Drinking Water Quality Management Plan (DWQMP) Annual Report 2014-2015

Mount Isa Water Board

Drinking Water Quality Management Plan – Annual Report 2014 – 2015

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	www.mountisawater.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 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

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 2014 - 2015.

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. Drinking Water Scheme

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 is treated via sedimentation and re-oxygenation in the Settling Pond and subsequently in the Clear Water Lagoon (CWL). Water is then chlorinated at Mount Isa Terminal Reservoir (MITR) and supplied directly to industrial customers. As per the BGA Management Manual, for the majority of the reporting period, an emergency filtration plant was in place for water supplied to Mount Isa City Council (MICC) to address the elevated levels of BGA in CWL. From March 2015, all water supplied to MICC as been treated by micro-filtration for supply as drinking water to the city.

The daily demand of MIWB's three major customers varies from 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.

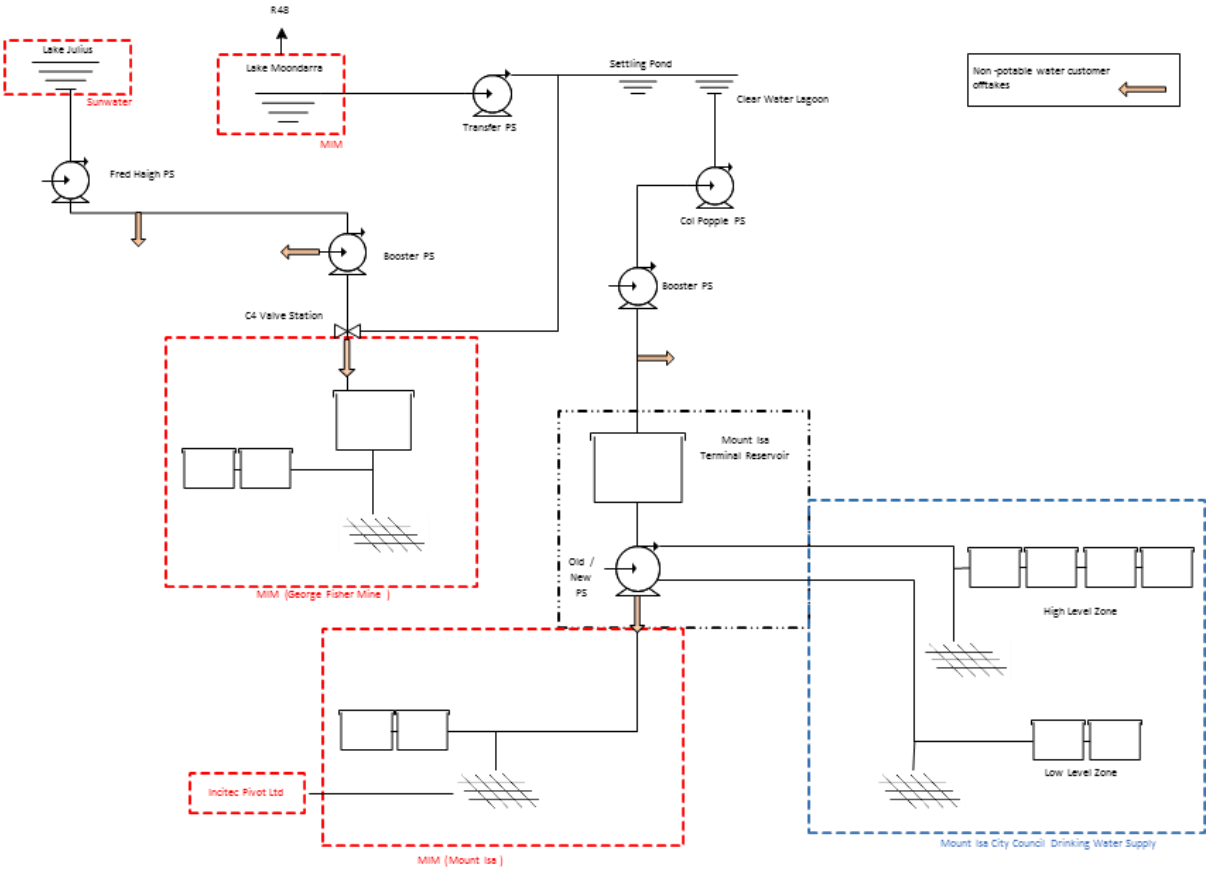

Figure 1 MIWB Drinking Water Supply Scheme

3. Notification to the Regulator under section 102 and 102A of the Act

This financial year there were seven water quality incidents/events reported to the Regulator under section 102 and 102A of the Act.

- Two of the notifications were caused by the detection of Trichloroacetic acid (TCA) and one by Total Trihalomethanes (TTHM's) – both disinfection by-products (DBP's) of chlorination.
- One notification was due to chlorine concentrations exceeding the Australian Drinking Water Guidelines (ADWG 2011) health value.
- Two notifications involved the detection of Lead at above threshold concentrations in tanks prior to discharge.
- One notification was due to a non-reportable event of cylindrospermopsin toxin.

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

Exceedance of Trichloroacetic acid

Incident description: On 9 July 2014 results for TCA at sampling locations MICC town low (S22) and MIM front main (S31) were both 0.109mg/L. These results exceeded the ADWG health guideline limit of 0.100mg/L. These results were reported to the QWSR and recorded as incident DWI-7-199-00036. Further occasions of exceedance in TCA concentrations were noted on the 12 May, 25 May, 10 June and 26 June 2015. These were also reported to the QWSR and incident DWI-7-199-00042 was opened.

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. Closer monitoring of chlorine residuals was initiated in an effort to reduce formation of DBP's without compromising bacteriological disinfection. Consultancy services were engaged to investigate ways to optimise chlorine dosing and to develop a more efficient chlorine strategy that reduces disinfection by-products. Proposed improvements were included in the improvement plan and have subsequently been successfully implemented.

Exceedance of Total Trihalomethanes

Incident description: On 18 November 2014 the result for Total Trihalomethanes (TTHM's) at sampling location MIM front main (S31) was 0.251mg/L. This result exceeded the ADWG health guideline limit of 0.250mg/L. This result was reported to the QWSR and incident DWI-7-199-00038 was opened.

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. Chlorine grab sample results of free and total chlorine were below the ADWG health guideline limit. Consultancy services were engaged to investigate ways to optimise chlorine dosing and to develop a more efficient chlorine strategy that reduces disinfection by-products. Proposed improvements were included in the improvement plan and have subsequently been successfully implemented.

Exceedance of Chlorine

Incident description: On 12 February 2015 results for free and total chlorine at sample location MICC town high (S21) were above the ADWG health guideline limit of 5 mg/L. These results were reported to the QWSR and incident DWI-7-199-00041 was opened. Within half an hour the chlorine level was below 5 mg/L.

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 and chlorine dosing was reduced. The project to supply MICC from MITR South pump station, which has an automatically adjusting chlorine dosing system, was moved to a high priority

Detection of Lead

Incident description: Lead exceeded the ADWG health limit of 0.01 mg/L in the north tank (S18) on 5 August 2014 and 3 February 2015 and the south tank (S19) on 13 January, 5 May and 3 June 2015. These results were included in incident DWI-7-199-00039 and DWI-7-199-00040. During this reporting period no sample supplying to MICC was found to have lead levels above the ADWG health limit.

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, followed by road reformation which minimised the effect of dust transfer into the tanks.

High cylindrospermopsin concentration

Incident description: On 3 September 2014 the Lake Julius cylindrospermopsin toxin concentration increased above the 1 µg/L World Health Organisation limit for drinking water. As this limit is based on drinking water, not source water, it was a non-reportable event.

Corrective and preventative actions: QWSR was contacted and the event reported. MIWB O&M Contractors were informed of the toxin levels and PAC dosing was carried out at the 22.6 booster pump station. The MIWB BGA Management Manual was updated, with input from a water quality Consultant, and determined that PAC dosing should be discontinued as higher toxin levels in the CWL made dosing at this site ineffective in total system reductions. Oxidation with chlorine has proven to be an effective barrier against toxin for the destruction within the MIWB system.

4. Amendments to the DWQMP

During the reporting period MIWB undertook a review of the DWQMP including risk assessment, improvement plan and monitoring plan. This resulted in amendments to the DWQMP which were approved 2 July 2015.

The current DWQMP implemented by MIWB includes:

- DWQMP main document - version 3.1 April 2015
- risk assessment report April 2015
- monitoring plan July 2015
- improvement plan April 2015
- all documents submitted in August 2014 that were not subsequently amended

The amended DWQMP was submitted to the Regulator as required and an additional information notice was issued in December 2014 with further amendments provided in response.

Additionally, an updated BGA management manual was submitted in October 2014.

5. DWQMP Review outcome

Significant changes were made to the MIWB DWQMP to reflect modifications in the treatment system during the review period. The largest change has been the implementation of the permanent micro-filtration plant which has led to significant water quality improvements for MICC. MICC is the only major customer receiving drinking water as industrial customers having opted out of receiving further treatment. This significantly changed the scope of the DWQMP.

Key Review Findings

The DWQMP risk assessment of preventative measures (April 2015) concluded that there were no extreme or very high residual risks, but high risk were identified associated with the potential for contamination at uncovered tanks, and potential for high DBP, iron or cyanobacteria levels. The DWQMP Improvement Plan (April 2015) targeted these areas.

The predominate hazards identified during the risk assessment were toxin and blue green algal (BGA) cell count from BGA blooms in the CWL. Chlorine is used to oxidise and control cylindrospermopsin toxin and there were no positive toxin detections in the treated water throughout the reporting period.

Micro-filtration plants have been installed by MIWB to manage BGA cell count, as well as provide an additional barrier for other hazards such as bacteria and protozoa, for MIWB's drinking water supply.

The other major customers, Mount Isa Mines and Incitec Pivot Ltd, use water predominately for process systems have employed on-site measures, including chlorination, filtration plants and use of bottled water to meet their on-site needs.

Key improvements identified include:

- Improved assurance of water quality due to the operation of the permanent filtration plant
- Implementation of steps to manage the continuing cyanobacteria bloom in CWL to reduce the consequent impact on key non-health water quality parameters
- Reduced risk of DBP exceedances by implementing a revised chlorination strategy optimising the use of existing infrastructure

6. DWQMP Audit

There was no internal or external audit of the DWQMP implementation undertaken by MIWB for the reporting period. The first regular audit of the plan will be conducted by 30 June 2016.

7. Customer Complaints

MIWB did not receive any formal water quality complaints from its customers for the period.

Appendix A – Details of compliance with water quality criteria

Table 1 – Reticulation *E. coli* verification monitoring 2014

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

Year	***2014***											
Month	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***
No. of samples collected	17	17	17	20	17	17	12	12	14	12	12	10
No. of samples collected in which *E. coli* 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	189	198	197	194	197	198	197	200	195	192	186	184
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

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

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Table 2 – Reticulation *E. coli* verification monitoring 2015

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

Year	***2015***											
Month	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sept***	***Oct***	***Nov***	***Dec***
No. of samples collected	12	11	15	9	12	15						
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0						
No. of samples collected in previous 12 month period	177	172	166	164	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	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

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

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Table 3 - Summary of the 2014 – 2015 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	Minimum (Concentration or Count)	Maximum (Concentration or Count)	Average (Mean) Concentration or Count
CRYPTOSPORIDIUM											
Cryptosporidium	LM	SW	ALS	Oocyst	1 oocyst/L	23	0	0	<0.1	<0.13	<0.1
ESCHERICHIA COLI AND THERMOTOLERANT COLIFORMS											
Escherichia coli (E.coli)	LM	SW	ALS	MPN/100mL	1 MPN/100mL	38	24	N/A	<1	140	8.8
Escherichia coli (E.coli)	MITR	R	ALS	MPN/100mL	1 MPN/100mL	148	0	0	<1	<1	<1
Giardia	LM	SW	ALS	Cyst	1 cyst/L	23	0	0	<1	<0.13	<0.1
COUNTS OF POTENTIALLY TOXIC CYANOBACTERIA											
Anabaena Circinalis/ Anabaena coiled or straight	LM	SW	ALS	Cells/mL	1 Cells/mL	37	11	N/A	0	1379	71
Anabaena Circinalis/ Anabaena coiled or straight	CWL	SW	ALS	Cells/mL	1 Cells/mL	51	15	N/A	0	215	25
Anabaena Circinalis/ Anabaena coiled or straight	MITR	T	ALS	Cells/mL	1 Cells/mL	67	26	N/A	0	2887	152
Anabaena Circinalis/ Anabaena coiled or straight	MITR	R	ALS	Cells/mL	1 Cells/mL	36	4	0	0	1820	89
Cylindrospermopsis Raciborskii	LM	SW	ALS	Cells/mL	1 Cells/mL	37	43	N/A	0	103210	12396

Cylindrospermopsis Raciborskii	CWL	WTP	ALS	Cells/mL	1 Cells/mL	51	51	N/A	3152	516291	174516
Cylindrospermopsis Raciborskii	MITR	T	ALS	Cells/mL	1 Cells/mL	67	67	N/A	0	658351	165621
Cylindrospermopsis Raciborskii	MITR	R	ALS	Cells/mL	1 Cells/mL	36	36	1	19	9646	1522
Microcystis	LM	SW	ALS	Cells/mL	1 Cells/mL	37	9	N/A	0	1533	146
Microcystis	CWL	SW	ALS	Cells/mL	1 Cells/mL	51	51	N/A	24	7777	1091
Microcystis	MITR	T	ALS	Cells/mL	1 Cells/mL	67	55	N/A	0	1620	328
Microcystis	MITR	R	ALS	Cells/mL	1 Cells/mL	36	2	0	0	199	6
Nodularia spumigena	LM	SW	ALS	Cells/mL	1 Cells/mL	37	0	N/A	0	0	0
Nodularia spumigena	CWL	SW	ALS	Cells/mL	1 Cells/mL	51	0	N/A	0	0	0
Nodularia spumigena	MITR	T	ALS	Cells/mL	1 Cells/mL	67	0	N/A	0	0	0
Nodularia spumigena	MITR	R	ALS	Cells/mL	1 Cells/mL	36	0	0	0	0	0
CYANOBACTERIAL TOXINS											
Cylindrospermopsin	LM	SW	ALS/MIWB	µg/L	0.05 µg/L	30	11	N/A	<0.05	0.2	<0.05
Cylindrospermopsin	CWL	WTP	ALS/MIWB	µg/L	0.05 µg/L	29	0	N/A	<0.05	<0.05	0.0
Cylindrospermopsin	MITR	T	ALS/MIWB	µg/L	0.05 µg/L	101	0	N/A	<0.05	<0.05	0.0
Cylindrospermopsin	MITR	R	ALS/MIWB	µg/L	0.05 µg/L	43	0	0	<0.05	<0.05	0.0
DISINFECTION BYPRODUCTS											
Trihalomethanes (THMs)	CWL	WTP	ALS	µg/L	5 µg/L	29	29	N/A	38	100	77
Trihalomethanes (THMs)	MITR	T	ALS	µg/L	5 µg/L	140	140	1	72	251	185
Trihalomethanes (THMs)	MITR	R	ALS	µg/L	5 µg/L	68	68	0	79	241	178
Chloroacetic acid (HAA)	MITR	T	ALS	µg/L	1 µg/L	16	16	0	1	7	4
Dichloroacetic acid (HAA)	MITR	T	ALS	µg/L	10 µg/L	16	16	0	23	79	55
Trichloroacetic acid (HAA)	MITR	T	ALS	µg/L	10 µg/L	16	16	3	29	109	64
Chloroacetic acid (HAA)	MITR	R	ALS	µg/L	1 µg/L	15	12	0	1	8	5
Dichloroacetic acid (HAA)	MITR	R	ALS	µg/L	10 µg/L	15	15	0	10	88	53
Trichloroacetic acid (HAA)	MITR	R	ALS	µg/L	10 µg/L	15	15	5	23	139	78

DISINFECTION RESIDUAL											
Free Chlorine	CWL	WTP	Field	mg/L	0.01mg/L	50	50	0	0.03	0.57	0.21
Free Chlorine	MITR	T	Field	mg/L	0.01 mg/L	1116	1116	2	0.00	9.3	0.88
Free Chlorine	MITR	R	Field	mg/L	0.01mg/L	334	334	1	0.05	6.6	1.09
Total Chlorine	CWL	WTP	Field	mg/L	0.01 mg/L	50	50	0	0.08	1.26	0.62
Total Chlorine	MITR	T	Field	mg/L	0.01mg/L	200	200	1	0.17	8.8	1.25
Total Chlorine	MITR	R	Field	mg/L	0.01 mg/L	86	86	1	0.24	8.8	1.57
ANIONS											
Nitrate + Nitrite	MITR	R	ALS	mg/L	0.01mg/L	7	7	0	0.01	0.02	0.02
FLUORIDE											
Fluoride	MITR	R	ALS	mg/L	0.1 mg/L	4	4	0	0.2	0.3	0.2
pH											
pH	LM	SW	Field	Standard	0.1	52	52	N/A	7.6	9.5	8.5
pH	CWL	WTP	Field	Standard	0.1	50	50	N/A	7.5	9.2	8.5
pH	MITR	T	Field	Standard	0.1	199	199	N/A	6.9	8.6	7.9
pH	MITR	R	Field	Standard	0.1	78	78	N/A	6.7	8.1	7.7
TURBIDITY											
Turbidity	LM	SW	Field	NTU	0.1 NTU	52	52	N/A	3.2	68.4	10.6
Turbidity	CWL	WTP	Field	NTU	0.1 NTU	50	50	N/A	2.1	12	4.3
Turbidity	MITR	T	Field	NTU	0.1 NTU	199	199	N/A	0.03	28.4	1.8
Turbidity	MITR	R	Field	NTU	0.1 NTU	79	79	N/A	0.02	2.3	0.3
METALS											
Aluminium	LM	SW	ALS	mg/L	0.005 mg/L	52	36	0	<0.005	0.131	0.018
Aluminium	CWL	WTP	ALS	mg/L	0.005 mg/L	52	20	0	<0.005	0.019	<0.005
Aluminium	MITR	R	ALS	mg/L	0.005 mg/L	52	4	0	<0.005	0.013	<0.005
Antimony	MITR	R	ALS	mg/L	0.001 mg/L	5	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 - Dissolved	MITR	R	ALS	mg/L	0.001 mg/L	9	7	0	<0.001	0.002	0.001
Boron	LM	SW	ALS	mg/L	0.05 mg/L	4	1	0	<0.05	0.05	<0.05
Copper	MITR	R	ALS	mg/L	0.001 mg/L	11	11	0	0.002	0.034	0.006
Iron	LM	SW	ALS	mg/L	0.05 mg/L	52	52	0	0.09	2.28	0.33
Iron	CWL	WTP	ALS	mg/L	0.05 mg/L	52	25	0	<0.05	0.86	0.07
Iron	MITR	R	ALS	mg/L	0.05 mg/L	52	4	0	<0.05	0.12	<0.05
Lead	LM	SW	ALS	mg/L	0.001 mg/L	52	47	0	<0.001	0.013	0.002
Lead	CWL	WTP	ALS	mg/L	0.001 mg/L	52	15	0	<0.001	0.004	<0.001
Lead	MITR	R	ALS	mg/L	0.001 mg/L	52	3	0	<0.001	0.005	<0.001
Manganese - Total	LM	SW	ALS	mg/L	0.001 mg/L	52	52	0	0.017	0.283	0.060
Manganese - Total	CWL	WTP	ALS	mg/L	0.001 mg/L	52	52	0	0.028	0.420	0.058
Manganese - Total	MITR	R	ALS	mg/L	0.001 mg/L	53	35	0	<0.001	0.132	0.008
Nickel	MITR	R	ALS	mg/L	0.001 mg/L	4	0	0	<0.001	<0.001	<0.001
Selenium	LM	SW	ALS	mg/L	0.01 mg/L	5	1	0	<0.01	<0.01	<0.01
Zinc	MITR	R	ALS	mg/L	0.005 mg/L	11	3	0	<0.005	0.009	<0.005

Appendix B – Implementation of the DWQMP Risk Management Improvement Program

Progress against the risk management improvement program in the approved DWQMP

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 zooplankton, daphnia, were cultured and a trial conducted in the indoor controlled laboratory environment. Following the addition of 1-2 daphnia per millilitre of CWL water into isolated containers, a 97 % reduction in BGA cell counts was observed in three days. Although these results are encouraging, this solution is difficult and possibly impossible to implement as it relies on the ability to upscale from trails to the volume of CWL. Daphnia are already present in CWL, however, do not populate as densely as required. Consideration was given to removal of daphnia predators (fish) to encourage population numbers.

An electrofishing survey was carried out in May 2015 to monitor the fish population and gain a better understanding of the ecosystem. This information was also used to assess the feasibility of reducing the abundance of fish to allow zooplankton populations to grow. Eleven species of fish were detected during the survey, the most abundant being juvenile rainbow fish. The catch per unit effort was approximately eight fish per minute. The observations indicated that all species have been present for many generations and are reproducing regularly with the exception of Sooty Grunter. Due to large areas in the CWL being inaccessible to capture fish, if a fish reduction program is to be initiated it would need to coincide with lowering the water level.

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 for, 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 following a switchboard is upgraded, the CWL cannot be drawn down to a significant extent. This work is scheduled to be completed in early 2016.

Implement Optimised Chlorination Strategy

Changes to the chlorine dosing system were implemented to allow for increased dosing closer to the customer delivery points which 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 chlorine dosing trial was implemented and successfully verified in the 2015-2016 financial year, which is outside of the scope for this report.

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.
- Improvement opportunities in disinfection infrastructure to further reduce the consumer exposure to THMs with the aim of significantly bettering the health standard without compromising disinfection.
- Reconfiguration tanks to roofed clean water storage to prevent re-contamination of treated water has been combined into a larger delivery optimisation project which is progressing to the business case stage.