Drinking Water Quality Management Plan (DWQMP) Report

1 July 2015 to 30 June 2016

Rockhampton Regional Council

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Definitions and glossary of terms

ADWG	Australian Drinking Water Guidelines (2011). Published by the National Health and Medical Research Council of Australia
CCTV	Closed-circuit television
cells/ml	cells per millilitre
C. raciborskii	*Cylindrospermopsis raciborskii*, a freshwater cyanobacterium known to produce the toxin cylindrospermopsin
DWQMP	Drinking Water Quality Management Plan
EC	Electrical conductivity
E. coli	*Escherichia coli*, a bacterium which is considered to indicate the presence of faecal contamination and therefore a potential health risk
FRW	Fitzroy River Water
GWTP	Glenmore Water Treatment Plant
LOR	Limit of Reporting
LSC	Livingstone Shire Council
mg/L	Milligrams per litre
NTU	Nephelometric turbidity units
MPN/100ml	Most probable number per 100 millilitres
RRC	Rockhampton Regional Council
RMIP	Risk Management Improvement Program
TCU	True colour units
TDS	Total dissolved solids
THM	Trihalomethanes
µg/L	Micrograms per litre
µS/cm	Micro-Siemens per centimetre

1. Introduction

This report documents the performance of Rockhampton Regional Council's drinking water service with respect to water quality and also its performance in implementing the actions detailed in the Drinking Water Quality Management Plan (DWQMP) as required under the *Water Supply (Safety and Reliability) Act 2008* (the Act).

This report assists the Regulator to determine whether the approved amended DWQMP and any approval conditions 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

This report relates to the drinking water supply schemes which Rockhampton Regional Council (RRC) owned and operated from 1 July 2015 to 30 June 2016. Fitzroy River Water (FRW), a commercialised business unit of the Rockhampton Regional Council, is the drinking water service provider.

The direct physical link of localities within the newly re-formed Livingstone Shire Council (LSC) to the Rockhampton Water Supply Scheme means that some LSC communities are partially or fully served by the water infrastructure operated by RRC. Only the performance of water supply schemes for which RRC have ownership, operating and maintenance responsibility, i.e. drinking water supplied to RRC ratepayers, during this reporting period is detailed in this report. Table 1 lists the water supply scheme, water source, water treatment process, population and average drinking water demand for the water supply schemes covered in this report.

Table 1 Water supply scheme, water supply source, treatment process, population served and average water demand

Scheme	Water Source	Treatment Process	Population	Average Demand (ML/d)
Rockhampton (includes LSC's Capricorn Coast)	Fitzroy River	Coagulation, flocculation, sedimentation, filtration, pH correction and disinfection	77,140 (99,710)	49 (60)
Mount Morgan	Dee River	Coagulation, sedimentation, filtration, pH correction and disinfection	3,114	1.0

During this reporting period, Mount Morgan Water Supply Scheme's alternate water source (Fletcher Creek) was not used thus its water quality monitoring results is not incorporated in this report.

3. Actions taken to implement the DWQMP

Generally, the DWQMP describes the operating strategies, operating limits and approaches to water quality monitoring and the overall management of risks to water quality that were in place at the time that the DWQMP was approved. Specific changes or improvements to the drinking water services provided by FRW have occurred via the implementation of the Risk Management Improvement Program (RMIP) as detailed below.

Progress in implementing the Risk Management Improvement Program

Refer to the Appendix B for a summary of progress in implementing each of the improvement program actions. The information provided describes the progress made during this reporting period towards the completion of specific tasks identified in the RMIP listed in the approved amended DWQMP.

Amendments made to the DWQMP

A review of the DWQMP was completed during this reporting period both before and after the independent audit of the DWQMP. A proposed amended DWQMP was submitted to the regulator and is currently being reviewed. Many of the proposed amendments include the updating of information relating to water supply infrastructure, but also the outcomes of a review of the risk assessment completed for each scheme. In addition, some minor amendments to the verification monitoring program were made to incorporate some recent changes such as the inclusion of new reticulation sampling points. The RMIP was also reviewed and updated based on the revised risk assessments and the progress that continues to be made to deliver the RMIP.

4. Compliance with water quality criteria for drinking water

Appendix A provides an overview of the results from the water quality monitoring program for the reporting period of 1 July 2015 to 30 June 2016. The water quality monitoring program was carried out as per Section 10.2 of the approved DWQMP. The drinking water results were compared against the water quality criteria, i.e. the health guideline values in the current Australian Drinking Water Guidelines (ADWG), as well as the standards in the *Public Health Regulation 2005*.

Appendix A Tables 1.1 and 1.2 contain a summary of the results of the water quality monitoring program for the Rockhampton and Mount Morgan water supply schemes. All physico-chemical drinking water quality results from the standard monitoring program met the recommended values in the ADWG.

Appendix A Tables 2.1 and 2.2 contain a summary of the results of the reticulation *E. coli* verification monitoring program for Rockhampton and Mount Morgan water supply schemes. All samples taken tested negative for *E. coli*.

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

For this reporting period, there was one instance where the Regulator was notified under section 102 or 102A of the Act. This notification involved the detection of *Giardia* – an organism for which there is currently no health guideline in the ADWG, but the detection of which requires reporting and further investigation to further assess any increased risk to public health. This reported event did not require FRW to issue a "boil water alert" or "do not drink notice" to the members of the community in the Mount Morgan Water Supply Scheme.

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

Nil. There were no non-compliances with water quality criteria.

5.2 Prescribed incidents or events reported to the Regulator and corrective and preventative actions undertaken

Overview of event: A low count of the protozoan *Giardia* was recorded in a potable water sample collected from the Mount Morgan Water Supply Scheme.

Event description: As part of the annual verification monitoring program, samples were collected from the Mount Morgan WTP (potable water) and No. 7 Dam (raw water source) for *Giardia* analyses. The result obtained for the potable water sample was 1 cyst per 20L while the raw water sample had <1 cyst per 20L. The test results for the potable sample did not contain any other unusually high or non-compliant results for a range of physical-chemical parameters including turbidity.

At the day of sampling, the daily in-house water testing results measured a turbidity of 0.62 NTU, a free chlorine residual of 1.61 mg/L and a pH of 7.53. There were no known excursions to normal operations at the WTP during days prior to the time of sampling. The telemetry data were also within the normal operating range. There was no known immediate impact for the *Giardia* detection within and downstream of the WTP.

Corrective and preventative actions: As reported in the initial report to QWSR on 20 May 2016, the performance of the Mount Morgan WTP process and other potentially contributing factors were assessed through a follow-up investigation. No specific causes or sources of the *Giardia* detection were found. Follow-up samples were collected and sent for testing for *Giardia* and *Cryptosporidium*. Test results received from the Queensland Health Forensic and Scientific Services Laboratory showed that neither *Giardia* nor *Cryptosporidium* were detected in any of the three samples.

In this instance, apart from a negative test result for the follow-up sample testing, there was no other specific evidence that can be provided to actually demonstrate any resolution of a specific event, nor was a specific

treatment process or other failure specifically identified. As this the first time a positive test result has ever been obtained for *Giardia* in the Mount Morgan Water Supply Scheme for either raw or potable water, it would appear that the likelihood of this happening again is relatively low.

As a long term preventative measure FRW is currently planning the procurement of a UV Disinfection system that will be installed at the Mount Morgan WTP. This system will be a USEPA Certified system with a design capacity of 30 L/s that will be capable of providing dual disinfection along with the existing chlorine gas disinfection system, but more importantly it will provide an effective treatment barrier for the destruction of protozoan pathogens including *Giardia* and *Cryptosporidium*. This treatment process upgrade was identified as a capital upgrade project prior to this *Giardia* detection due to the less than ideal performance of the Mount Morgan WTP with respect to turbidity removal, but also to prepare for the possible inclusion of a health-based targets approach to the establishment of health guidelines in further revisions of the ADWG. It is anticipated that the installation of a UV disinfection system at the Mount Morgan WTP will be completed by early 2017.

6. Customer complaints related to water quality

Rockhampton Regional Council is required to report on the number of drinking water quality complaints, general details of complaints and the responses undertaken.

Table 2 and Figure 1 provide a breakdown of the customer complaints relating to drinking water quality during this period.

Table 2 Number of drinking water quality complaints from 1 July 2015 to 30 June 2016

Scheme	Suspected Illness	Taste and/or Odour	Appearance and/or Discoloured Water	Total
Rockhampton	0	9	53	**62**
Mount Morgan	0	3	18	**21**
Total	**0**	**12**	**71**	**83**

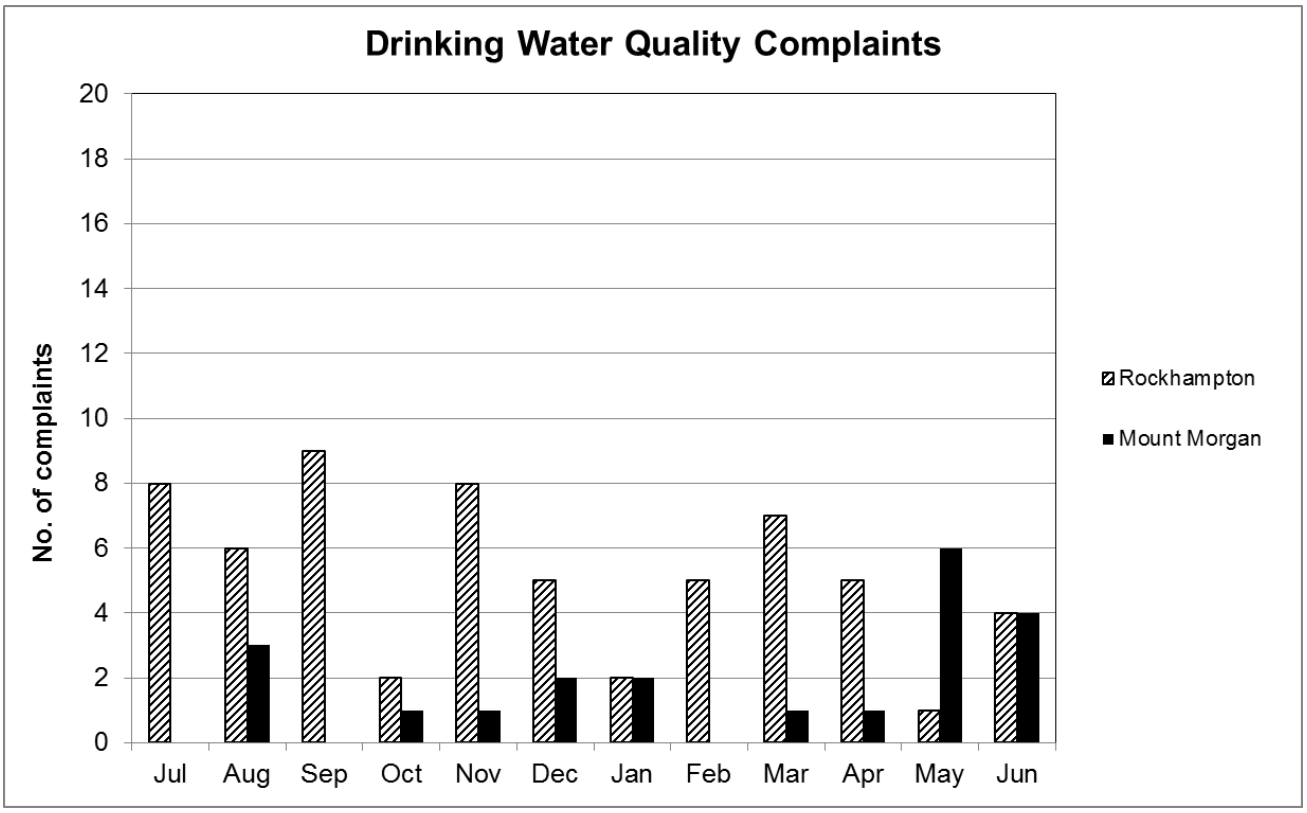

Figure 1. Drinking water quality complaints received between 1 July 2015 and 30 June 2016 for the Rockhampton and Mount Morgan Water Supply Schemes respectively.

Suspected illness

Complaints are sometimes received from customers who suspect their water may be associated with an illness they are experiencing. FRW investigates each complaint relating to alleged illness from the water quality, typically by testing the customers tap and closest

reticulation sampling for the presence of *E. coli* as well as general physico-chemical testing. In addition, FRW staff periodically liaises with local Queensland Health Officers in order to receive updates on any reports of suspected waterborne disease.

During this reporting period, FRW was not aware of any confirmed cases of illness arising from drinking water supplied from Rockhampton and Mount Morgan water supply schemes.

Taste and/or odour

A total number of 12 customer complaints associated with unfavourable taste and/or odour were received during this reporting period. Nine (9) complaints were from the Rockhampton Water Supply Scheme. Three (3) customer complaints relating to taste and/or odour were received from the Mount Morgan Water Supply Scheme.

FRW responded to each complaint by dispatching crews to collect samples for further testing or to flush water mains when necessary to provide improved water quality.

Appearance and/or discoloured water

A total of 71 customer complaints associated with appearance and/or discoloured water were received during this reporting period. Fifty-three (53) complaints were received from the Rockhampton Water Supply Scheme and 18 complaints were received from the Mount Morgan Water Supply Scheme. A small proportion of the complaints received in Rockhampton were due to the presence of air in the water.

FRW responded to each complaint by dispatching crews to collect samples for further testing or to flush water mains when necessary to provide improved water quality.

7. Findings and recommendations of the DWQMP auditor

During this reporting period, FRW engaged an external auditor to conduct an audit of the DWQMP. In accordance with legislative requirements, an audit of the DWQMP was scheduled for completion by 31 August 2016, with subsequent findings of the audit to be incorporated as appropriate in future revisions of the DWQMP.

The purpose of this audit is to determine whether the DWQMP is an accurate representation of the actual systems, procedures and processes currently being used by FRW to manage the safety of the drinking water supply schemes that it operates. Completed by a qualified drinking water auditor engaged from Bligh Tanner, the audit assessed 80 separate items related to the DWQMP and the activities undertaken by FRW. The findings of the audit were that FRW was compliant in all but one of the items assessed, with the one non-compliance related to an incorrect description of a procedure in one part of the DWQMP document. A number of suggestions and recommendations made by the auditor have been included in the recent review of the DWQMP. Overall, this result was a positive outcome for FRW, and demonstrates the strong commitment towards providing safe and reliable drinking water for the community.

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

A review of the DWQMP was completed during this reporting period both before and after the independent audit of the DWQMP. A proposed amended DWQMP was submitted to the regulator and is currently being reviewed. Many of the proposed amendments include the updating of information relating to water supply infrastructure, but also the outcomes of a review of the risk assessment completed for each scheme. In addition, some minor amendments to the verification monitoring program were made to incorporate some recent changes such as the inclusion of new reticulation sampling points. The RMIP was also reviewed and updated based on the revised risk assessments and the progress that continues to be made to deliver the RMIP. A response from the regulator is expected by early 2017.

Appendix A Summary of compliance with water quality criteria

The results from the verification program for the period of 1 July 2015 to 30 June 2016 have been compared against the levels of the water quality criteria specified by the Regulator in the *Water Quality and Reporting Guidelines for a Drinking Water Service*.

The drinking water quality monitoring program for this reporting period was carried out as per Section 10.2 of the approved DWQMP. The reported statistics do not include results from repeat samples undertaken in response to an elevated result or from event-related or investigative samples. The notification provided to the regulator for the detection of *Giardia* in a sample from the Mount Morgan Water Supply Scheme does not represent a non-compliance with the water quality criteria as there is no health guideline value provided for this microorganism in the ADWG.

Tables A1.1 and A1.2 contains a summary of water quality monitoring results from Rockhampton and Mount Morgan water supply schemes, respectively, including scheme component, parameter, limit of resolution (LOR), unit of measure, frequency of sampling, total number of samples taken, number of samples with values greater than or equal the LOR, number of drinking water samples exceeding the levels of the water quality criteria (specifically the ADWG health guideline value or other regulatory target), minimum concentration or count, maximum concentration or count, average (mean) concentration or count, and laboratory name or source of the water quality data. The fluoride data presented in Tables A1.1 and A1.2 represents naturally-occurring fluoride. RRC discontinued fluoridating drinking water on 17 June 2013.

Tables A2.1 and A2.2 provide a summary of the reticulation *E. coli* verification monitoring from Rockhampton and Mount Morgan Water Supply Schemes, respectively. The percentage from each water supply scheme was calculated using a twelve (12) month rolling annual value. A total of 611 samples were collected and tested for *E. coli*, with all samples testing negative for this bacterium. This 100% compliance of all samples collected is well above the 98% compliance target specified in the *Public Health Regulation 2005*.

Table A1.1 Rockhampton Water Supply Scheme water quality monitoring results from 1 July 2015 to 30 June 2016

Scheme Name	Scheme Component	Parameter	Sampling Frequency	LOR	Unit	No. of samples collected	No. of samples within LOR	Minimum	Maximum	Average	Laboratory/Source
Rockhampton	Source Water	pH	Monthly	0.01	unit	12	12	6.26	8.71	7.71	Symbio Alliance
Rockhampton	Source Water	Colour (True)	Monthly	2	TCU	12	12	2	200	54.91	Symbio Alliance
Rockhampton	Source Water	Turbidity	Monthly	0.1	NTU	12	12	3	983	109.84	Symbio Alliance
Rockhampton	Source Water	Electrical Conductivity	Monthly	1	µS/cm	12	12	160	480	316.66	Symbio Alliance
Rockhampton	Source Water	Solids (Dissolved)	Monthly	2	mg/L	12	12	120	340	253.33	Symbio Alliance
Rockhampton	Source Water	Chloride	Monthly	2	mg/L	12	12	21	85	52.83	Symbio Alliance
Rockhampton	Source Water	Fluoride	Monthly	0.05	mg/L	12	9	0.06	0.12	0.09	Symbio Alliance
Rockhampton	Source Water	Nitrate (as N)	Monthly	0.005	mg/L	12	7	0.065	0.38	0.20	Symbio Alliance
Rockhampton	Source Water	Nitrite (as N)	Monthly	0.005	mg/L	12	4	0.005	1	0.25	Symbio Alliance
Rockhampton	Source Water	Sulphate	Monthly	5	mg/L	12	9	7.1	18	11.72	Symbio Alliance
Rockhampton	Source Water	Aluminium (Acid Soluble)	Monthly	0.01	mg/L	12	10	0.012	2.4	0.33	Symbio Alliance
Rockhampton	Source Water	Iron (Total)	Monthly	0.005	mg/L	12	12	0.033	5.3	1.06	Symbio Alliance
Rockhampton	Source Water	Manganese (Total)	Monthly	0.0005	mg/L	12	12	0.019	0.34	0.06	Symbio Alliance
Rockhampton	Source Water	Copper (Total)	Monthly	0.0005	mg/L	12	12	0.00074	0.017	0.003	Symbio Alliance
Rockhampton	Source Water	Lead (Total)	Monthly	0.0001	mg/L	12	9	0.00012	0.0061	0.0011	Symbio Alliance
Rockhampton	Source Water	Zinc (Total)	Monthly	0.0005	mg/L	12	12	0.0019	0.092	0.0216	Symbio Alliance
Rockhampton	Source Water	Calcium (Total)	Monthly	0.1	mg/L	12	12	2.2	23	15.22	Symbio Alliance
Rockhampton	Source Water	Sodium (Total)	Monthly	1	mg/L	12	12	2.8	42	26.65	Symbio Alliance
Rockhampton	Source Water	Potassium (Total)	Monthly	0.2	mg/L	12	12	1.2	5.3	3.98	Symbio Alliance
Rockhampton	Source Water	Magnesium (Total)	Monthly	0.05	mg/L	12	12	1.5	19	11.41	Symbio Alliance
Rockhampton	Source Water	Hardness (Total)	Monthly	1	mg/L	12	12	12	140	86.08	Symbio Alliance
Rockhampton	Source Water	Alkalinity (Total) as CaCO3	Monthly	1	mg/L	12	12	51	131	87.41	Symbio Alliance
Rockhampton	Source Water	Total Organic Carbon	Quarterly	1	mg/L	5	5	7.1	13	9.44	Symbio Alliance
Rockhampton	Source Water	Arsenic	Annual	0.0005	mg/L	1	1	0.0019	0.0019	0.0019	Symbio Alliance
Rockhampton	Source Water	Barium	Annual	0.0001	mg/L	1	1	0.035	0.035	0.035	Symbio Alliance
Rockhampton	Source Water	Beryllium	Annual	0.0001	mg/L	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	Source Water	Cadmium	Annual	0.0001	mg/L	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	Source Water	Chromium	Annual	0.0005	mg/L	1	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Rockhampton	Source Water	Mercury	Annual	0.0001	mg/L	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	Source Water	Nickel	Annual	0.0001	mg/L	1	1	0.0018	0.0018	0.0018	Symbio Alliance
Rockhampton	Source Water	Selenium	Annual	0.0005	mg/L	1	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Rockhampton	Source Water	Perfluorooctanoic Acid	Annual	0.00001	µg/L	1	0	<0.00001	<0.00001	<0.00001	Symbio Alliance
Rockhampton	Source Water	Perfluorooctane Sulphonate	Annual	0.00001	µg/L	1	0	<0.00001	<0.00001	<0.00001	Symbio Alliance
Rockhampton	Source Water	Pesticides	Annual	0.2	ug/L	1	0	<0.2	<0.2	<0.2	Symbio Alliance
Rockhampton	Source Water	Biochemical Oxygen Demand	Monthly	2	mg/L	12	9	2	7	3.66	Symbio Alliance
Rockhampton	Source Water	Aluminium (Dissolved)	Monthly	0.005	mg/L	11	8	0.011	0.11	0.0647	Symbio Alliance
Rockhampton	Source Water	pH	Continuous	0.01	unit			6.88	8.98	7.93	FRW SCADA
Rockhampton	Source Water	Turbidity	Continuous	0.01	NTU			5.10	980	58.64	FRW SCADA
Rockhampton	Source Water	pH	Daily	0.01	unit	366	366	6.82	8.98	7.90	FRW Inhouse
Rockhampton	Source Water	Turbidity	Daily	0.01	NTU	366	366	2.12	997	54.7	FRW Inhouse

Table A1.1 Rockhampton Water Supply Scheme water quality monitoring results from 1 July 2015 to 30 June 2016 (*continued*)

Scheme Name	Scheme Component	Parameter	Sampling Frequency	LOR	Unit	No. of samples collected	No. of samples within LOR	No. of samples exceeding water quality criteria	Minimum	Maximum	Average	Laboratory/Source
Rockhampton	WTP	pH	Monthly	0.01	unit	12	12	No value	6.25	7.79	7.37	Symbio Alliance
Rockhampton	WTP	Colour (True)	Monthly	2	TCU	12	1	No value	2	2	2	Symbio Alliance
Rockhampton	WTP	Turbidity	Monthly	0.1	NTU	12	10	No value	0.1	0.4	0.18	Symbio Alliance
Rockhampton	WTP	Electrical Conductivity	Monthly	1	µS/cm	12	12	No value	190	480	329.16	Symbio Alliance
Rockhampton	WTP	Solids (Dissolved)	Monthly	2	mg/L	12	12	No value	100	310	207.5	Symbio Alliance
Rockhampton	WTP	Chloride	Monthly	2	mg/L	12	12	No value	29	100	59.75	Symbio Alliance
Rockhampton	WTP	Fluoride	Monthly	0.05	mg/L	12	8	0	0.06	0.11	0.09	Symbio Alliance
Rockhampton	WTP	Nitrate (as N)	Monthly	0.005	mg/L	12	12	0	0.049	0.44	0.18	Symbio Alliance
Rockhampton	WTP	Nitrite (as N)	Monthly	0.005	mg/L	12	3	0	0.005	1.1	0.37	Symbio Alliance
Rockhampton	WTP	Sulphate	Monthly	5	mg/L	12	8	0	5.3	17	11.91	Symbio Alliance
Rockhampton	WTP	Aluminium (Acid Soluble)	Monthly	0.01	mg/L	12	4	No value	0.012	0.02	0.0155	Symbio Alliance
Rockhampton	WTP	Iron (Total)	Monthly	0.005	mg/L	12	2	No value	0.0053	0.0055	0.0054	Symbio Alliance
Rockhampton	WTP	Manganese (Total)	Monthly	0.0005	mg/L	12	8	0	0.00053	0.0029	0.0014	Symbio Alliance
Rockhampton	WTP	Copper (Total)	Monthly	0.0005	mg/L	12	12	0	0.0033	0.012	0.0066	Symbio Alliance
Rockhampton	WTP	Lead (Total)	Monthly	0.0001	mg/L	12	12	0	0.00035	0.0017	0.0009	Symbio Alliance
Rockhampton	WTP	Zinc (Total)	Monthly	0.0005	mg/L	12	12	No value	0.0017	0.042	0.0085	Symbio Alliance
Rockhampton	WTP	Calcium (Total)	Monthly	0.1	mg/L	12	12	No value	12	21	16.58	Symbio Alliance
Rockhampton	WTP	Sodium (Total)	Monthly	1	mg/L	12	12	No value	14	41	27.41	Symbio Alliance
Rockhampton	WTP	Potassium (Total)	Monthly	0.2	mg/L	12	12	No value	2.2	5	4.13	Symbio Alliance
Rockhampton	WTP	Magnesium (Total)	Monthly	0.05	mg/L	12	12	No value	4.1	19	11.35	Symbio Alliance
Rockhampton	WTP	Hardness (Total)	Monthly	1	mg/L	12	12	No value	47	130	89	Symbio Alliance
Rockhampton	WTP	Alkalinity (Total) as CaCO3	Monthly	1	mg/L	12	12	No value	47	108	78.58	Symbio Alliance
Rockhampton	WTP	Total Organic Carbon	Quarterly	1	mg/L	5	5	No value	2	4.4	3.2	Symbio Alliance
Rockhampton	WTP	Trihalomethanes	Quarterly	4	µg/L	5	5	0	40	71	53	Symbio Alliance
Rockhampton	Reticulation	Trihalomethanes - Gracemere	Quarterly	4	µg/L	5	5	0	130	200	170	Symbio Alliance
Rockhampton	WTP	Arsenic	Annually	0.0005	mg/L	1	1	0	0.00075	0.00075	0.00075	Symbio Alliance
Rockhampton	WTP	Barium	Annually	0.0001	mg/L	1	1	0	0.037	0.037	0.037	Symbio Alliance
Rockhampton	WTP	Beryllium	Annually	0.0001	mg/L	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	WTP	Cadmium	Annually	0.0001	mg/L	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	WTP	Chromium	Annually	0.0005	mg/L	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Rockhampton	WTP	Mercury	Annually	0.0001	mg/L	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Rockhampton	WTP	Nickel	Annually	0.0001	mg/L	1	1	0	0.001	0.001	0.001	Symbio Alliance
Rockhampton	WTP	Selenium	Annually	0.0005	mg/L	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Rockhampton	WTP	Perfluorooctanoic Acid	Annually	0.00001	mg/L	1	0	No value	<0.00001	<0.00001	<0.00001	Symbio Alliance
Rockhampton	WTP	Perfluorooctane Sulphonate	Annually	0.00001	mg/L	1	0	No value	<0.00001	<0.00001	<0.00001	Symbio Alliance
Rockhampton	WTP	pH	Continuous	0.01	unit			No value	7.22	7.99	7.73	FRW SCADA
Rockhampton	WTP	Turbidity	Continuous	0.01	NTU			No value	0	4.66	0.18	FRW SCADA
Rockhampton	WTP	Electrical Conductivity	Continuous	0.01	µS/cm			No value	134	661	347	FRW SCADA
Rockhampton	WTP	Chlorine (Free)	Continuous	0.01	mg/L			0	0.64	1.95	0.99	FRW SCADA
Rockhampton	WTP	pH	Daily	0.01	unit	366	366	No value	7.21	8.09	7.70	FRW Inhouse
Rockhampton	WTP	Turbidity	Daily	0.01	NTU	366	366	No value	0	0.51	0.13	FRW Inhouse
Rockhampton	WTP	Electrical Conductivity	Daily	0.01	µS/cm	366	366	No value	172	624	357	FRW Inhouse
Rockhampton	WTP	Chlorine (Free)	Daily	0.01	mg/L	366	366	0	0.66	1.97	1.00	FRW Inhouse
Rockhampton	Reticulation	*Escherichia coli (E. coli)*	Weekly	1	MPN/100mL	468	0	0	<1	<1	<1	Ecoscope Environmental
Rockhampton	Reticulation	Chlorine (Free)	Weekly	0	mg/L	556	556	0	0	1.88	0.68	FRW *in situ*

Table A1.2 Mount Morgan Water Supply Scheme water quality monitoring results from 1 July 2015 to 30 June 2016

Scheme Name	Scheme Component	Parameter	Sampling Frequency	LOR	Unit	No. of samples collected	No. of samples within the LOR	Minimum	Maximum	Average	Laboratory/Source
Mount Morgan	Source Water	pH	Monthly	0.01	unit	12	12	6.5	7.86	7.42	Symbio Alliance
Mount Morgan	Source Water	Colour (True)	Monthly	2	TCU	12	11	2	55	14	Symbio Alliance
Mount Morgan	Source Water	Turbidity	Monthly	0.1	NTU	12	12	1.6	71.6	8.60	Symbio Alliance
Mount Morgan	Source Water	Electrical Conductivity	Monthly	1	µS/cm	12	12	160	230	198.33	Symbio Alliance
Mount Morgan	Source Water	Solids (Dissolved)	Monthly	2	mg/L	12	12	110	180	140	Symbio Alliance
Mount Morgan	Source Water	Chloride	Monthly	2	mg/L	12	12	16	34	23.75	Symbio Alliance
Mount Morgan	Source Water	Fluoride	Monthly	0.05	mg/L	12	4	0.05	0.12	0.08	Symbio Alliance
Mount Morgan	Source Water	Nitrate (as N)	Monthly	0.005	mg/L	12	5	0.011	0.3	0.089	Symbio Alliance
Mount Morgan	Source Water	Nitrite (as N)	Monthly	0.005	mg/L	12	3	0.005	0.015	0.008	Symbio Alliance
Mount Morgan	Source Water	Sulphate	Monthly	5	mg/L	12	0	<5	<5	<5	Symbio Alliance
Mount Morgan	Source Water	Aluminium (Acid Soluble)	Monthly	0.01	mg/L	12	6	0.014	0.032	0.0186	Symbio Alliance
Mount Morgan	Source Water	Iron (Total)	Monthly	0.005	mg/L	12	12	0.083	1.7	0.323	Symbio Alliance
Mount Morgan	Source Water	Manganese (Total)	Monthly	0.0005	mg/L	12	12	0.026	0.53	0.101	Symbio Alliance
Mount Morgan	Source Water	Copper (Total)	Monthly	0.0005	mg/L	12	12	0.0012	0.0027	0.0020	Symbio Alliance
Mount Morgan	Source Water	Lead (Total)	Monthly	0.0001	mg/L	12	8	0.00011	0.00028	0.00017	Symbio Alliance
Mount Morgan	Source Water	Zinc (Total)	Monthly	0.0005	mg/L	12	12	0.0048	0.059	0.0193	Symbio Alliance
Mount Morgan	Source Water	Calcium (Total)	Monthly	0.1	mg/L	12	12	10	16	12.66	Symbio Alliance
Mount Morgan	Source Water	Sodium (Total)	Monthly	1	mg/L	12	12	12	16	14	Symbio Alliance
Mount Morgan	Source Water	Potassium (Total)	Monthly	0.2	mg/L	12	12	1.4	2.1	1.56	Symbio Alliance
Mount Morgan	Source Water	Magnesium (Total)	Monthly	0.05	mg/L	12	12	6.1	8.8	7.42	Symbio Alliance
Mount Morgan	Source Water	Hardness (Total)	Monthly	1	mg/L	12	12	51	75	62.08	Symbio Alliance
Mount Morgan	Source Water	Alkalinity (Total) as CaCO3	Monthly	1	mg/L	12	12	54	104	75.25	Symbio Alliance
Mount Morgan	Source Water	Total Organic Carbon	Quarterly	1	mg/L	5	4	7	11	8.425	Symbio Alliance
Mount Morgan	Source Water	Arsenic	Annually	0.0005	mg/L	1	1	0.00063	0.00063	0.00063	Symbio Alliance
Mount Morgan	Source Water	Barium	Annually	0.0001	mg/L	1	1	0.0029	0.0029	0.0029	Symbio Alliance
Mount Morgan	Source Water	Beryllium	Annually	0.0001	mg/L	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	Source Water	Cadmium	Annually	0.0001	mg/L	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	Source Water	Chromium	Annually	0.0005	mg/L	1	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	Source Water	Mercury	Annually	0.0001	mg/L	1	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	Source Water	Nickel	Annually	0.0001	mg/L	1	1	0.00029	0.00029	0.00029	Symbio Alliance
Mount Morgan	Source Water	Selenium	Annually	0.0005	mg/L	1	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	Source Water	Pesticides	Annually	0.2	µg/L	1	0	<0.2	<0.2	<0.2	Symbio Alliance
Mount Morgan	Source Water	pH	Continuous	0.01	unit			6.89	8.29	7.65	FRW SCADA
Mount Morgan	Source Water	Turbidity	Continuous	0.01	NTU			0.52	7.18	3.22	FRW SCADA
Mount Morgan	Source Water	pH	Daily	0.01	unit	366	366	6.81	8.11	7.56	FRW Inhouse
Mount Morgan	Source Water	Turbidity	Daily	0.01	NTU	366	366	0.64	7.66	2.81	FRW Inhouse

Table A1.2 Mount Morgan Water Supply Scheme water quality monitoring results from 1 July 2015 to 30 June 2016 (*continued*)

Scheme Name	Scheme Component	Parameter	Sampling Frequency	LOR	Unit	No. of samples collected	No. of samples within the LOR	No. of samples exceeding the water quality criteria	Minimum	Maximum	Average	Laboratory/Source
Mount Morgan	WTP	pH	Monthly	0.01	unit	12	12	No value	6.4	7.62	7.18	Symbio Alliance
Mount Morgan	WTP	Colour (True)	Monthly	2	TCU	12	2	No value	2	2	2	Symbio Alliance
Mount Morgan	WTP	Turbidity	Monthly	0.1	NTU	12	12	No value	0.3	1.2	0.64	Symbio Alliance
Mount Morgan	WTP	Electrical Conductivity	Monthly	1	µS/cm	12	12	No value	260	300	285.83	Symbio Alliance
Mount Morgan	WTP	Solids (Dissolved)	Monthly	2	mg/L	12	12	No value	120	220	186.66	Symbio Alliance
Mount Morgan	WTP	Chloride	Monthly	2	mg/L	12	12	No value	21	34	28.16	Symbio Alliance
Mount Morgan	WTP	Fluoride	Monthly	0.05	mg/L	12	0	0	<0.05	<0.05	<0.05	Symbio Alliance
Mount Morgan	WTP	Nitrate (as N)	Monthly	0.005	mg/L	12	12	0	0.03	0.73	0.14	Symbio Alliance
Mount Morgan	WTP	Nitrite (as N)	Monthly	0.005	mg/L	12	1	0	0.74	0.74	0.74	Symbio Alliance
Mount Morgan	WTP	Sulphate	Monthly	5	mg/L	12	12	0	34	47	39	Symbio Alliance
Mount Morgan	WTP	Aluminium (Acid Soluble)	Monthly	0.01	mg/L	12	12	No value	0.39	0.69	0.47	Symbio Alliance
Mount Morgan	WTP	Iron (Total)	Monthly	0.005	mg/L	12	11	No value	0.006	0.064	0.0169	Symbio Alliance
Mount Morgan	WTP	Manganese (Total)	Monthly	0.0005	mg/L	12	12	0	0.0035	0.082	0.0141	Symbio Alliance
Mount Morgan	WTP	Copper (Total)	Monthly	0.0005	mg/L	12	12	0	0.001	0.0058	0.0021	Symbio Alliance
Mount Morgan	WTP	Lead (Total)	Monthly	0.0001	mg/L	12	2	0	0.0001	0.00023	0.00016	Symbio Alliance
Mount Morgan	WTP	Zinc (Total)	Monthly	0.0005	mg/L	12	12	No value	0.0029	0.045	0.01539	Symbio Alliance
Mount Morgan	WTP	Calcium (Total)	Monthly	0.1	mg/L	12	12	No value	10	15	12.5	Symbio Alliance
Mount Morgan	WTP	Sodium (Total)	Monthly	1	mg/L	12	12	No value	25	43	32.33	Symbio Alliance
Mount Morgan	WTP	Potassium (Total)	Monthly	0.2	mg/L	12	12	No value	1.4	2	1.63	Symbio Alliance
Mount Morgan	WTP	Magnesium (Total)	Monthly	0.05	mg/L	12	12	No value	6	8.7	7.27	Symbio Alliance
Mount Morgan	WTP	Hardness (Total)	Monthly	1	mg/L	12	12	No value	50	73	61.16	Symbio Alliance
Mount Morgan	WTP	Alkalinity (Total) as CaCO3	Monthly	1	mg/L	12	12	No value	60	98	73.25	Symbio Alliance
Mount Morgan	WTP	Total Organic Carbon	Quarterly	1	mg/L	5	5	No value	2.7	6.7	4.5	Symbio Alliance
Mount Morgan	WTP	Trihalomethanes	Quarterly	4	µg/L	4	4	0	90	150	115	Symbio Alliance
Mount Morgan	Reticulation	Trihalomethanes - Smalls Road	Quarterly	4	µg/L	4	4	0	98	160	134.5	Symbio Alliance
Mount Morgan	WTP	Arsenic	Annually	0.0005	mg/L	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	WTP	Barium	Annually	0.0001	mg/L	1	1	0	0.0032	0.0032	0.0032	Symbio Alliance
Mount Morgan	WTP	Beryllium	Annually	0.0001	mg/L	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	WTP	Cadmium	Annually	0.0001	mg/L	1	0	0	<0.0001	<0.0001	<0.0001	Symbio Alliance
Mount Morgan	WTP	Chromium	Annually	0.0005	mg/L	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	WTP	Mercury	Annually	0.0001	mg/L	1	1	0	0.00017	0.00017	0.00017	Symbio Alliance
Mount Morgan	WTP	Nickel	Annually	0.0001	mg/L	1	1	0	0.00018	0.00018	0.00018	Symbio Alliance
Mount Morgan	WTP	Selenium	Annually	0.0005	mg/L	1	0	0	<0.0005	<0.0005	<0.0005	Symbio Alliance
Mount Morgan	WTP	pH	Continuous	0.01	unit			No value	6.71	9.92	7.16	FRW SCADA
Mount Morgan	WTP	Chlorine (Free)	Continuous	0.01	mg/L			0	0.63	1.91	1.35	FRW SCADA
Mount Morgan	WTP	Electrical Conductivity	Continuous	1	µS/cm			No value	141	436	219	FRW SCADA
Mount Morgan	WTP	pH	Daily	0.01	unit	366	366	No value	6.74	7.91	7.20	FRW Inhouse
Mount Morgan	WTP	Turbidity	Daily	0.01	NTU	366	366	No value	0.28	1.40	0.64	FRW Inhouse
Mount Morgan	WTP	Chlorine (Free)	Daily	0.01	mg/L	366	366	0	0.58	1.89	1.25	FRW Inhouse
Mount Morgan	WTP	Electrical Conductivity	Daily	1	µS/cm	366	366	No value	211	586	317	FRW Inhouse
Mount Morgan	Reticulation	*Escherichia coli (E. coli)*	Weekly	1	MPN/100ml	143	0	0	<1	<1	<1	Ecoscope Environmental
Mount Morgan	Reticulation	Chlorine (Free)	Weekly	0	mg/L	138	138	0	0	2.09	0.82	FRW *in situ*

Table A2.1 Rockhampton Water Supply Scheme reticulation *E. coli* verification monitoring from 1 July 2015 to 30 June 2016

Drinking water scheme: **Rockhampton Water Supply Scheme**

Year	*July 2015 to June 2016*											
Month	***Jul***	***Aug***	***Sep***	***Oct***	***Nov***	***Dec***	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***Jun***
No. of samples collected	36	45	36	36	45	36	36	45	36	36	45	36
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	464	476	467	467	476	468	468	477	468	468	477	468
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 refered 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 A2.2 Mount Morgan Water Supply Scheme reticulation *E. coli* verification monitoring from 1 July 2015 to 30 June 2016

Drinking water scheme: **Mount Morgan Water Supply Scheme**

Year	*July 2015 to June 2016*											
Month	***Jul***	***Aug***	***Sep***	***Oct***	***Nov***	***Dec***	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***Jun***
No. of samples collected	8	10	8	12	15	12	12	15	12	12	15	12
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	104	106	104	108	115	117	121	128	130	134	141	143
No. of failures for previous 12 month period	1	1	1	1	1	1	1	1	1	1	1	0
% of samples that comply	99.0%	99.1%	99.0%	99.1%	99.1%	99.1%	99.2%	99.2%	99.2%	99.3%	99.3%	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 refered 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).

Appendix B Implementation of the DWQMP Risk Management Improvement Program

Tables B1.1 and B1.2 below describes the progress that has been made during this reporting period towards the completion of specific actions identified in the Risk Management Improvement Program in the approved amended DWQMP.

Table B1.1 Progress against the Risk Management Improvement Program in the Rockhampton Water Supply Scheme

Risk No.	Scheme Component / Sub-Component	Action(s)	Target Date(s)	Status as at December 2016	(If implementing these actions will take longer than anticipated, please provide detail, as it may affect the approved amended DWQMP)
R08	Source - Contamination of raw water with EC or TDS	Continue to lobby regulator for tighter water quality limits on mine water discharges	Ongoing (as required)	Continuing as required	As this is an ongoing matter, it is anticipated that the action will continue to form part of the RMIP
R13	Treatment – Lack of effective treatment for viral pathogens	Perform testing for viruses for further confirmation of process effectiveness	30 Sept 2012 (Planning)	Deferred	This risk has been re-assessed through the review of the DWQMP and is no longer considered part of the RMIP.
R30	Reservoirs – Inadequate security against deliberate act of sabotage or terrorism	Identify high risk sites and install CCTV at these sites	June 2017	Budget allocation secured for 2015-16 and 2016-17 for project commencement.	Physical and electronic security upgrades at various reservoirs are currently in progress.
R33	Customer tap – Contamination of treated water with microbial pathogens	Create a website Fact Sheet warning of contamination at customers tap	October 2015	Deferred	This risk has been re-assessed through the review of the DWQMP and is no longer considered part of the RMIP.

Table B1.2 Progress against the Risk Management Improvement Program in the Mount Morgan Water Supply Scheme

Risk No.	Scheme Component / Sub-Component	Action(s)	Target Date(s)	Status as at December 2016	(If implementing these actions will take longer than anticipated, please provide detail, as it may affect the approved amended DWQMP)
MM12	Treatment – Lack of effective treatment for protozoan pathogens	Further optimise filter performance or looking at installing UV disinfection if required	June 2017	Budget allocation secured in 2015-16 year for UV disinfection installation.	Procurement currently underway with installation of UV disinfection system expected before 30 June 2017.
MM13	Treatment – Process control failure for the removal of cyanobacteria	Conduct more analysis to determine effectiveness of each treatment barrier for removal of cyanobacteria	June 2016	Continuing	To be completed following the installation of the UV disinfection system.
MM14	Treatment – Lack of effective treatment for viral pathogens	Perform testing for viruses for further confirmation of process effectiveness	30 Sept 2012 (Planning)	Continuing	To be completed following the installation of the UV disinfection system.
MM18	Treatment – Process control failure leading to excessive turbidity	Continue to use newly installed on-line analyser to drive further process optimisation	June 2016	Continuing	Process optimisation largely completed with further mitigation of this risk following the installation of the UV disinfection system.
MM20	Treatment – Process control failure leading to coagulant underdose	Convert coagulant dosing to liquid alum for on-line flow metering and better measurement of chemical usage	November 2015	Continuing	Commissioning works planned for early 2017. Delayed slightly due to record winter rainfall and unseasonal flow in the Dee River.
MM32	Treatment – Inadequate security against deliberate act of sabotage or terrorism	Identify high risk sites and install CCTV at these sites	June 2016	Work in progress	Installation work currently in progress with physical and electronic security upgrades expected to be complete in early 2017.
MM36	Customer tap – contamination treated water with microbial pathogens	Create a website Fact Sheet warning of contamination at customers tap	October 2015	Deferred	This risk has been re-assessed through the review of the DWQMP and is no longer considered part of the RMIP.