DRINKING WATER QUALITY MANAGEMENT PLAN REPORT 2017

Douglas Shire Council

Reporting period: 1 July 2016 – 30 June 2017

Drinking Water Service Provider 558

11 December 2017

DOUGLAS SHIRE COUNCIL

Improving Environmental Performance
Ngaral Kulji Bubungu - Eastern Kuku Yalanji
Pulmpa dakit jarral-a-kaling - Yirrganydji

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Glossary of terms

ADWG	Australian Drinking Water Guidelines 2011. Published by the National Health and Medical Research Council of Australia
The Act	*Water Supply (Safety and Reliability)* Act 2008
CCP	Critical Control Point - point, step or procedure at which controls can be applied and a hazard can be prevented, eliminated or reduced
CFU/100mL	Colony forming units per 100 millilitres
DSC	Douglas Shire Council
DWQMP	Drinking Water Quality Management Plan
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
MPN/100mL	Most probable number per 100 millilitres
NATA	National Association of Testing Authorities
NTU	Nephelometric Turbidity Units
The Regulator	Department of Energy and Water Supply (DEWS)
RMIP	Risk Management Improvement Program
SCADA	Supervisory control and data acquisition

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Drinking Water Quality Management Plan Report

1. Introduction

This report documents the performance of Douglas Shire Council's (DSC) drinking water service with respect to water quality and 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)*.

The report provides a mechanism for providers to report publicly on their performance in managing drinking water quality.

2. Overview of operations

The Douglas Shire Council as Drinking Water Service Provider (SPID 558) operates three principle water supply schemes namely:

- Mossman / Port Douglas
- Whyanbeel
- Daintree

The water supply schemes draw raw water from rainforest streams and treat water to Australian Drinking Water Guideline (ADWG) standards by utilising ultrafiltration membrane processes and disinfection with chlorine.

In addition there is a non-potable water supply scheme:

- Dagmar Heights

This scheme consists of a bore field pump system with no treatment and is a declared non-potable water supply.

3. Overview of compliance outcomes

All Douglas Shire Council potable water schemes are sourced from protected rainforest catchments and after water treatment process provide high quality drinking water to the customers. During the financial year 2016-2017 all physical, chemical and microbiological parameters met with the health guideline values in the ADWG including the standards in the Public Health Regulation 2005. A regular audit held in July 2017 declared a high level of compliance imposed by the Water Supply (Safety and Reliability) Act 2008 during the audit period.

4. Actions taken to implement the DWQMP

The Douglas Shire Council Drinking Water Quality Management Plan was implemented in March 2016. DWQMP is a public health based risk management plan that demonstrates how public health risks to our services are managed.

Amended DWQMP identifies previous risks that were considered unacceptable prior to current mitigation in the risk management improvement program (RMIP) (Appendix B). As part of the RMIP Douglas Shire Council changed disinfection from sodium hypochlorite to gas chlorine at Mossman and Whyanbeel water treatment plants in July 2017. Since the change chlorine test results have returned within acceptable parameters, with no anomalies or concerns. pH results in reticulation system have been within acceptable limits at consumer points, even though gas chlorine has slightly

decreased the pH at the water treatment plants. Together with the RMIP the DWQMP includes critical control point (CCP) limits, which ensure that operators become aware of potential issues faster, and respond to ensure that our customers receive safe drinking water.

Compliance with the CCPs is continually monitored via SCADA control system and operational checks are performed by plant operators. Operational monitoring is undertaken to meet the ADWG recommendations. Verification monitoring is undertaken regularly with external analyses undertaken at a National Association of Testing Authorities (NATA) certified laboratory.

All data is recorded and reviewed to ensure a system is in place to identify any potential risks that may arise in relation to water quality and allow for early intervention with corrective measures to ensure compliance.

4.1. Progress in implementing the Risk Management Improvement Program

As stated above, the RMIP was updated in the review of the current DWQMP. This identified a number of important actions to improve our drinking water quality over time. Refer to Appendix B Table 5 for a summary of progress in implementing each of the Improvement program actions.

4.2. Amendments to the Drinking Water Quality Management Plan

DSC is currently going through a further review of the DWQMP and will submit the new version for consideration of the Regulator by 31st March 2018.

5. Compliance with water quality criteria for drinking water

Douglas Shire Council undertook verification monitoring in accordance with the requirements of the DWQMP approved in 2016.

Water quality data is presented in Appendix A: Tables 2 to 5 – Summary of water quality criteria compliance. All chemical and microbiological parameters met with the recommended values in the Australian Drinking Water Guidelines including the standards in the Public Health Regulation 2005.

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

During the report period there was one notice of non-compliance where the Regulator was notified.

Incident description: The non-compliance related to lead levels higher than ADWG health guideline values where the sample was taken from a private water meter. Water supply was sampled simultaneously from the local reservoir and from a private internal tap after the water meter. Water quality samples were analysed by an external NATA accredited laboratory. Results from the reservoir and internal tap met all health and aesthetic guideline values, but samples from the private water meter showed anomalous elevated lead results.

Corrective and preventative actions: Resampling and reanalyses were conducted soon after the non-compliant results were received from the NATA accredited laboratory. Resamples were taken following more cautious sampling methods and sent to the NATA certified laboratory. All the water quality samples in the scheme, including the internal samples demonstrated compliance with ADWG aesthetic and health guideline values. Due to compliant results within the water reticulation system, Council were confident that public health was not at risk. It appeared that the water meter was excavated and dismantled before taking water quality samples in the first instance, and this may

have impacted on the water quality in the water sample. Council have amended the water sampling procedure to clarify the sampling regime and investigation process during a non-compliance. It is recommended not to take future water samples directly from a customer's water meter, as this requires the water meter to be dismantled and can have an impact on water quality.

7. Customer complaints related to water quality

Throughout the year the following complaints about water quality were received (Table 1).

Table 1. Complaints about water quality

Scheme	Alleged Illness	Discoloured Water	Taste and Odour	Total
Daintree	0	0	0	0
Mossman / Port Douglas	0	6	5	11
Whyanbeel	1	0	2	3

7.1. Alleged illness

During the period there was 1 complaint about alleged illness in the Whyanbeel water reticulation scheme. The complaint related to health concerns that may be due to high heavy metal levels in drinking water. After NATA accredited analysis through water supply scheme the water quality was found to demonstrate compliance with ADWG aesthetic and health guideline values.

7.2. Discoloured water

A total of 6 complaints were received from residents in Mossman/Port Douglas scheme in relation to discoloured water. Milky to black coloured water was reported from complainant's domestic taps, this was not observed by Council Officer on inspection. As a precaution, flushing of service water mains was conducted in each instance and consumers were advised to flush their taps. Chlorine residual was checked and found to be adequate. Customer samples were analysed, and in each instance demonstrated compliance with ADWG health guideline values.

7.3. Taste and odour

A total of 7 complaints were received from residents in Mossman/Port Douglas and Whyanbeel schemes. Typically, the complaints were in relation to chlorine odour and or metallic tastes. In all instances the chlorine residual levels were checked and found to be well within our target set points of <1.5 mg/L. Customer samples were taken to check for possible compounds that may have caused metallic tastes and all results demonstrated compliance with ADWG health guideline values. Precautionary flushing of the service mains was also performed and consumers advised to flush their taps.

8. Findings and recommendations of the DWQMP auditor

Viridis Consultants Pty Ltd was engaged to conduct the first regular audit of Douglas Shire Council's DWQMP in April 2017. The purpose of the audit was to verify the accuracy of the monitoring and performance data provided to the Regulator, assess compliance with the DWQMP and to assess the relevance of the DWQMP in relation to the service provided. The regular audit declared a high level of compliance imposed by the Water Supply (Safety and Reliability) Act 2008 during the audit period.

The audit concluded that DSC:

- Provided accurate monitoring and performance data to the Regulator
- Generally implemented its DWQMP to manage risks to public health
- Maintained the relevance of the DWQMP

One minor non-compliance was identified in relation to the implementation of SCADA alarms at Whyanbeel water treatment plant. An online monitoring and alarm system for permeate turbidity had been manually disabled on one day. As Whyanbeel water treatment plant is not staffed on a full time basis, online monitoring and alarms are an important preventive measure in the operation of the plant. The auditor's recommendation was to establish a process for making changes to the SCADA alarms for critical control points, which includes approval of the change and documentation of the changes made. The process should also include regular review of SCADA alarms to ensure that they are fully implemented. DSC is implementing a new CCP documentation process together with a CCP incident form to better document the changes made to the water treatment plant process.

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

The identified non-compliance and the opportunities for improvement will be considered and addressed by reviewing and amending Douglas Shire Council's Drinking Water Quality Management Plan which will be submitted by 31 March 2018.

Appendix A – Summary of compliance with water quality criteria

Verification monitoring was carried out as per the program stated in the approved DWQMP at the time.

The verification monitoring program is considered appropriate to ensure compliance with the recommended values in the ADWG as well as the standards in the Public Health Regulation 2005.

Mossman/Port Douglas reticulation

Table 2. Verification monitoring results for the reporting period – July 2015 to June 2016

E.coli (MPN/100mL) Reticulation	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	<1	<1	<1	<1	<1	<1
Max	-	<1	<1	1	<1	1	<1
Min	-	<1	<1	<1	<1	<1	<1
Test Counts	-	537	526	522	524	618	626
95th %ile	-	<1	<1	<1	<1	<1	<1
Free Chlorine (mg/L) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0.41	0.45	0.62	0.54	0.61	0.46	0.67
Max	1.1	1.9	2.4	1.2	1.2	1.07	1.3
Min	0.01	0.01	<0.1	<0.1	<0.1	<0.1	<0.1
Test Counts	514	536	526	472	422	617	626
5th %ile					<0.1	<0.1	<0.1
95th %ile	0.8	0.9	1	0.92	0.92	0.89	1.1
pH (pH unit) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	8.5	8.2	7.9	7.7	7.64	7.76	7.87
Max	9.7	9.6	9.4	9.2	9.6	9.42	10.06
Min	7.2	7.2	7.1	6.8	6.6	6.7	6.7
Test Counts	522	537	526	490	525	603	626
95th %ile	9.3	9	8.6	8.6	8.48	8.78	8.8
Colour (PCU) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	1.9	1.6	1.8	1.3	<1	<5	<5
Max	13	4.5	8.4	5.3	5	5	<5
Min	1	<1	<1	<1	<1	<5	<5
Test Counts	219	537	526	486	71	154	156
95th %ile	3.1	2.8	3.4	4	5	<5	<5

Turbidity (NTU) Reticulation	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	0.25	0.1	0.1	0.1	<0.10	<0.5	<0.5
Max	3.1	1	5.7	0.3	2	14	1.1
Min	0.1	<0.10	<0.10	<0.10	<0.10	<0.5	<0.5
Test Counts	135	537	526	494	208	154	156
95th %ile	0.63	0.2	0.2	0.2	0.1	0.5	0.6
Iron (mg/L) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0.25	0.1	0.1	0.1	<0.10	<0.5	0.005
Max	3.1	1	5.7	0.3	2	14	0.053
Min	0.1	<0.10	<0.10	<0.10	<0.10	<0.5	<0.005
Test Counts	135	537	526	494	208	154	156
95th %ile	0.63	0.2	0.2	0.2	0.1	0.5	0.019
Manganese (mg/L) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	0.001	<0.01	0.02	<0.01	<0.005	<0.005
Max	-	0.025	0.02	0.03	<0.01	<0.005	<0.005
Min	-	<0.001	<0.01	<0.01	<0.01	<0.005	<0.005
Test Counts	-	253	505	349	71	154	156
95th %ile	-	0.004	0.02	0.03	<0.01	<0.005	<0.005

Mossman/Port Douglas reservoirs water quality results

E.coli (MPN/100mL) Reservoir	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	<1	<1	<1	<1	<1	<1
Max	-	<1	<1	<1	<1	1	<1
Min	-	<1	<1	<1	<1	<1	<1
Test Counts	-	106	105	104	106	105	104
95th %ile	-	<1	<1	<1	<1	<1	<1
Free Chlorine (mg/L) Reservoir	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0.48	0.64	0.77	0.73	0.72	0.79	0.94
Max	0.93	1.9	2.8	1.4	1.21	2.1	1.33
Min	0.01	0.03	<0.10	<0.10	<0.10	0.14	0.26
Test Counts	97	106	105	96	103	105	104
5th %ile	-	-	-	-	0.17	0.37	0.61
95th %ile	0.8	1.15	1.2	1.2	1.18	1.11	1.17

pH (pH unit) Reservoir	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	8.3	8.2	7.7	7.5	7.5	7.25	7.53
Max	9.5	9.3	8.7	8.5	8.5	8.52	8.4
Min	7.4	7.1	7.1	7	6.4	6.44	6.4
Test Counts	98	106	105	90	105	101	104
95th %ile	9.4	9.1	8.5	8	8.21	7.75	8.2

Mossman/Port Douglas treatment

E.coli (MPN/100mL) Treatment	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	<1	<1	<1	<1	<1	<1
Max	-	<1	<1	<1	1	<1	<1
Min	-	<1	<1	<1	<1	<1	<1
Test Counts	-	157	168	153	156	158	116
95th %ile	-	<1	<1	<1	<1	<1	<1
Free Chlorine (mg/L) Treatment	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	0.91	1	0.91	0.9	0.89	1.1
Max	-	2.2	2.6	1.3	1.13	1.31	1.6
Min	-	0.2	0.38	0.34	0.085	0.54	0.68
Test Counts	-	137	113	89	102	106	104
5th %ile	-						0.77
95th %ile	-	1.38	1.3	1.2	1.04	1.13	1.4
pH (pH unit) Treatment	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	7.2	7.2	7.1	7.3	7.3	7.64
Max	-	7.7	8.5	7.3	7.92	8.55	8.4
Min	-	6.6	6.9	6.9	6.5	6.7	6.4
Test Counts	-	137	113	92	113	102	104
95th %ile	-	7.5	7.4	7.2	7.8	7.63	8.2

Mossman/Port Douglas raw

E.coli (MPN/100mL) Raw	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	45	46	9	14	10.75	19
Max	-	>100	>100	12	37	34	34
Min	-	5	3	6	4	1	10
Test Counts	-	4	5	4	5	4	4
95th %ile	-	94	>100	12	34	34	34
pH (pH unit) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	7.1	7.1	7.1	6.84	6.78	7.08
Max	-	7.2	7.2	7.3	7.1	6.8	7.8
Min	-	6.9	6.9	6.9	6.5	6.7	6.4
Test Counts	-	4	5	4	16	4	14
95th %ile	-	7.2	7.2	7.3	7.1	6.8	7.8
Colour (PCU) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	14.4	7.3	5.8	10.2	9	7
Max	-	27	8.8	7.2	15	15	10
Min	-	4.4	5.7	3.3	5.5	5	<5
Test Counts	-	4	5	4	3	4	4
95th %ile	-	25.4	8.7	7.1	14.5	15	10
Turbidity (NTU) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	1.5	0.6	0.4	0.5	6.75	<0.5
Max	-	2.5	1.1	0.6	5.3	25	1.1
Min	-	0.4	0.3	0.3	0.1	<5	<0.5
Test Counts	-	4	5	4	17	4	14
95th %ile	-	2.5	1	0.6	2.02	25	1.1
Iron (mg/L) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	0.082	0.03	0.02	0.013	0.024	0.02
Max	-	0.094	0.05	0.024	0.036	0.037	0.022
Min	-	<0.05	<0.02	<0.02	<0.02	0.015	0.016
Test Counts	-	4	5	4	3	4	4
95th %ile	-	0.093	0.05	0.023	0.033	0.037	0.022

Manganese (mg/L) Raw	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	0.002	<0.01	<001	<0.01	<0.005	<0.005
Max	-	0.004	<0.01	<0.01	<0.01	<0.005	<0.005
Min	-	0.001	0.001	<0.01	<0.01	<0.005	<0.005
Test Counts	-	4	5	4	3	4	4
95th %ile	-	0.004	<0.01	<0.01	<0.01	<0.005	<0.005

Whyanbeel reticulation

E.coli (MPN/100mL) Reticulation	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	<1	<1	<1	<1	<1	<1
Max	-	<1	1	7	<1	<1	<1
Min	-	<1	<1	<1	<1	<1	<1
Test Counts	-	162	209	154	160	154	156
95th %ile	-	<1	<1	<1	<1	<1	<1
Free Chlorine (mg/L) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0.41	0.47	0.29	0.39	0.36	0.37	0.73
Max	4.4	8.2	1	1.9	1.25	1.5	1.46
Min	0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1
Test Counts	208	162	209	146	157	154	156
5th %ile					<0.10	<0.1	0.28
95th %ile	1.3	1.4	0.6	0.8	0.92	0.81	1.1
pH (pH unit) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	8.6	8	8.1	7.7	7.69	7.95	7.87
Max	10.1	9.4	9.7	8.9	9.31	9.08	9.1
Min	6.9	7	7.2	7.1	6.5	6.8	6.6
Test Counts	211	162	209	144	159	153	156
95th %ile	9.6	9.2	9.3	8.7	9.01	8.83	8.81
Colour (PCU) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	1.4	1.8	2.5	1.3	<1	<5	<5
Max	2.5	13	21	3.9	1.4	<5	<5
Min	1	<1	<1	<1	<1	<5	<5
Test Counts	42	162	156	144	38	39	39
95th %ile	2.1	3.2	4.6	3	1.1	<5	<5

Turbidity (NTU) Reticulation	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	0.15	0.2	<0.10	0.1	<0.10	<0.5	<5
Max	0.4	3.2	4.9	0.8	0.2	<0.5	0.7
Min	0.1	<0.10	<0.10	<0.10	<0.10	<0.5	<5
Test Counts	51	162	156	145	62	39	39
95th %ile	0.25	0.4	0.3	0.3	<0.10	<0.5	0.6
Iron (mg/L) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0.07	0.11	0.09	0.05	<0.02	0.02	0.017
Max	0.09	0.47	0.7	0.17	0.053	0.046	0.07
Min	0.06	<0.05	<0.02	<0.02	<0.02	<0.005	<0.005
Test Counts	4	75	150	108	24	39	39
95th %ile	0.09	0.3	0.22	0.1	0.047	0.042	0.044
Manganese (mg/L) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0	0.001	<0.01	0.02	<0.01	<0.005	<0.005
Max	0	0.02	0.03	0.03	<0.01	<0.005	<0.005
Min	0	<0.001	<0.01	<0.01	<0.01	<0.005	<0.005
Test Counts	21	75	150	108	24	39	39
95th %ile	0	0.01	0.01	0.03	<0.01	<0.005	<0.005

Whyanbeel reservoir

E.coli (MPN/100mL) Reservoir	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	<1	<1	<1	<1	<1	<1
Max	-	<1	<1	<1	3	1	<1
Min	-	<1	<1	<1	<1	<1	<1
Test Counts	-	110	49	85	52	53	52
95th %ile	-	<1	<1	<1	<1	<1	<1
Free Chlorine (mg/L) Reservoir	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0.34	0.29	0.33	0.23	0.71	0.72	0.95
Max	0.8	3	1.4	1.8	1.49	2.2	1.39
Min	0.02	<0.10	<0.10	<0.10	<0.10	0.19	<0.10
Test Counts	51	110	49	84	51	53	52
5th %ile					<0.10	0.24	0.55
95th %ile	0.61	0.6	0.74	0.56	1.08	1.03	1.3

pH (pH unit) Reservoir	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	0	8.4	7.4	7.9	7.13	7.34	7.51
Max	0	10	8	9.6	7.58	8.49	8.4
Min	0	7	7.2	7.1	6.6	6.6	6.6
Test Counts	0	110	49	77	52	51	52
95th %ile	0	9.9	7.8	9.1	7.43	8.03	8.2

Whyanbeel treatment

E.coli (MPN/100mL) Treatment	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	<1	<1	<1	<1	<1	<1
Max	-	<1	<1	<1	<1	<1	<1
Min	-	<1	<1	<1	<1	<1	<1
Test Counts	-	87	53	100	106	105	64
95th %ile	-	<1	<1	<1	<1	<1	<1
Free Chlorine (mg/L) Treatment	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	0.88	0.92	0.83	0.96	0.9	1.04
Max	-	1.5	2	1.3	1.34	1.46	1.5
Min	-	0.48	0.27	0.36	0.67	0.44	0.69
Test Counts	-	54	53	49	51	53	52
5th %ile	-				0.69	0.68	0.77
95th %ile	-	1.24	1.2	1.1	1.12	1.11	1.4
pH (pH unit) Treatment	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	7.1	7	7	7	7.1	7.05	7.5
Max	7.5	7.4	7.4	7.2	8.56	7.81	8.6
Min	6.7	6.7	6.8	6.8	6.3	6.6	6.3
Test Counts	53	53	53	47	64	51	52
95th %ile	7.3	7.2	7.2	7	7.58	7.63	8.2

Whyanbeel raw

E.coli (MPN/100mL) Raw	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	44	54	44	52	102	17
Max	-	>100	>100	130	>100	260	29
Min	-	16	6	14	12	27	10
Test Counts	-	3	4	4	4	4	5
95th %ile	-	92	>100	113	97	260	29
pH (pH unit) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	6.7	6.6	6.7	6.6	6.54	6.48	6.53
Max	6.9	6.7	6.8	6.7	7	6.5	7
Min	6.4	6.5	6.5	6.4	6.1	6.4	6.2
Test Counts	9	3	4	4	18	4	15
95th %ile	6.9	6.7	6.8	6.7	6.99	6.5	6.9
Colour (PCU) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	15.3	12.4	8.6	11.2	10	11.25
Max	-	20	17	9.2	15	15	15
Min	-	7	8.6	9.2	15	5	10
Test Counts	-	3	4	4	3	4	4
95th %ile	-	19.9	16.4	9.2	14.5	15	15
Turbidity (NTU) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	1.4	0.9	0.6	0.36	4.23	<0.5
Max	-	2.8	2.2	0.7	2.8	15	2.1
Min	-	0.4	0.5	0.3	<0.1	<0.5	<0.5
Test Counts	-	3	4	4	18	4	15
95th %ile	-	2.6	1.9	0.7	1.19	15	0.9
Iron (mg/L) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	-	0.085	0.06	0.03	0.03	0.031	0.032
Max	-	0.117	0.12	0.032	0.04	0.037	0.035
Min	-	<0.05	0.03	0.027	0.02	0.026	0.028
Test Counts	-	3	4	4	3	4	4
95th %ile	-	0.114	0.11	0.03	0.04	0.037	0.035

Manganese (mg/L) Raw	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	0.002	<0.01	<0.01	<0.01	<0.005	<0.005
Max	-	0.003	<0.01	<0.01	<0.01	<0.005	<0.005
Min	-	0.001	0.001	<0.01	<0.01	<0.005	<0.005
Test Counts	-	3	4	4	3	4	4
95th %ile	-	0.003	<0.01	<0.01	<0.01	<0.005	<0.005

Daintree reticulation

E.coli (MPN/100mL) Reticulation	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	<1	<1	<1	<1	<1	<1
Max	-	<1	<1	<1	<1	<1	<1
Min	-	<1	<1	<1	<1	<1	<1
Test Counts	-	55	51	50	54	52	52
95th %ile	-	<1	<1	<1	<1	<1	<1
Free Chlorine (mg/L) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0.13	0.12	0.17	0.2	0.2	0.64	0.84
Max	0.3	0.3	0.4	0.37	0.71	1.16	1.4
Min	0.01	<0.10	<0.10	<0.10	<0.10	0.2	0.5
Test Counts	53	55	51	50	53	52	52
5th %ile					<0.10	0.4	0.6
95th %ile	0.28	0.25	0.31	0.36	0.62	0.85	1.14
pH (pH unit) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	7.7	7.8	7.7	7.7	7.46	7.53	7.65
Max	7.9	9	7.9	8	7.9	7.96	8.6
Min	7.3	7.5	7.5	7.3	6.75	7.03	6.9
Test Counts	55	55	51	48	54	51	52
95th %ile	7.9	8.3	7.8	7.8	7.74	7.81	8.23
Colour (PCU) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	1.5	<1	<1	1.3	<1	<5	<5
Max	3.8	2.1	1.8	2.1	4.1	5	<5
Min	1	<1	<1	<1	<1	<5	<5
Test Counts	29	55	51	48	13	13	13
95th %ile	3.3	1.3	1	1.8	1.64	5	<5

Turbidity (NTU) Reticulation	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	0.18	0.1	0.1	0.1	0.11	<0.5	<0.5
Max	0.6	0.2	0.6	0.3	0.6	0.7	0.9
Min	0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5
Test Counts	32	55	51	50	21	13	13
95th %ile	0.49	0.2	0.2	0.2	0.4	0.7	<0.5
Iron (mg/L) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0.07	<0.05	<0.02	<0.02	0.03	0.008	0.005
Max	0.09	<0.05	0.03	<0.02	<0.02	0.031	0.012
Min	0.06	<0.05	<0.02	<0.02	<0.02	<0.005	<0.005
Test Counts	4	55	49	37	8	13	13
95th %ile	0.09	<0.05	0.02	<0.02	0.08	0.031	0.009
Manganese (mg/L) Reticulation	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0	<0.001	<0.01	<0.01	<0.01	<0.005	<0.005
Max	0	<0.001	<0.01	<0.01	<0.01	<0.005	<0.005
Min	0	<0.001	<0.01	<0.01	<0.01	<0.005	<0.005
Test Counts	21	55	49	37	8	13	13
95th %ile	0	<0.001	<0.01	<0.01	<0.01	<0.005	<0.005

Daintree treatment

E.coli (MPN/100mL) Treatment	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	<1	<1	<1	<1	<1	<1
Max	-	<1	<1	<1	<1	<1	<1
Min	-	<1	<1	<1	<1	<1	<1
Test Counts	-	107	106	103	104	105	64
95th %ile	-	<1	<1	<1	<1	<1	<1
Free Chlorine (mg/L) Treatment	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0.31	0.28	0.28	0.33	0.5	0.96	1.01
Max	0.5	0.5	0.62	0.51	0.98	1.39	1.68
Min	0.19	<0.10	<0.10	<0.10	0.1	0.67	0.6
Test Counts	54	87	54	49	51	53	52
5th %ile					0.29	0.69	0.8
95th %ile	0.41	0.4	0.47	0.43	0.85	1.29	1.22

pH (pH unit) Treatment	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	7.5	7.5	7.5	7.6	7.4	7.41	7.4
Max	8.6	7.7	8.2	7.7	8.3	7.74	8.19
Min	7.2	7.2	7.4	7.4	6.93	7.02	6.6
Test Counts	53	87	54	48	66	51	52
95th %ile	7.6	7.6	7.6	7.7	7.69	7.64	7.9

Daintree raw

E.coli (MPN/100mL) Raw	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	-	52	89	66	39	141.3	252
Max	-	>100	>100	160	88	340	770
Min	-	27	72	23	10	30	24
Test Counts	-	4	5	4	3	3	4
95th %ile	-	92	>100	144	81	340	770
pH (pH unit) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	7.3	7.4	7.5	7.5	7.37	7.27	7.14
Max	7.3	7.5	7.7	7.6	7.6	7.3	7.5
Min	7.1	7.2	7.3	7.3	7.2	7.2	6.6
Test Counts	9	4	5	4	3	3	5
95th %ile	7.3	7.5	7.7	7.6	7.57	7.3	7.5
Colour (PCU) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	1.5	38.6	13.6	14.3	12	18.3	8.75
Max	3.8	>70	19	24	15	45	15
Min	1	5.9	9.2	53	10	10	<5
Test Counts	29	4	5	4	3	3	4
95th %ile	3.3	>70	18.4	22.5	14.6	45	15
Turbidity (NTU) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	1.56	13.6	1.4	1.4	0.8	18.4	1.22
Max	2.7	45	2.9	2.6	1.2	52	1.9
Min	0.9	0.6	0.9	0.7	0.6	1.3	0.6
Test Counts	9	4	5	4	3	3	5
95th %ile	2.58	39.4	2.6	2.4	1.14	52	1.9

Iron (mg/L) Raw	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Avg	0.16	0.37	0.19	0.162	0.176	0.24	0.173
Max	0.25	0.67	0.28	0.28	0.28	0.4	0.27
Min	0.11	0.13	0.14	0.098	0.1	0.14	0.09
Test Counts	6	4	5	4	3	3	4
95th %ile	0.24	0.65	0.27	0.264	0.267	0.4	0.27
Manganese (mg/L) Raw	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Avg	0	0.007	0.008	<0.1	<0.1	0.002	<0.005
Max	0.01	0.017	0.01	<0.1	<0.01	0.007	0.008
Min	0	0.001	0.003	<0.1	<0.1	<0.005	<0.005
Test Counts	6	4	5	4	3	3	4
95th %ile	0.01	0.015	0.01	<0.1	<0.1	0.007	0.008

Table 3. E.coli verification monitoring Mossman/Port Douglas Scheme

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	64	85	67	64	80	64	66	68	76	64	80	64
No. of samples collected in which *E.coli* was detected	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	78	69	84	69	69	75	69	53	102	69	77	79
No. of failures for previous 12 months	0	0	0	0	0	0	0	0	0	0	1	0
% of samples that comply	100	100	100	100	100	100	100	100	100	100	100	100
Compliance with 98% annual value	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

During 2015-2016 reporting period one *E.coli* organism per 100 mL was detected in Mossman/Port Douglas Scheme during a heavy rain fall event. As no other E.coli detections and/or high bacterial counts from within the surrounding reticulation system were found in the simultaneous or following samples, the most probable cause of the detection was external contamination of the sample due to inclement weather at the time of sampling. A review of sampling procedures was carried out to ensure all sampling was being performed to reduce the possibility of further instances of sample contamination.

Table 4. E.coli verification monitoring Whyanbeel Scheme

Month	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
No. of samples collected	24	30	23	20	25	20	20	25	20	20	25	20
No. of samples collected in which *E.coli* was detected	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	31	25	31	25	25	27	25	25	31	25	31	25
No. of failures for previous 12 months	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	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 5. E.coli verification monitoring Daintree Scheme

Month	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
No. of samples collected	12	15	11	8	10	8	8	10	8	8	10	8
No. of samples collected in which *E.coli* was detected	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	16	13	16	13	13	14	13	13	16	13	16	13
No. of failures for previous 12 months	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	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Appendix B – Implementation of the DWQMP Risk Management Improvement Program

Table 6. Progress against risk management improvement program in the approved DWQMP

RMIP Reference	Scheme	Hazardous Event	Hazards Managed by Same Barriers	Primary Preventive Measures	Risk Management Improvements			
					Status	2015/16 FY	2016/17 FY	2017/18 FY or later
DWQMP Doc	Mossman/Port Douglas	Raw water main break	Failure of supply	Multiple intakes – Mossman	Completed	Strategy to be finalised in 2016/17 FY	Mains break procedure updated	
DWQMP Doc	All Schemes	Blocked Johnston screen	Failure of supply	Intake checked daily	Commenced	Strategy to be finalised in 2016/17 FY	Procedure, including preparing for storm events required	Rex Creek stage 2 intake upgrade, SOP for cleaning and maintenance
PCWST116	Daintree	Loss of raw water reservoir at Daintree due to subsidence	Failure of supply	Stabilisation works are scheduled	Completed	Reassessed and moved to 2016/17 FY	Daintree WTP Bank Stabilisation Adjacent to Raw Water Reservoir	
PCWST111	Mossman/Port Douglas	Loss of integrity	Protozoa, turbidity	Continuous turbidity monitoring, 24 hr PDT	Completed	Budget item PCWST111 MWTP UF racks integrity test associated valve replacement. Replace all the old butterfly valves (on each UF rack) associated with the integrity test pressurisation system		
PCWST110	Mossman/Port Douglas	Loss of integrity	Protozoa, turbidity	Continuous turbidity monitoring, 24 hr PDT	Completed	Budget item PCWST110 Install turbidity meters to each rack		
Dain 1*	Daintree	Loss of integrity	Protozoa, turbidity	Continuous turbidity monitoring, 24 hr PDT	Completed	Move turbidity meter to permeate rather than treated water		
Whyanbeel 1*	Whyanbeel	Loss of integrity	Protozoa, turbidity	Continuous turbidity monitoring, 24 hr PDT	Completed	Move turbidity meter to permeate rather than treated water		
PCWST117	Whyanbeel	Membrane scaling reducing plant capacity	Reduced supply	Regular backwashes, including CEB/CIP as required	Completed	Budget item PCWST117 Renewal of chemical dosing system for CIP and CEB		
PCWST112	Mossman/Port Douglas	Chemical breakdown	Chlorate	Nil currently	Completed	Expected completion by 30 June 2017	Budget item PCWST112 Change MWTP to gas chlorine (2*920kg drums)	
PCWST113	Whyanbeel	Chemical breakdown	Chlorate	Nil currently	Completed	Expected completion by 30 June 2017	Budget item PCWST113 Whyanbeel gas chlorination project (2*70kg cylinders)	
PCWST114	Daintree	Chemical breakdown	Chlorate	Nil currently	Terminated	Project under review	Daintree gas chlorination project terminated after found not to be required	
PCWR125 DWQMP Doc	Mossman/Port Douglas	Ingress into reservoirs	Bacteria/virus	Primary disinfection, redosing at Craiglie	Completed	Project under review	Budget item PCWR125 Craiglie gas chlorination project (2*70kg cylinders)	
WR2 DWQMP Doc	Mossman/Port Douglas	Ingress into reservoirs	Protozoa	Integrity at Craiglie	Commenced	Project under review	Budget item WR2 replace Craiglie Reservoir roof placed on future capital program	Craiglie Reservoir roof replacement delayed until Crees Road Reservoir constructed for supply security reasons
PCWR124 DWQMP Doc	All Schemes	Ingress into reservoirs	Protozoa	Integrity and sealing	Completed	Expected completion by 30 June 2017	Budget item PCW124 eliminate any potential ingress into reservoir, seal vertical sheeting to abutment, repair/replace sheeting, water proof hatches	
PCWST118 DWQMP Doc	Mossman/Port Douglas	Ingress into reservoirs	Bacteria/virus	Primary disinfection, hypo dosing at Rocky Point	Completed	Budget item PCWST118 Calcium Hypo dosing plant installed at Rocky Point Res, including telemetry and alarms		
PCWST115 DWQMP Doc	Mossman/Port Douglas	Ingress into reservoirs	Bacteria/virus	Primary disinfection, manual redosing at Flagstaff Res	Completed	Budget item PCWST115 Calcium Hypo dosing plant installed at Flagstaff Reservoir, including telemetry and alarms		

RMIP Reference	Scheme	Hazardous Event	Hazards Managed by Same Barriers	Primary Preventive Measures	Risk Management Improvements			
					Status	2015/16 FY	2016/17 FY	2017/18 FY or later
PCWST119 DWQMP Doc	Mossman/Port Douglas and Whyanbeel	Ingress into reservoirs	Bacteria/virus	Primary disinfection, no redosing (Cooya, Wonga)	Cooya Reservoir and Wonga Reservoir not currently in use		Reassessed and moved to the 2017/18 FY budget	Reassessed and moved to the 2017/18 FY budget
PCWR127 DWQMP Doc	Mossman/Port Douglas	Ingress of contaminated water	Bacteria/virus	Network pressure, residual disinfection, mains break procedure	Commenced	Capital program to be established in 2016/17 FY	Budget item PCWR127 Upgrade of mains Newell Beach	Capital project ongoing
DWQMP Doc	All Schemes	Ingress of contaminated water	Protozoa	Network pressure, mains break procedure	Commenced	Capital program to be established in 2016/17 FY	Mains break procedure commenced	Mains break procedure to be finalised
Port 1		Power failure	Failure of supply	Power supply generally robust. Many areas gravity fed	Completed – Generator to be provided by Ergon Energy as required in an emergency situation			
PCWST114	All Schemes	Increasing pH impacting residual disinfection	Bacteria/virus	Network pressure, reservoir integrity, mains break procedure	Commenced/Ongoing	Budget item PCWR128 Replacement of ageing AC mains	Ongoing on a priority status	Capital project ongoing
DWQMP Doc Retic 1	All Schemes	Backflow	Protozoa	System integrity, backflow prevention on new installations	Commenced		Long term meter replacement strategy ongoing	Long term meter replacement strategy ongoing
PCWST115 and PCWST118	Mossman/Port Douglas	Insufficient dose	Bacteria/virus	Disinfection, daily inspections	Completed	PCWST115 and PCWST118		
PCWST120 PCWST121 PCWST122 PCWST123	All Schemes	SCADA/telemetry failure	Protozoa	Treated water in system	Completed Additional minor improvements ongoing	Budget item PCWST120 Upgrade SCADA to new version of CITEC. PCWST121, PCWST122, PCWST123 telemetry and switching improvements also associated with these communication upgrades	PCWST123 improving telemetry over 2 years	Additional minor improvements ongoing
PCWR126	Mossman/Port Douglas	Demand exceeds supply	Limited supply	Asset planning	Commenced planning phase		Subject to planning review – 2017/18	Subject to planning review – 2017/18
PCWR131	Mossman/Port Douglas	Demand exceeds supply	Limited supply	Asset planning	Commenced	Budget item PCWR131 Develop Crees Rd Reservoir site	Continue PCWR131	Crees Rd Reservoir to be completed 2017/18
PCWR132	Mossman/Port Douglas	Drought (Mossman)	Failure of supply	Restrictions leading to wet season	Commenced	Budget item PCWR132 Water supply security – investigate, design and possibly implement alternate supply source	Continue PCWR132	Subject to planning review – 2017/18
PCWR130	Daintree	Flood	Failure of supply	Daintree intake	Completed	Budget item PCWR130 install 2 hydrants and 2 sluice valves to improve raw water supply source		
PCWR130	Daintree	Landslip Daintree intake	Failure of supply	Daintree intake	Completed	Budget item PCWR130 install 2 hydrants and 2 sluice valves to improve raw water supply source		
PCWR127	Mossman/Port Douglas & Whyanbeel	Cyclone	Failure of supply	DMP	Commenced	Budget item PCWR127 Improve interconnection to improve supply security	To be budgeted in future capital program	Budgeted for commencement 2017/18
Training 1 DWQMP Doc	All Schemes	Operator error	Any	Training, experience, mentoring	All operators are Cert III trained and relevant training occurring as courses are available	Develop procedures listed as required	Training ongoing	Training ongoing
DWQMP Doc	All Schemes	Accidental use of bypass	Protozoa and bacteria	Valves identified as permanently closed, tagged out	Commenced	Develop bypass procedures	Procedures commenced 16/17 FY	To be completed 2017/18 FY
Training 1	All Schemes	Loss of knowledge	All	Formalise Water Operations professional development. Ground truth is GIS	Ongoing	Local government structure plan		Local government structure plan ongoing