Drinking Water Quality Management Plan (DWQMP) Annual Report 2015-2016

Mount Isa Water Board

Drinking Water Quality Management Plan

Annual Report 2015-2016

Table 1: Service provider details:

DETAIL	INFORMATION
SPID	199
Name	Mount Isa Water Board
Address	PO Box 1712 Mount Isa QLD 4825
Telephone	07 4740 1000
Email	info@mountisawater.qld.gov.au
Website	wwwmountisawater.qld.gov.au
Water Supply Schemes covered by this plan	Mount Isa

Glossary of terms

ADWG 2011	Australian Drinking Water Guidelines (2011) Published by the National Health and Medical Research Council of Australia
E coli	*Escherichia coli,* a bacterium which is considered to indicate the presence of faecal contamination and therefore potential health risk
mg/L	milligrams per litre
NTU	Nephelometric Turbidity Units
MPN/100mL	Most probable number of microorganisms per 100 millilitres
CFU/100mL	Colony forming units per 100 millilitres
BGA	Blue Green Algae
TTHM's	Total Trihalomethanes
DBP's	Disinfection By-Products
<	Less than
>	Greater than
O&M	Operations and Maintenance
CWL	Clear Water Lagoon
AWQC	Australian Water Quality Centre
DWIERP	Drinking Water Incident and Emergency Response Plan
SW	Source Water
R	Reticulation

1. Introduction

This annual report documents the performance of the Mount Isa Water Board (MIWB) as a Category 1 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 2015 - 2016

The goal of the DWQMP is the protection of public health through the identification and minimisation of any public health related risks associated with drinking water. An amended DWQMP for MIWB was approved by the Queensland Water Supply Regulator, Department of Energy and Water Supply (QWSR, DEWS) in July 2015.

This annual report assists the Regulator to determine whether the approved DWQMP, and any conditions of approval, have been complied with and provides a mechanism for providers to report publicly on their performance in managing drinking water quality.

2. Overview of Operations

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

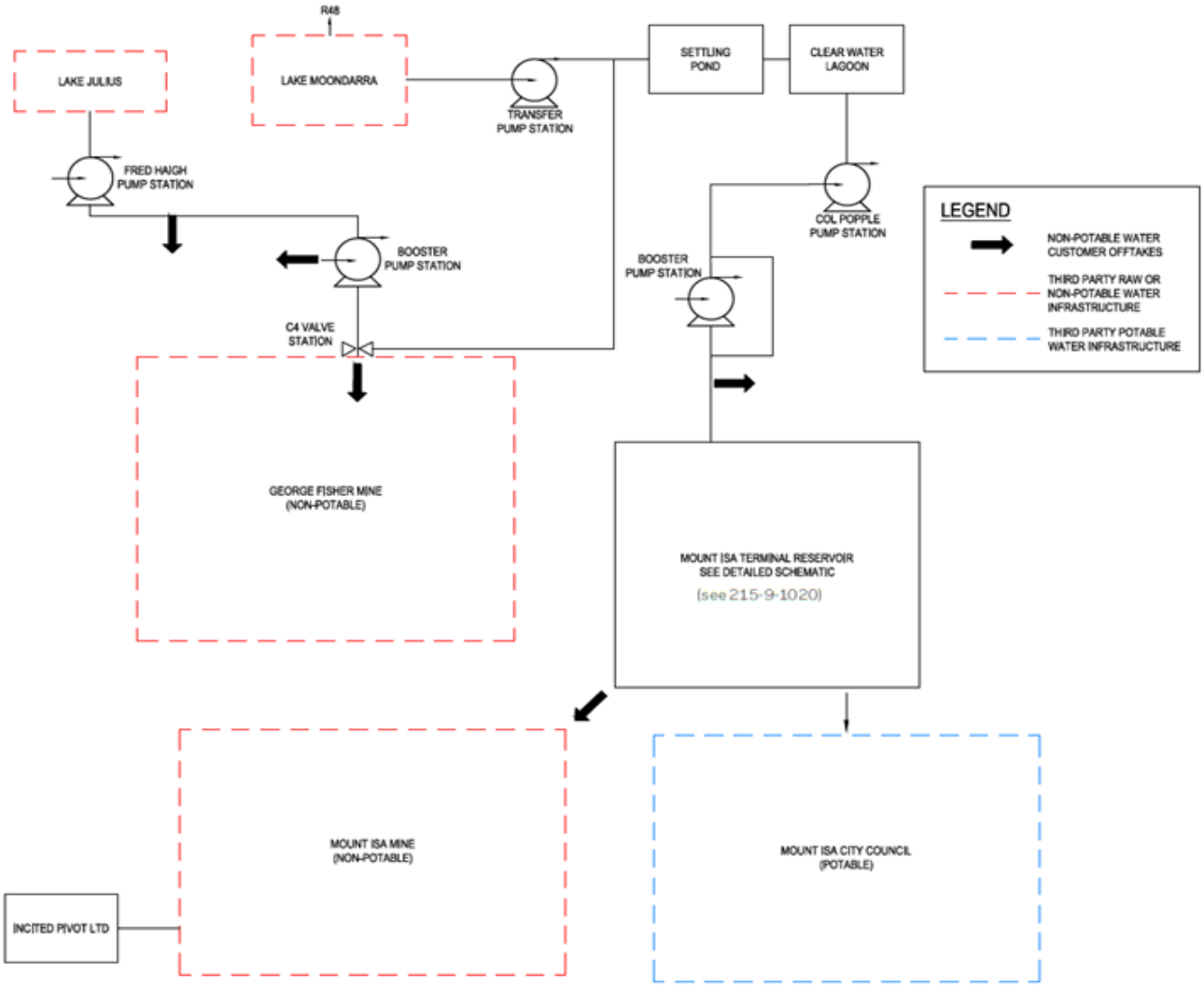
There are two sources of raw water that can be utilised, Lake Moondarra and Lake Julius Water from either source is pumped via an aeration flume to oxygenate the water prior to entering a settling pond which utilises reed beds for natural filtration and sedimentation. Water follows from the Settling Pond into a purpose built storage lagoon of approximately 2,300ML capacity. The Clear Water Lagoon (CWL) allows for residual suspended solids to be removed including any residual lead which is rarely detected. The Clear Water Lagoon is fully fenced to exclude cattle.

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 the Mount Isa Terminal Reservoir (MITR) undergoes a microfiltration polishing stage and chlorination before delivery to MIWB's sole drinking water customer Mount Isa City Council (MICC). The daily demand of MIWB's three major customers is approximately 40-55 ML/day due to seasonal changes and industrial customer's operational requirements.

A schematic for the water supply is presented in Figure 1:

Figure 1 MIWB Drinking Water Supply Scheme



3. Actions taken to implement the DWQMP

A hazard identification and risk assessment approach has been undertaken which is consistent with the Australian Drinking Water Guidelines. (ADWG)

The methodology used to assess the water quality risks is a step based approach. Firstly, the inherent risk from the water sources is identified, secondly the maximum risk is calculated whereby no barriers or existing preventative measures are put in place, and thirdly the residual risk is calculated with all preventative measures in place for the customers at the supply point.

A number of critical control points (CCPs) were identified in the system that is monitored. These CCPs can be actioned to prevent process excursions leading to non-compliant product.

In the reporting period of 2015-2016 there were four CCP events:

1. High turbidity at Lake Moondarra

On December 27, 2015 there was a high rainfall event which triggered high turbidity levels at the Lake Moondarra transfer pumps. Pumping into the Clear Water Lagoon ceased until turbidity levels returned to the set point of <20NTU's. Turbidity remained above the set point for fourteen days before pumping into the CWL could resume. Due to cessation of pumping in CWL, no non-compliant water was transferred to the MITR.

2. Microfiltration unit trip due to high turbidity

On February 11, 2016 a microfiltration unit at the MITR tripped due to a high turbidity reading above the set point. Each microfiltration unit is programmed to cease operation if high turbidity is monitored for 600 seconds. Upon investigation, it was found that check samples did not exceed the set point of 1NTU. Further investigation found that the unit had reverted to a zero second monitoring time frame for high turbidity readings after a recent power failure. Also at the time of the high reading, the second unit in the pair was completing an air scour and the possible high reading was due to an extraneous air bubble. Additional monitoring was completed and no product exceeded the water quality guidelines.

3. High turbidity at Lake Moondarra

On March 15, 2016, high turbidity was recorded above the set point at the Lake Moondarra transfer pumps due to a recent inflow event. At the time, the CWL was full and no water was being transferred. No action was taken except to continue to monitor the lake turbidity levels.

4. Microfiltration unit trip due to high turbidity

On June 6, 2016 a microfiltration unit at the MITR tripped due to a high turbidity reading above the set point. The microfiltration units are programmed to trip if high turbidity is monitored for 600 seconds. Upon investigation, it was found that check samples did not exceed the set point of 1NTU. Further investigation found that the unit had been set to a 400 second monitoring time and that water flow was too high through the meter. Also at the time of the high reading, the second unit in the pair was completing an air scour and the possible high reading was due to an extraneous air bubble. The delay timer was reset to 600 seconds and the flow rate to the meter was adjusted back to the correct level. Additional monitoring was completed and no product exceeded the water quality guidelines.

In all cases the CCP events showcased that all set points and response measures ensured no water breached the quality guidelines during the year.

4. Compliance with water quality criteria for drinking water

During the 2015-2016 financial year verification monitoring was undertaken for a number of parameters.

41 Escherichia coli

In all cases, the water quality results met the Australian Drinking Water Guidelines for *Escherichia coli.* Ninety-eight 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 1.

For source waters emanating from Lake Moondarra and Lake Julius, the maximum E coli counts are 185 and 122 MPN/100ml respectively. The minima equated to the limit of reporting (LOR) of 1MPN. Results are given in Appendix A – Table 2.

4.2 Cryptosporidium and Giardia

During the financial year, the source water quality results showed no evidence of Cryptosporidium and Giardia. Twenty-six samples each, from Lake Moondarra and Lake Julius, were collected and tested by the NATA certified laboratory ALS. No samples were observed to contain any oocysts or cysts. Full details are provided in Appendix A – Table 3.

4.3 Cyanobacteria Counts

A total of 53 samples were collected during the year for cyanobacteria identification and counting. Of the 51 samples, 20 were from Lake Julius, 28 from Lake Moondarra and 5 from MITR. None of the samples showed evidence of *Nodularia spumigena* with all having levels below the LOR of 1cell/ml. All samples taken from Lake Julius and Lake Moondarra had varying amounts of *Cylindrospermopsis raciborskii* present. At Lake Julius, counts varied from 2500 to over 850,000 cells/ml. Lake Moondarra counts were less; between 40 and 80,000 cells/ml. Microcystis species was evident in 10 samples from Lake Moondarra with a maximum count of 1,245 cells/ml.

MITR had no evidence of any cyanobacteria contamination and all samples were compliant with the ADWG. Full results are indicated in Appendix A – Table 4.

4.4 Cyanotoxins

A total of 50 samples were collected during the year for cyanotoxin testing; specifically cylindrospermopsin. Of the 50 samples, 3 were from Lake Julius, 5 from Lake Moondarra and 42 from MITR. In all samples, not one reported a toxin level above 10 µg/l. 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.

MITR had no results of cyanotoxin levels exceeding the WHO guideline level of 1µg/l Full results are indicated in Appendix A – Table 5.

4.5 Disinfection By-products

As a consequence of chlorination of the water, organic material can react with the chlorine and form disinfection by-products. Two forms of by-products can be produced and are collectively known as Total Halomethanes (THMs) and Haloacetic acids (HAAs). As part of the verification monitoring program, these groups of compounds are monitored.

For the 2016-2016 financial year, 52 samples for THM's and 29 samples for HAA's were collected from MITR. All samples were tested at the NATA accredited laboratory ALS. The THM results ranged from 87 to 186µg/l. No sample exceeded the ADWG of 250µg/l for the year.

Of the samples collected for HAA's, 6 exceeded the ADWG for trichloroacetic acid of 100µg/l. The results ranged from <5 to 130µg/l. The results are shown in Appendix A – Table 6, and further detail is given in section 5.

4.6 Chlorine, physical parameters and Metals

Free and total chlorine was monitored throughout the financial year at the MITR. A total of 306 samples were tested, and none exceeded the ADWG limit of 5mg/l. Physical parameters such as pH and turbidity was also monitored as well as metals. There was one exceedance of lead at 0066mg/l at the MITR north tank. This was above the ADWG limit of 001mg/l All results are shown in Appendix A – Table 7, and further detail of the lead exceedance is given in section 5.

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

There were two water quality incidents/events reported as a result of breach of ADWG and twenty four notifications for test results exceeding the interim guidelines to the Regulator under section 102 and 102A of the Act.

- One notification involved the detection of Lead at above threshold concentrations in tanks prior to discharge
- One notification were caused by the detection of Trichloroacetic acid (TCA), one of the disinfection by-products (DBPs) of chlorination. There were six occurrences of TCA exceeding the guideline limit during the event.

None of these incidents required Mount Isa Water Board to issue a boil or do not drink notice to our customers.

Non-compliant drinking water quality criteria and corrective actions

Detection of Lead

Incident description: Lead exceeded the ADWG health limit of 1 mg/L in the north tank (S18) on 21st July 2015. This result was included in the incident DWI-7-199-00040 which was opened on 10th February 2015 in the last financial year (2014-2015). Further resample results showed the lead concentrations were below the ADWG limit. This incident was closed in October 2015. During this reporting period lead levels above the ADWG health limit was not found in any sample from the MICC supply.

Corrective and preventative actions: MIWB informed the QWSR of the incident within the incident notification timeframe. The MIWB's O&M Contractors were informed of the incident. Dust suppression was carried out near the north and south tanks, which involved spraying a non-toxic water soluble polymer onto dusty areas, followed by road reformation in August 2015 which minimised the effect of dust transfer into the tanks. The areas surrounding the filter containers were concreted, grass was established and sprinklers have been installed in some areas and roads re-gravelled with clean fill.

Exceedance of Trichloroacetic acid

Incident description: On 7th June 2016, the result for TCA at sampling location MICC Town High (S29) was 110 µg/L. This result exceeded the ADWG health guideline limit of 100 µg/L. The result was reported to the QWSR and recorded as incident DWI-7-199-00045. Further detections of high TCA concentration was noted on 14th June, 20th June, 23rd June, 28th June and 30th June 2016 with results being 112, 123, 130, 127 and 112 µg/L respectively. These were also reported to the QWSR and included in the open incident DWI-7-199-00045.

Corrective and preventative actions: MIWB informed the QWSR of the incident within the incident notification timeframe. The MIWB's operations and maintenance (O&M) Contractors were informed of the incident. Chlorine grab sample results of free and total chlorine were checked and found to be below the ADWG health guideline limit. The frequency of sampling for Haloacetic acids which includes Trichloroacetic acid was increased from monthly to twice weekly. Closer monitoring of chlorine residuals was initiated in an effort to reduce formation of DBP's without compromising bacteriological disinfection. Investigation steps included a chlorine reduction trial in the storage tanks, frequent monitoring of chlorine residuals and sampling at various points in the system; in addition to the final discharge points. This was to better understand the formation of TCA, ways to optimise chlorine dosing that reduces disinfection by-products.

Exceedance of total Haloacetic acids

Seven notifications of total haloacetic acids were made to the regulator in regards to detection of parameters with no water quality criteria. The Guidelines for Canadian Drinking Water Quality was used to establish a reporting parameter for the group of disinfection by-products, haloacetic acids, which was set at a total limit of 0.08 mg/L in. Using this limit, the amount was breached for the Town high/low sample point (S29/30) in February with a returned result of 0.105 in February; 0.120 mg/L in April; 0.158 mg/L in May; 0.212, 0.211, 0.197, 0.183 mg/L in June 2016. These were reported under the incident DWI-7-199-00044.

6. Customer Complaints

MIWB did not receive any formal water quality complaints from its drinking water customer for the 2015-2016 financial year.

7. Findings and recommendations of the DWQMP auditor

An external audit of the MIWB DWQMP was completed in March 2016.

The audit was conducted to verify the accuracy of monitoring and performance data provided to the regulator; assess the service provider's compliance with the plan; and to assess the relevance of the plan in relation to the provider's drinking water service.

Each of the twelve elements of the plan were reviewed and rated as compliant, opportunities for improvement; or non-compliance was noted. The elements are:

- Commitment to Drinking Water Quality
- Water supply system analysis
- Hazard identification and risk assessment
- Operational Procedures and Process Control
- Verification of Drinking Water
- Management of Incidents and Emergencies
- Employee Awareness and Training
- Community Involvement and Awareness
- Research and Development
- Documentation and Reporting
- Evaluation and Audit
- Review and Continual Improvement

The auditor found that in general, the MIWB was complying with the DWQMP and that the DWQMP meets the key regulatory requirements of the ADWG. Some opportunities for improvement were noted and three non-conformances were observed. Findings from the auditor are listed.

The non-conformances are identified below:

1) Schematic and scheme description due to the changes in the service, the schematic and scheme description do not accurately describe the Col Popple chlorine dosing system, and do not identify the Y-piece at the MITR which is now effectively a bypass of the normal operation

2) The raw water selection CCP described in the DWQMP is not implemented as described in the plan as monitoring is not twice daily, and is not undertaken on the weekends However, given the changes in the operation of the service, this does not at all impact on the quality of water supplied to MICC

3) The operational monitoring program is not implemented exactly as described. Again, the daily chlorine monitoring is undertaken on weekdays, not daily as described in the DWQMP, this is not considered to adversely affect the final water quality as there is continuous online monitoring of the chlorine residual to MICC

Sixteen opportunities for improvement were identified with the major items summarised below.

The major item to address is that the Header, North and South Tanks at the Mount Isa Terminal Reservoir complex are uncovered. The tanks have been risk assessed and therefore are compliant within the framework of the approved DWQMP. The auditor expressed an opinion that uncovered clean water tanks are not best practice and present a risk of recontamination post filtration.

A second significant improvement related to the operation and maintenance contract between MIWB and MIM. The current contract was signed prior to the requirement for DWQMPs, and as such, the contract does not stipulate that the operators need to adhere to the DWQMP. Also it was identified that the contract does not include sufficient reference to water quality. The auditor recommended rectification as soon as possible.

The remaining improvement items can be considered as suggestions as to how the DWQMP may be amended in the upcoming review to ensure it meets the ADWG and current regulatory requirements.

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

A new the DWQMP was drafted in June 2016 and submitted to the regulator subsequent to the end of the reporting period.

Appendix A – Details of compliance with water quality criteria

Table 1A – Reticulation *E coli* verification monitoring 2014-2015

Drinking water scheme: Mount Isa Water Board - Lake Moondarra and Lake Julius

Year	***2014-2015***											
Month	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No of samples collected	12	12	14	12	12	15	12	11	15	9	12	15
No of samples collected in which *E coli* 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	197	200	195	192	186	184	177	172	166	165	153	148
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 1B – Reticulation *E coli* verification monitoring 2015-2016

Drinking water scheme: Mount Isa Water Board - Lake Moondarra and Lake Julius

Year	***2015-2016***											
Month	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No of samples collected	4	4	5	4	4	5	4	4	5	4	4	5
No of samples collected in which *E coli* 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	143	135	126	118	110	100	92	85	75	70	62	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 2 - Summary of the 2015 – 2016 drinking water quality results

Parameter Name of Scheme Component	Scheme Component	Laboratory Name	Unit of Measure	Limit of Reporting (LOR) for Chemical Parameters	Total No Samples taken	No of Samples in which the Parameter was Detected	No of Samples Exceeding Health Guideline Value or in which Pathogens were Detected	Minimum	Maximum	Average (Mean)
								(Concentration or Count)		
ESCHERICHIA COLI AND THERMOTOLERANT COLIFORMS										
Lake Julius	SW	MIWB	MPN/100mL	1 MPN/100mL	23	14	N/A	<1	12.2	2.356
Lake Moondarra	SW	MIWB	MPN/100mL	1 MPN/100mL	24	14	N/A	<1	18.5	2.87
MITR	R	MIWB	MPN/100mL	1 MPN/100mL	52	0	0	<1	<1	<1

Table 3 - Summary of the 2015 – 2016 drinking water quality results

Parameter Name of Scheme Component	Scheme Component	Laboratory Name	Unit of Measure	Limit of Reporting (LOR) for Chemical Parameters	Total No Samples taken	No of Samples in which the Parameter was Detected	No of Samples Exceeding Health Guideline Value or in which Pathogens were Detected	Minimum	Maximum	Average (Mean)
								(Concentration or Count)		
CRYPTOSPORIDIUM										
Lake Moondarra	SW	ALS	Oocysts/ 10L	0.1 oocyst/10L	26	0	0	<0.1	<0.2	<0.1
Lake Julius	SW	ALS	Oocysts/ 10L	0.1 oocyst/10L	26	0	0	<0.1	<0.2	<0.1
GIARDIA										
Lake Moondarra	SW	ALS	Cysts/10L	0.1 cyst/10L	26	0	0	<0.1	<0.2	<0.1
Lake Julius	SW	ALS	Cysts/10L	0.1 cyst/10L	26	0	0	<0.1	<0.2	<0.1

Table 4 - Summary of the 2015 – 2016 drinking water quality results

Parameter	Name of Scheme Component	Scheme Component	Laboratory Name	Unit of Measure	Limit of Reporting (LOR) for Chemical Parameters	Total No Samples taken	No of Samples in which the Parameter was Detected	No of Samples Exceeding Health Guideline Value or in which Pathogens were Detected	Minimum	Maximum	Average (Mean)
									(Concentration or Count)		
COUNTS OF POTENTIALLY TOXIC CYANOBACTERIA											
Anabaena Circinalis/ Anabaena coiled or straight	LJ	SW	ALS	cells/ml	1 Cell/mL	20	1	N/A	0	77	4.27
Anabaena Circinalis/ Anabaena coiled or straight	LM	SW	ALS	cells/ml	1 Cell/mL	28	1	N/A	0	32	2.28
Anabaena Circinalis/ Anabaena coiled or straight	MITR	R (S29)	ALS	cells/ml	1 Cell/mL	5	0	0	0	0	0
Cylindrospermopsis Raciborskii	LJ	SW	ALS	cells/ml	1 Cell/mL	20	20	N/A	2,498	850,294	164,902
Cylindrospermopsis Raciborskii	LM	SW	ALS	cells/ml	1 Cell/mL	28	26	N/A	41	88,273	24,784
Cylindrospermopsis Raciborskii	MITR	R (S29)	ALS	cells/ml	1 Cell/mL	5	5	0	0	487	151
Microcystis	LJ	SW	ALS	cells/ml	1 Cell/mL	20	1	N/A	0	167	18
Microcystis	LM	SW	ALS	cells/ml	1 Cell/mL	28	10	N/A	0	1,245	161
Microcystis	MITR	R (S29)	ALS	cells/ml	1 Cell/mL	5	0	0	0	0	0
Nodularia spumigena	LJ	SW	ALS	cells/ml	1 Cell/mL	20	0	N/A	0	0	0
Nodularia spumigena	LM	SW	ALS	cells/ml	1 Cell/mL	28	0	N/A	0	0	0
Nodularia spumigena	MITR	R (S29)	ALS	cells/ml	1 Cell/mL	5	0	0	0	0	0

Table 5 - Summary of the 2015 – 2016 drinking water quality results

Parameter Name of Scheme Component	Scheme Component	Laboratory Name	Unit of Measure	Limit of Reporting (LOR) for Chemical Parameters	Total No Samples taken	No of Samples in which the Parameter was Detected	No of Samples Exceeding Health Guideline Value or in which Pathogens were Detected	Minimum	Maximum	Average (Mean)
								(Concentration or Count)		
CYANOBACTERIAL TOXINS – Cylindrospermopsin										
Lake Julius	SW	ALS/MIWB	µg/L	0.05 µg/L	3	3	N/A	0.27	0.7	0.416
Lake Moondarra	SW	ALS/MIWB	µg/L	0.05 µg/L	5	5	N/A	0.08	0.36	0.19
MITR	R (S29)	ALS/MIWB	µg/L	0.05 µg/L	42	27	0	<0.05	0.34	0.17

Table 6 - Summary of the 2015 – 2016 drinking water quality results

Parameter Name of Scheme Component	Scheme Component	Laboratory Name	Unit of Measure	Limit of Reporting (LOR) for Chemical Parameters	Total No Samples taken	No of Samples in which the Parameter was Detected	No of Samples Exceeding Health Guideline Value or in which Pathogens were Detected	Minimum	Maximum	Average (Mean)
								(Concentration or Count)		
DISINFECTION BYPRODUCTS										
Trihalomethanes (THMs) - MITR	R	ALS	µg/L	5 µg/L	52	52	0	87	186	137.34
Chloroacetic acid (HAA) - MITR	R	ALS	µg/L	1 µg/L	28	27	0	<1	5	3.38
Dichloroacetic acid (HAA) - MITR	R	ALS	µg/L	10 µg/L	28	28	0	33	58	46.88
Trichloroacetic acid (HAA) - MITR	R	ALS	µg/L	10 µg/L	28	28	6	23	130	61.83

Table 7 - Summary of the 2015 – 2016 drinking water quality results

Parameter Name of Scheme Component	Scheme Component	Laboratory Name	Unit of Measure	Limit of Reporting (LOR) for Chemical Parameters	Total No Samples taken	No of Samples in which the Parameter was Detected	No of Samples Exceeding Health Guideline Value or in which Pathogens were Detected	Minimum	Maximum	Average (Mean)
								(Concentration or Count)		
DISINFECTION RESIDUAL										
Free Chlorine - MITR	T S18	Field	mg/L	0.01 mg/L	52	52	0	0.04	1.04	0.3686
	T S19	Field	mg/L	0.01 mg/L	49	49	0	0.04	0.91	0.26
	R	Field	mg/L	0.01 mg/L	52	52	0	0.78	2.9	1.688
Total Chlorine - MITR	T S18	Field	mg/L	0.01 mg/L	52	52	0	0.16	1.49	0.702
	T S19	Field	mg/L	0.01 mg/L	49	49	0	0.14	1.05	0.532
	R	Field	mg/L	0.01 mg/L	52	52	0	1.16	3.2	2.054
ANIONS AND PHYSICAL PARAMETERS										
Nitrate + Nitrite - MITR	R	ALS	mg/L	0.01mg/L	4	4	N/A	0.02	0.03	0.0275
Fluoride - MITR	R	ALS	mg/L	0.1 mg/L	4	4	0	0.2	0.4	0.275
pH – Lake Julius	SW	Field	Standard	0.1	52	52	N/A	6.78	8.96	7.77
pH – Lake Moondarra	SW	Field	Standard	0.1	52	52	N/A	7.48	8.94	8.23
pH - MITR	T S18	Field	Standard	0.1	52	52	N/A	7.47	8.23	7.77
pH - MITR	T S19	Field	Standard	0.1	52	52	N/A	7.45	8.15	7.71
pH - MITR	R	MIWB	Standard	0.1	52	52	N/A	7.26	7.96	756
Turbidity – Lake Julius	SW	Field	NTU	0.1 NTU	52	52	N/A	0	16.0	12.37
Turbidity – Lake Moondarra	SW	Field	NTU	0.1 NTU	52	52	N/A	2.29	27.1	7
Turbidity - MITR	T S18	Field	NTU	0.1 NTU	52	52	N/A	0.03	0.86	0.293
Turbidity - MITR	T S19	Field	NTU	0.1 NTU	52	52	N/A	0.06	0.61	0.28
Turbidity - MITR	R	Field	NTU	0.1 NTU	52	52	N/A	0	0.65	0.25

Table 7 continued - Summary of the 2015 – 2016 drinking water quality results

Parameter	Name of Scheme Component	Scheme Component	Laboratory Name	Unit of Measure	Limit of Reporting (LOR) for Chemical Parameters	Total No Samples taken	No of Samples in which the Parameter was Detected	No of Samples Exceeding Health Guideline Value or in which Pathogens were Detected	Minimum	Maximum	Average (Mean)
									(Concentration or Count)		
METALS											
Aluminium	LM	SW	ALS	mg/L	0.005 mg/L	52	43	0	<0.005	0.11	0.0166
Boron	LM	SW	ALS	mg/L	0.05 mg/L	1	0	0	<0.05	<0.05	<0.05
Iron	LM	SW	ALS	mg/L	0.05 mg/L	52	52	0	0.06	2.65	0.3204
Lead	LM	SW	ALS	mg/L	0.001 mg/L	52	42	1	<0.001	0.066	0.0046
Manganese - Total	LM	SW	ALS	mg/L	0.001 mg/L	52	52	0	0.016	0.114	0.0564
Selenium	LM	SW	ALS	mg/L	0.01 mg/L	1	0	0	<0.01	<0.01	<0.01
Aluminium	MITR	R	ALS	mg/L	0.005 mg/L	52	11	0	<0.005	0.05	0.0070
Antimony	MITR	R	ALS	mg/L	0.001 mg/L	4	0	0	<0.001	<0.001	<0.001
Cadmium	MITR	R	ALS	mg/L	0.0001 mg/L	4	0	0	<0.0001	<0.0001	<0.0001
Chromium	MITR	R	ALS	mg/L	0.001 mg/L	4	0	0	<0.001	<0.001	<0.001
Arsenic	MITR	R	ALS	mg/L	0.001 mg/L	4	3	0	<0.001	0.002	0.0013
Copper	MITR	R	ALS	mg/L	0.001 mg/L	12	12	0	0.002	0.004	0.0023
Iron	MITR	R	ALS	mg/L	0.05 mg/L	52	52	0	<0.05	<0.05	<0.05
Lead	MITR	R	ALS	mg/L	0.001 mg/L	52	4	0	<0.001	0.003	0.0011
Manganese - Total	MITR	R	ALS	mg/L	0.001 mg/L	52	38	0	<0.001	0.037	0.0038
Nickel	MITR	R	ALS	mg/L	0.001 mg/L	4	0	0	<0.001	<0.001	<0.001
Zinc	MITR	R	ALS	mg/L	0005 mg/L	12	1	0	<0.05	0.0052	0.0050

Appendix B – Implementation of the DWQMP Risk Management Improvement Program

Progress against the risk management improvement program in the approved DWQMP is listed in this section.

Improved Filtration Plant Operational Assurance

MIWB has now acquired permanent plant which includes sophisticated automation of daily pressure delay tests and continuous turbidity monitoring as well as self-diagnosis and fault reporting.

Pressure decay tests ensure the daily integrity of plant. Any failure of integrity test will alarm and notify the filter plant operator.

Continuous turbidity monitoring tracks and trends filtrate turbidity and results and will automatically shut down a filter plant if out of specification water is supplied for a nominated duration.

These measures provide robust engineering control of the possibility of these treatment plants delivering out of specification water for any significant period which improved the assurance provided by this system barrier.

Manage the continuing cyanobacterial bloom in CWL

Following an extensive literature review, MIWB selected a suite of BGA management tools to investigate further in laboratory and field trials. In the 2014-2015 financial year laboratory trials took place to assess zooplankton biomanipulation by the introduction of daphnia. Other activities included fish reduction investigation, partial emptying and refilling CWL and planning for a sediment cores laboratory trial with alum and phoslock dosing.

The partial emptying and refilling of CWL successfully dropped BGA cells counts by approximately 50 % in March 2015. It could not be determined how long this effect would last, as temperatures began decreasing, which naturally lowered BGA numbers in CWL, Lake Julius and Lake Moondarra. Emptying CWL is restricted by the Col Popple pump station draw depth. Until the recommissioning of the Deep Well Pump Station, the CWL cannot be drawn down to a significant extent. This re-commissioning process includes the replacement of significant High Voltage infrastructure with the potential to cause interruption to regional supply. This project is scheduled for completion in June 2017.

An investigation into increased destratification and aeration rates within Clear Water Lagoon is currently taking place. This includes the installation of additional aeration assets adjacent to Col Popple Pump Station and floating impeller type destratification pontoons at strategic locations on the lagoon.

Implement Optimised Chlorination Strategy

Changes to the chlorine dosing system were implemented to allow for increased dosing closer to the customer delivery points. This reduced overall chlorine contact time while maintaining minimum contact times required for quality disinfection. This included relocating the GFM chlorine

injection point, installing a new sample point prior to GFM and increasing dosing capacity at MITR. This enabled the primary dosing point at the CWL to be discontinued and to test the theory of reduced DBP's with the altered chlorine dosing system due to reduced contact times.

The result has been a proven reduction in DBP's and an improvement in the management of chlorine dosing in general. Daily monitoring of free chlorine levels throughout the system continue to provide feedback on system performance.

Other Improvement Opportunities

- Pre-feasibility investigations continue into options for implementation for activated carbon treatment to provide assurance against cyanotoxins which cannot be managed by oxidation.
- Two independent tank design projects are currently underway with the expected outcome of phasing out open tanks altogether from the MIWB treatment infrastructure. These design projects are scheduled for completion in 2016/17.