissolved Oxygen	% Saturation	Weekly	31	31	1	86.50	109.7	95.43	0.10%	Field
	North Tank	pH	Standard	Weekly	31	31	0	6.75	8.42	7.71	0.1	Field
	North Tank	Conductivity	µS/cm	Weekly	31	31	N/A	126	481	286	1 µS/cm	Field
	North Tank	Temperature	°C	Weekly	31	31	N/A	15.41	30.75	24.75	0.1 °C	Field
	North Tank	Turbidity	NTU	Weekly	31	31	N/A	0.18	1.27	0.42	0.1 NTU	Field
	South tank (East)	Colour	HU	Weekly	36	36	N/A	<1	34	8.69	1HU	MIWB
	South tank (East)	Dissolved Oxygen	% Saturation	Weekly	36	36	3	81.1	104.4	92.69	0.10%	Field
	South tank (East)	pH	Standard	Weekly	36	36	0	7.14	8.52	7.68	0.1	Field
	South tank (East)	Conductivity	µS/cm	Weekly	35	35	N/A	124	397	304	1 µS/cm	Field
	South tank (East)	Temperature	°C	Weekly	36	36	N/A	15.46	30.51	25.46	0.1 °C	Field
	South tank (East)	Turbidity	NTU	Weekly	36	36	N/A	0.14	0.57	0.30	0.1 NTU	Field

Table 7D - Operational monitoring results Drinking Water Supply (Physicals continued...)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Physicals												
Lake Julius and Lake Moondarra	South tank (West)	Colour	HU	Weekly	34	34	N/A	<1	18	9	1HU	MIWB
	South tank (West)	Dissolved Oxygen	% Saturation	Weekly	35	35	5	80.8	107.2	92.6	0.10%	Field
	South tank (West)	pH	Standard	Weekly	35	35	0	7.07	8.2	7.66	0.1	Field
	South tank (West)	Conductivity	µS/cm	Weekly	35	35	N/A	128	394	313.08	1 µS/cm	Field
	South tank (West)	Temperature	°C	Weekly	35	35	N/A	16.29	31.48	25.43	0.1 °C	Field
	South tank (West)	Turbidity	NTU	Weekly	35	35	N/A	0	0.24	0.078	0.1 NTU	Field
	Drinking Water Supply	Colour	HU	Weekly	52	52	N/A	<1	36	6	1HU	MIWB
	Drinking Water Supply	Dissolved Oxygen	% Saturation	Weekly	52	52	10	82.60	103.7	93.78	0.10%	Field
	Drinking Water Supply	pH	Standard	Weekly	52	52	0	7	8.1	7.65	0.1	Field
	Drinking Water Supply	Conductivity	µS/cm	Weekly	52	52	N/A	147	404	298.29	1 µS/cm	Field
	Drinking Water Supply	Temperature	°C	Weekly	52	52	N/A	15.92	30.89	24.25	0.1 °C	Field
	Drinking Water Supply	Turbidity	NTU	Weekly	52	52	N/A	0.12	1.2	0.32	0.1 NTU	Field

Table 7E - Operational monitoring results Drinking Water Supply (Algal counts)

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. of samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of Detection	Laboratory name
Algae Counts												
Lake Julius and Lake Moondarra	50ML Tank	<i>Anabaena circinalis/ Anabaena coiled or straight</i>	cells/ml	Weekly	52	0	N/A	0	0	0	1 Cell/mL	ALS
	50ML Tank	<i>Chrysosporum</i>	cells/ml	Weekly	52	0	N/A	0	0	0	1 Cell/mL	ALS
	50ML Tank	<i>Chrysosporum c.f. bergii</i>	cells/ml	Weekly	52	29	N/A	0	4278	406	1 Cell/mL	ALS
	50ML Tank	<i>Chrysosporum c.f. ovalisporum</i>	cells/ml	Weekly	52	9	N/A	0	2360	107	1 Cell/mL	ALS
	50ML Tank	<i>Cylindrospermum</i>	cells/ml	Weekly	52	1	N/A	0	94	2	1 Cell/mL	ALS
	50ML Tank	<i>Microcystis</i>	cells/ml	Weekly	52	47	N/A	0	8408	1027	1 Cell/mL	ALS
	50ML Tank	<i>Microcystis c.f. aeruginosa</i>	cells/ml	Weekly	52	0	N/A	0	0	0	1 Cell/mL	ALS
	50ML Tank	<i>Nodularia spumigena</i>	cells/ml	Weekly	52	0	N/A	0	0	0	1 Cell/mL	ALS
	50ML Tank	<i>Raphidiopsis raciborskii</i>	cells/ml	Weekly	52	50	N/A	0	144999	56169	1 Cell/mL	ALS