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SUSTAINABLY DEVELOPING THE OUTBACK

Service Provider # 42

Drinking Water Quality Management Plan (DWQMP) Report

1 July 2015 – 30 June 2016

DECEMBER 2016

GBA CONSULTING ENGINEERS

Document Control

Date	Name	Position	Action required *(Review/Endorse/Approve)*
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2.	22/02/2016	W. Green	Alignment with DWQMP Approval Conditions
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TABLE OF CONTENTS

GLOSSARY OF TERMS

ADWG	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
DSC	Diamantina Shire Council
mg/L	Milligrams per litre
DWQMP	Drinking Water Quality Management Plan
CFU/100mL	Colony forming units per 100 millilitres
ORWA	Outback regional Water Alliance

INTRODUCTION

Pursuant to sections 99(2) (b) and 106 of the Act, regular reviews of the approved Drinking Water Quality Management Plan must be undertaken at specific intervals, this report documents the performance of Diamantina Shire Councils (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 assists the Regulator to determine whether the approved 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.

1. OVERVIEW OF OPERATIONS

Diamantina Shire covers an area of 95,000sq km with an overall population of approximately 350 people which swells significantly in the cooler months with travelling tourists. There are two operational water schemes in the shire in the towns of Birdsville and Bedourie, each town has a population of approximately 150 permanent residents. The administration centre of the shire is in Bedourie.

The systems are characterised by deep bores bringing hot water to the surface under pressure where the only treatment is cooling. Birdsville's Bore water is sourced from 1200m below ground level and emerges at a temperature of approximately 98ºC. Birdsville has a dual reticulation system where non potable water is sourced from the Diamantina River when water is available. Bedourie's water is sourced from a bore approximately 400m deep and emerges at approximately 45ºC.

In July 2013 DSC submitted a DWQMP demonstrating the commitment of council to managing its drinking water quality and complying with requirements of the Water Supply *(Safety and Reliability)* Act 2008, to protect public health by ensuring the provision of a safe water supply. The development of the DWQMP has documented potential risks associated with the operation of the water schemes and management strategies to safeguard drinking water quality for the public.

DSC has implemented a number of actions set out in the DWQMP to provide greater surety for the supply of safe drinking water for the Birdsville and Bedourie supply schemes. The application of a range of improvement items and management strategies that are set out in the DWQMP are identified in this report.

2. ACTIONS TAKEN TO IMPLEMENT THE DWQMP

2.1. Progress in Implementing the Risk Management Improvement Program

The information below presents the risks identified in the DWQMP Risk Management Improvement Program and the strategies that have been implemented to reduce these risks and ensure the provision of drinking water quality in the DSC's water schemes.

2.1.1. Improvement Item 1 – Bacterial or chemical contamination of water supply in power station prior to delivery to Council

A risk Assessment Workshop with DSC and Ergon Energy was conducted to assess the potential for drinking water contamination to occur through the release isopentane to the drinking water from the Birdsville Organic Rankine Cycle (ORC) Geothermal Powerstation. The workshop has effectively investigated and assessed the risks of potential contamination from the plant as low and have also identified control measures in the unlikely event of contamination occurring.

2.1.2. Improvement Item 2 – Bacterial Contamination from working on finished water pumps, heat exchanger.

The Work Method Statement on Water and Sewer Repairs, Maintenance and New Construction for DSC outlines preventative controls for this hazard with reference to the ADWG.

2.1.3. Improvement Item 3 – Loss of supply due to Bore Failure

Bedourie's town bore supplies the entire town with potable water and has been operating for over 100 years. A failure of this bore would have drastic consequences for the town.

To mitigate the risk of bore failure the following precautions have been undertaken:

- CCTV inspections of the bore every five years to assess the condition of the bore
- Pressure and flow has been monitored and any changes to these conditions have been investigated
- An investigation has been completed on alternative water supply options for Bedourie with recommendations

2.1.4. Improvement Item 4 – Birdsville bore water fluoride concentration above guideline limit

The sampling of the water quality at the bore-head of Birdsville has obtained an average result for Fluoride of 1.75mg/L while ADWG has a limit of 1.5mg/L. According to the ADWG, the risk from exceeding the limit is the potential for dental fluorosis in children of ages up to 6 or 8 years when exposed over an extended period time.

In response to the high fluoride results obtained from the Drinking Water Monitoring Program the drinking water regulator required Diamantina Shire Council to distribute a media release facts sheet regarding the high fluoride levels, a facts sheet was sent to all Birdsville residents in June 2014 advising parents to provide rainwater or bottled water for children under the age of six to limit or prevent dental fluorosis.

2.1.5. Improvement Item 5 – Pipe breakage in cooling pond – contaminant entry during shut-down

The upgrade of dated infrastructure in the cooling pond area was identified as a high priority by the DSC due to the risk of contamination from maintenance operations. Recent upgrades to the cooling ponds facilities have been undertaken, replacing galvanised pipes with an improved copper pipe system.

The Work Method Statement on Water and Sewer Repairs, Maintenance and New Construction for DSC outlines preventative control for this hazard with reference to the Practical Guide to the Operation and Optimisation of Distribution Systems, WIOA-05 (2012).

2.1.6. Improvement Item 6 – Bacterial contamination of supply during repairs to reticulation system

DSC's Work Method Statement covers training of staff on good hygiene practices for pipe repairs in the distribution systems. The disinfection and flushing procedure for contaminated areas of pipes or new pipelines is explained in the Work Method Statement.

2.1.7. Improvement Item 7 – Ingress of contamination in Birdsville from cross-connection to untreated river water system

The dual reticulation system in Birdsville delivering both potable and non-potable water has been strategically designed to ensure that cross contamination between systems is avoided through engineered design. The reticulation system for the non-potable river water has been designed so that the water pressure is significantly less than the potable water system to ensure that if a cross connection took place, the pressure variance between the two lines would ensure that water in the non-potable line would not have the pressure required to flow into the potable water line.

2.1.8. Improvement Item 8 – Water network drawings are not up to date

DSC has updated the drawings of the water networks for Birdsville and Bedourie water systems for the benefit of asset management and operational tasks.

2.1.9. Improvement Item 9 – Illegal access to finished water supply infrastructure or storage reservoirs

The development of a Work Method Statement by DSC has identified the risk of unauthorised access to water infrastructure in Bedourie and Birdsville. The successful implementation of the WMS requires shire staff to identify the risk of unauthorised entry, install necessary security measures in place and ensure that security gates, hatches and ladder shrouds are kept locked and in good working order. These works have been completed by shire staff.

2.1.10. Improvement Item 10 – Floods may prevent road transport when bacteriological sampling is indicated

In times where floods occur and roads are inaccessible and DSC staff are unable to conduct routine E. coli monitoring in accordance with DSC's Procedure for Water Quality Monitoring (E. coli), the Procedure for Water Quality Monitoring has specified that the samples may be transported by air freight which operates twice per week.

Also, the recent procurement of the Colilert 18 water testing device has allowed shire staff to test water at the depot in Bedourie making the testing process much simpler and allows greater opportunity to follow monthly testing schedules.

2.2. Revisions Made to the Operational Monitoring Program to Assist In Maintaining the Compliance With Water Quality Criteria1 in Verification Monitoring.

2.2.1. Review of Operations

In 2014 a review of operations was initiated by the Outback Regional Water Alliance (ORWA) to employ a drinking water quality specialist to identify issues and recommend actions to address these issues for the drinking water Schemes of Bedourie and Birdsville. The review involved an assessment of the full extent of the schemes from the bore head through the full extent of the distribution system. The review provided specialist advice to make improvements to the schemes in addition to those identified in the DWQMP.

An informal review of the DWQMP was conducted between August and September 2015 to regionalise and operationalise the DWQMP to ensure on ground implementation of the plan, and highlight any problems with the plan.
An investigation of the utilisation of the DWQMP determined the objectives and operational requirements were not clearly understood by operational staff and the DWQMP was not being utilised to its full extent. As a result of this investigation it was decided by Council as part of an ORWA project a DWQMP Operating Plan would be drafted in order to summarise the requirements of the DWQMP for operational staff. Staff workshops took place to formulate the documents structure. The objective of this document is to provide a succinct document for operational staff to reference and easily implement the management practices set out in the DWQMP.

2.2.2. Implementation of a Drinking Water Quality Operations Plan

An investigation of the utilisation of the DWQMP determined the objectives and operational requirements were not clearly understood by operational staff and the DWQMP was not being utilised to its full extent. As a result of this investigation it was decided by council

[1] Refer to *Water Quality and Reporting Guideline for a Drinking Water Service* for the water quality criteria for drinking water.

management that a DWQMP Operating Plan would be drafted in order to summarise the requirements of the DWQMP for operational staff. Staff Workshops have taken place to formulate the documents structure. The objective of this document will be to provide a succinct document for operational staff to reference and easily implement the management practices set out in the DWQMP.

2.2.3. In-house Turbidity Monitoring

A Turbidity meter has been purchased by DSC in order to identify if contamination of the water is occurring in the reticulation. The Source water for both Bedourie and Birdsville is generally clear, monitoring the turbidity in the distribution systems will help to determine if there are contaminants entering the system. The potential for dirty water contamination is particularly applicable to Birdsville which has a dual reticulation system where there is potential for contamination from river water.

2.2.4. Review of Testing Program

As part of the informal review the verification monitoring program was assessed to determine its capacity in effectively monitoring for hazardous events within the systems. The review identified that the lab testing conducted for the DSC was not tailored to potential hazards specific to the water supply schemes of Bedourie and Birdsville.
The proposal of a revised Verification Monitoring Program aimed to reduce the number of unnecessary analytes tested, these analytes were identified through the analysis of historical data, and where results identified consistent non detection values these analytes were removed from the verification testing program. Additional testing analytes were also identified providing improved detection of hazardous elements.

2.3. Amendments made to the DWQMP

In August 2016 an amended DWQMP was submitted to the regulator for review. The amendment was conducted primarily to document recommended changes made to the Verification Monitoring Program.
The amendment also updated verification monitoring data to include the data up to mid-2016. The amended version is in the final stages of review and is anticipated to be authorised in early 2017.

3. COMPLIANCE WITH WATER QUALITY CRITERIA FOR DRINKING WATER

3.1. Bedourie Drinking Water Scheme Water Quality Results 2015 – 2016

Bedourie Water Quality Test Results							
Analyte	**Scheme Component**	**Sampling Frequency**	**Number of Samples**	**Samples Exceeding Guidelines**	**Min**	**Max**	**Average**
E coli (orgs/100mL)	Distribution system	Monthly	36	0	0	0	0
Total coliforms	Source Water	Monthly	2	0	0	0	0

Bedourie Water Quality Test Results							
Analyte	**Scheme Component**	**Sampling Frequency**	**Number of Samples**	**Samples Exceeding Guidelines**	**Min**	**Max**	**Average**
(orgs/100mL)							
pH	Source Water	Biannually	2	0	8.2	8.4	8.3
Turbidity (NTU) (Aspirational)	Source Water	Monthly	2	0	<0.5	<0.5	<0.5
True colour (Pt Co)	Source Water	Biannually	2	0	<1	1	1
Dissolved Oxygen (%)	Source Water	Biannually	0				
Total dissolved solids (mg/L)	Source Water	Biannually	2	0	540	540	540
Sodium (mg/L)	Source Water	Biannually	2	2	200	200	200
Chloride (mg/L)	Source Water	Biannually	2	0	92	100	96
Fluoride (mg/L)	Source Water	Biannually	2	0	0.9	0.9	0.9
Sulfate (mg/L)	Source Water	Biannually	2	0	<1	<1	<1
Manganese (mg/L)	Source Water	Biannually	2	0	0.011	0.012	0.0115
Iron (mg/L)	Source Water	Biannually	2	0	0.033	<0.05	<0.0415
Aluminium (mg/L)	Source Water	Biannually	2	0	0.007	0.009	0.008
Antimony (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Barium (mg/L)	Source Water	Biannually	2	0	0.65	0.72	0.685
Boron (mg/L)	Source Water	Biannually	2	0	0.021	0.025	0.023
Cadmium (mg/L)	Source Water	Biannually	2	0	0.0001	0.001	0.00055
Chromium (mg/L)	Source Water	Biannually	2	0	<0.0002	<0.001	<0.0006
Copper (mg/L)	Source Water	Biannually	2	0	0.003	0.15	0.0765
Lead (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Molybdenum (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001

Bedourie Water Quality Test Results							
Analyte	**Scheme Component**	**Sampling Frequency**	**Number of Samples**	**Samples Exceeding Guidelines**	**Min**	**Max**	**Average**
Mercury (mg/L)	Source Water	Biannually	2	0	<0.0001	<0.0001	<0.0001
Nickel (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Arsenic (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Cyanide (mg/L)	Source Water	Biannually	0				
Silver (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Selenium (mg/L)	Source Water	Biannually	2	0	<0.001	<0.005	<0.005
Uranium (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Zinc (mg/L)	Source Water	Biannually	2	0	<0.005	<0.005	<0.005

3.2. Birdsville Drinking Water Scheme Water Quality Results 2015 – 2016

Birdsville Water Quality Test Results							
Analyte	**Scheme Component**	**Sampling Frequency**	**Number of Samples**	**Samples Exceeding Guidelines**	**Min**	**Max**	**Average**
E coli (orgs/100mL)	Distribution system	Monthly	36	0	0	0	0
Total coliforms (orgs/100mL)	Source Water	Monthly	2	0	0	0	0
pH	Source Water	Biannually	2	0	8.2	8.3	8.25
Turbidity (NTU) (Aspirational)	Source Water	Monthly	2	0	<0.5	<0.5	<0.5
True colour (Pt Co)	Source Water	Biannually	2	0	<1	2	<1.5
Dissolved Oxygen (%)	Source Water	Biannually	0				
Total dissolved solids (mg/L)	Source Water	Biannually	2	0	490	490	490
Sodium (mg/L)	Source Water	Biannually	2	1	180	190	185
Chloride (mg/L)	Source Water	Biannually	2	0	62	65	63.5

Birdsville Water Quality Test Results							
Analyte	**Scheme Component**	**Sampling Frequency**	**Number of Samples**	**Samples Exceeding Guidelines**	**Min**	**Max**	**Average**
Fluoride (mg/L)	Source Water	Biannually	2	2	1.9	2	1.95
Sulfate (mg/L)	Source Water	Biannually	2	0	1	<1	<1
Manganese (mg/L)	Source Water	Biannually	2	0	0.001	0.009	0.002
Iron (mg/L)	Source Water	Biannually	2	0	0.05	0.05	0.05
Aluminium (mg/L)	Source Water	Biannually	2	0	0.033	0.041	0.037
Antimony (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Barium (mg/L)	Source Water	Biannually	2	0	0.16	0.16	0.16
Boron (mg/L)	Source Water	Biannually	2	0	0.53	0.56	0.545
Cadmium (mg/L)	Source Water	Biannually	2	0	<0.0001	<0.0001	<0.0001
Chromium (mg/L)	Source Water	Biannually	2	0	<0.002	<0.002	<0.002
Copper (mg/L)	Source Water	Biannually	2	0	0.001	0.080	0.0405
Lead (mg/L)	Source Water	Biannually	2	0	0.001	<0.001	<0.001
Molybdenum (mg/L)	Source Water	Biannually	2	0	0.001	<0.002	<0.0015
Mercury (mg/L)	Source Water	Biannually	2	0	<0.0001	<0.0001	<0.0001
Nickel (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Arsenic (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Cyanide (mg/L)	Source Water	Biannually	0				
Silver (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Selenium (mg/L)	Source Water	Biannually	2	0	<0.005	<0.005	<0.005
Uranium (mg/L)	Source Water	Biannually	2	0	<0.001	<0.001	<0.001
Zinc (mg/L)	Source Water	Biannually	2	0	<0.005	0.068	0.0365

3.3. Summary of Results

Bacteriological sampling for both Bedourie and Birdsville has recorded no positive results since the implementation of the DWQMP, sampling has taken place on a monthly basis in three locations in the distribution system.

Elevated levels of fluoride detected in Birdsville's Drinking water have been identified as a hazard in DSC's DWQMP and a potential risk to water quality which is due to the underlying geology in the area causing naturally high levels in the water supply. In the 2015/16 reporting period Birdsville had 2 exceedances of ADWG health values with values of 1.9 and 2 mg/L.

For both Bedourie and Birdsville there was an exceedance of ADWG aesthetic values for Sodium, both schemes marginally exceeded the aesthetic guideline, Bedourie had 2 values of 200mg/L and Birdsville had a single exceedance of 190mg/L.

A new water testing regime tailored to the Bedourie and Birdsville drinking water schemes has required changes to be implemented to the testing program. The implementation of monthly testing of Coliforms and Turbidity has not been successfully adopted with these analytes only being tested externally; monthly in-house testing for these analytes will be required to be implemented in order to align with the DWQMP operating plan and the Amended DWQMP.

The requested changes to water testing analytes were not correctly implemented by the water testing laboratory. This has resulted in Dissolved Oxygen and Cyanide being omitted from the test results. This matter has been raised with the laboratory, and DSC are confident that this will be amended in the final testing interval in 2016.

4. NOTIFICATIONS TO THE REGULATOR UNDER SECTIONS 102 AND 102A OF THE ACT

Notification was sent to DEWS regarding the elevated fluoride levels for Birdsville's drinking water in February 2016 (Incident number: DWI-7-42-00003) and another notification in July 2016 regarding exceedance of ADWG health guideline values. As the incident refers to naturally occurring fluoride in Artesian source water the incident has been recorded as an ongoing incident.

5. CUSTOMER COMPLAINTS RELATED TO WATER QUALITY

Operating as a small water provider DSC does not manage a complaints register. In such a small community complaints are not made to a central reporting point but are directed to the town foreman. No complaints have been received this year.

6. FINDINGS AND RECOMMENDATIONS OF THE DWQMP AUDITOR

Since the implementation of the DWQMP there has not been an audit conducted. The first regular audit of the plan is due by the second of June 2018, prior to this date an audit will be instigated and recommendations provided.

7. OUTCOME OF THE REVIEW OF THE DWQMP AND HOW ISSUES RAISED HAVE BEEN ADDRESSED

An informal review of the DWQMP was conducted between August and September 2015. The purpose of the review was to ensure that the DWQMP remains relevant to the operational aspects of the drinking water service. The findings of the review were that the DWQMP operational requirements were not clearly understood by operational staff and that the DWQMP was not being utilised to its full extent. The review also identified the need for DSC to rationalise water monitoring program to better reflect the potential health risks associated with their schemes and also improve the efficiency of the program from a business perspective.

As a result of the review of the DWQMP a DWQMP Operating Plan was finalised in November 2015 to summarise the operational aspects of the DWQMP for on ground staff, to provide a summary of requirements and operating procedures to be to meet the requirements of the DWQMP. To develop the DWQMP Operating Plan workshops were held in Bedourie and Birdsville with operational and administrative staff managing all aspects of the drinking water schemes in Bedourie and Birdsville. The workshops were designed to identify all of different operations within the water schemes and identify the processes and procedures required to ensure safe work processes in the operation of the water distribution systems. The document breaks down the schemes into stages of production such as sourcing, cooling and distributing and identifies the risk factors and management improvement items identified in the DWQMP. The objective of this document will be to provide a succinct document for operational staff to implement the management strategies set out in the DWQMP.

The rationalisation of DSCs Water Monitoring Program was conducted in order to tailor their testing program to better meet the characteristics of the source water and the challenges faced by remote communities regarding regular water quality testing. Until the monitoring program review was performed testing programs were based on standard water testing suites. A review of historical data provided Council justification for tailoring their testing to eliminate unnecessary testing for analytes consistently returning non detection values and to focus on those associated with hazardous events.