DIAMANTINA SHIRE COUNCIL
17 Herbert Street
BEDOURIE QLD 4829

Service Provider ID 42

SUSTAINABLY DEVELOPING THE OUTBACK

DIAMANTINA DRINKING WATER QUALITY MANAGEMENT PLAN

June 2018

GBA CONSULTING ENGINEERS

Version History

Date	Name	Position	**Action required** *(Review/Endorse/Approve)*
01/06/2016	W. Green	Environmental Officer	Review
28/09/2016	W. Green	Environmental Officer	Review
12/03/2018	W. Green	Environmental Officer	Review
28/06/2018	W. Green	Environmental Officer	Amended based on regulator feedback

Prepared by	William Green
Title	Environmental Officer, George Bourne & Associates, Barcaldine Qld
Location	73 Elm Street, Barcaldine Qld
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Contact for enquiries and proposed changes

If you have any questions regarding this document or if you have a suggestion for improvements, please contact:

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Phone	07 4651 5177

Table of Contents

1 Registered Service Details

1.1 Diamantina Shire Council

Diamantina Shire includes the towns of Bedourie and Birdsville, and covers an expanse of 95,000 sq km. The population of the shire is approximately 350. The administration centre of the shire is in Bedourie.

Council provides potable water reticulation to the two towns which is sourced from artesian bores. Birdsville has dual reticulation with untreated river water supplied for irrigation use.

Council's corporate plan developed to provide strategic direction, includes the strategy: "*Ensure water quality meets guidelines for human consumption*".

1.2 Regulatory & Formal Requirements

The Water Supply (Safety and Reliability) Act 2008 (the Act) commenced on 1st July 2008. The purpose of the Act is to provide for the safety and reliability of water supply throughout Queensland.

The Regulator requires all small Water Service Providers to prepare a Drinking Water Quality Management Plan (DWQMP) under the *Act*. This document demonstrates the commitment of Diamantina Shire Council (DSC) to manage drinking water quality in accordance with the Act.

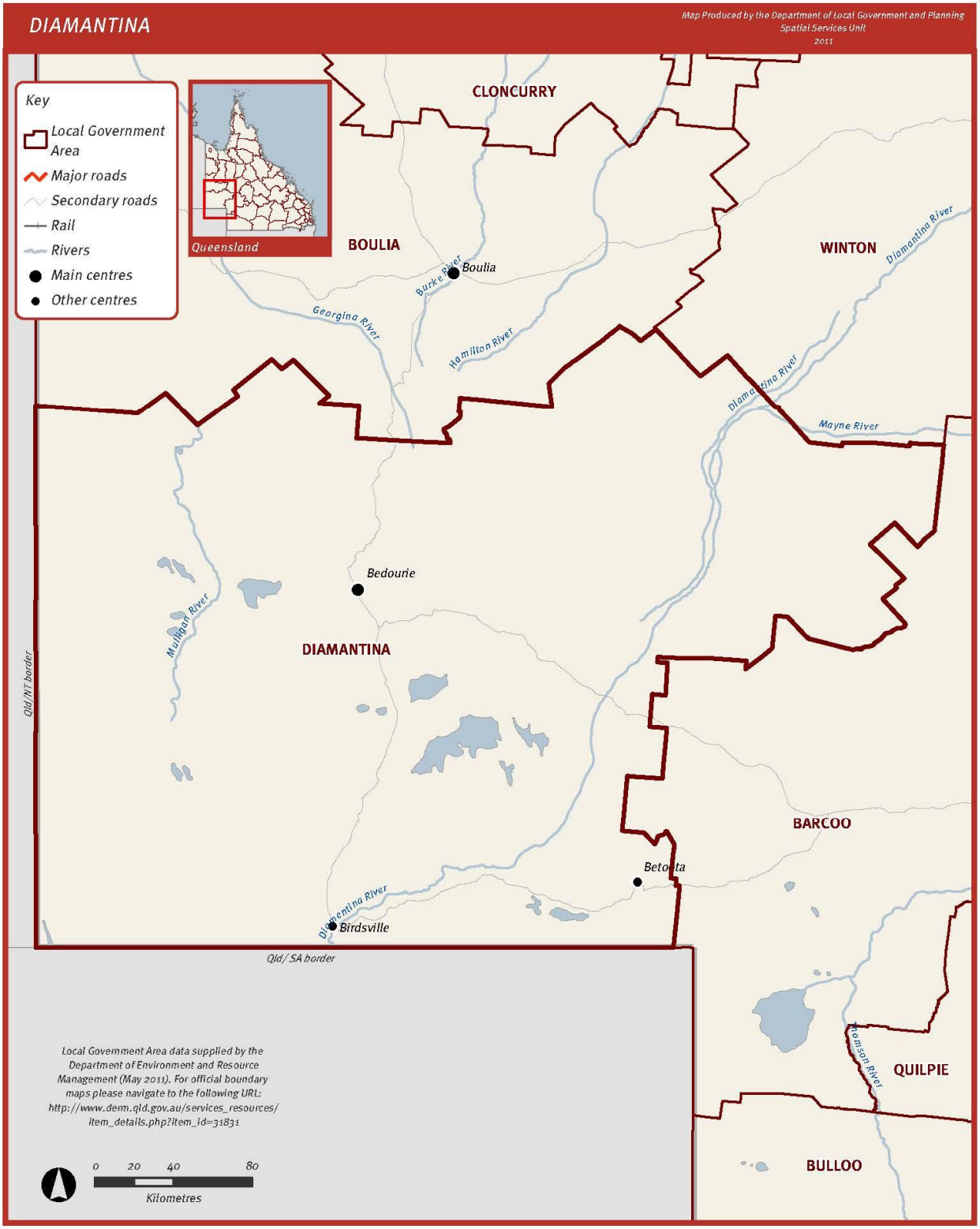
The Act includes provisions relating to the management of drinking water quality, aimed at protecting public health. This outcome is achieved primarily through regulatory framework for drinking water quality which requires drinking water service providers to:

- Undertake monitoring and reporting on drinking water quality
- Have an approved drinking water quality management plan

The operation of a water service or a drinking water service will also be covered under other state and Commonwealth legislation. Requirements of Water Supply (Safety and Reliability) Act 2008 do not negate the requirements of other legislation unless where expressly stated. The provider is responsible for obtaining any necessary approvals under other Acts to ensure the compliant operation of the service. Other State and Commonwealth legislation relating to the operations of a water service may include:

- Water Legislation Act 2016
- Public Health Act 2005
- Public Health Regulations 2005
- Plumbing and Drainage Act 2002
- Planning Act 2016
- Environmental Protection Act 1994
- Water Act 2000
- Trade Practices Act 1974
- WHS Act 2011

1.3 Diamantina Shire Map



1.4 Great Artesian Basin

Council supplies potable water to two towns, Bedourie and Birdsville. In both towns the water source is the Great Artesian Basin (GAB), which extends over the blue shaded area on the map below.

The water of the GAB is held in sandstone layers laid down by continental erosion of higher ground during the Triassic, Jurassic, and early Cretaceous periods, during a time when much of what is now inland Australia was below sea level. The sandstone was then covered by a layer of marine sedimentary rock shortly afterwards, which formed a confining layer - thus trapping water in the sandstone aquifer. The eastern edge of the basin was uplifted when the Great Dividing Range formed. The other side was created from the landforms of the Central Eastern Lowlands and the Great Western Plateau to the west.

Most recharge water enters the rock formations from relatively high ground near the eastern edge of the basin (in Queensland and New South Wales) and very gradually flows towards the south and west. A much smaller amount enters along the western margin in arid central Australia, flowing to the south and east. Because the sandstones are permeable, water gradually makes its way through the pores between the sand grains, flowing at a rate of one to five metres per year.

The age of the groundwater determined by carbon-14 and chlorine-36 measurements combined with hydraulic modelling ranges from several thousand years for the recharge areas in the north to nearly 2 million years in the south-western discharge zones. At this age the water would be expected to display consistent quality.

1.5 Diamantina current and future populations and demands

Listing of Diamantina Shire Drinking Water Supplies

Scheme Name	Communities Served	Current			Projected in 10 years		
		Population served	Connections	Demand kL/d	Population served	Connections	Demand kL/d
Bedourie	Bedourie	122	70	281	140	75	322
Birdsville Bore Supply	Birdsville	140	70	394	160	85	450

1.6 Council Contacts

The administration centre and Main Works Depot are in Bedourie
Customer Service is also available at the Information Centre in Birdsville

Council's mailing address is:
Diamantina Shire Council
17 Herbert St
Bedourie Qld 4829

The Council first point of contact in relation to this plan is:
Leon Love
Chief Executive Officer
Phone: 07 4746 1202
Email: leon.love@diamantina.qld.gov.au

1.7 DWQMP Structure

The details of the two supply schemes are listed separately in alphabetical sequence in the following sections.

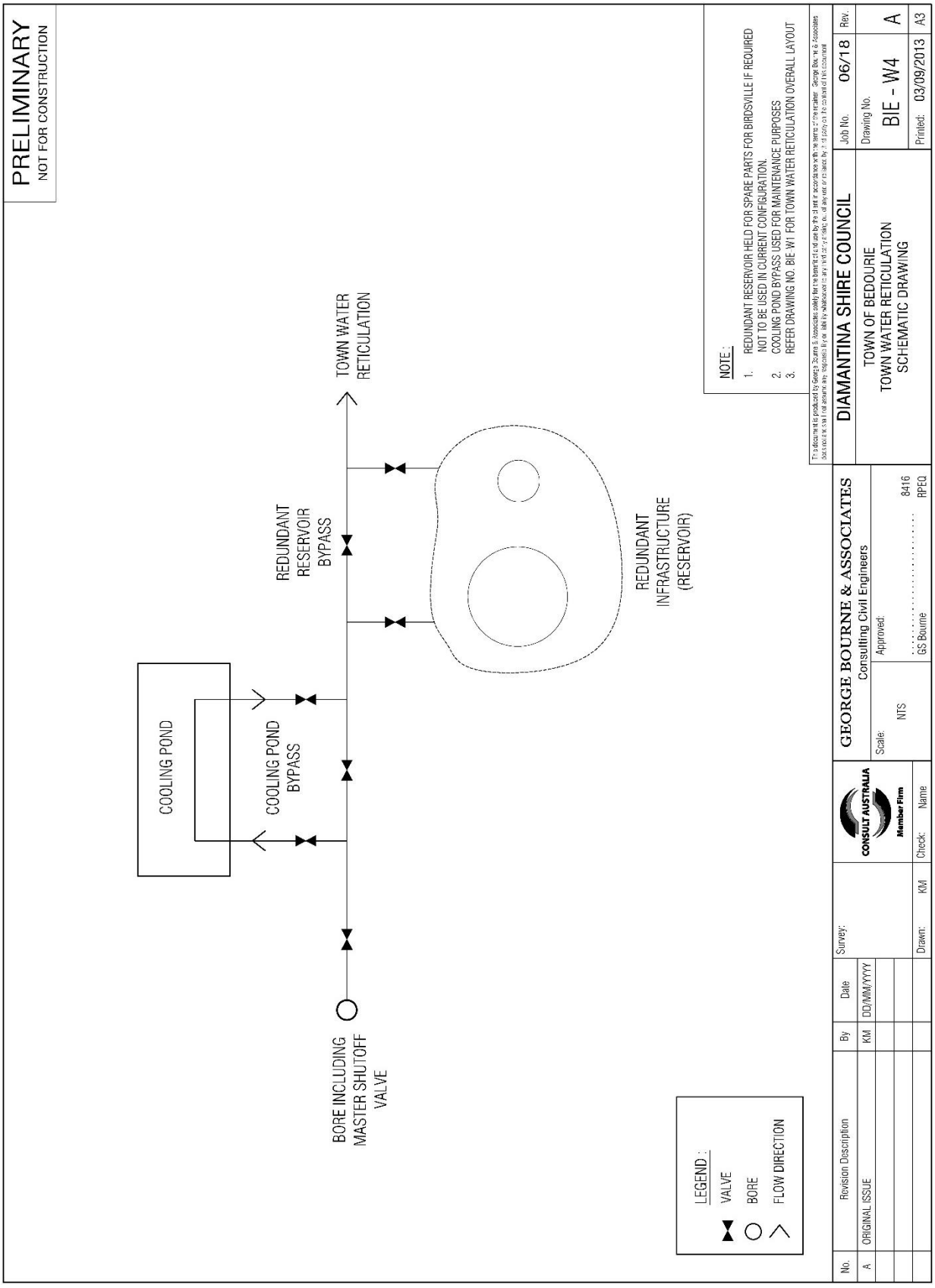
The risk analysis workshop for the shire was a combined session including all the available relevant personnel. The risk analysis follows after the individual scheme details in this plan.

1.8 Stakeholders

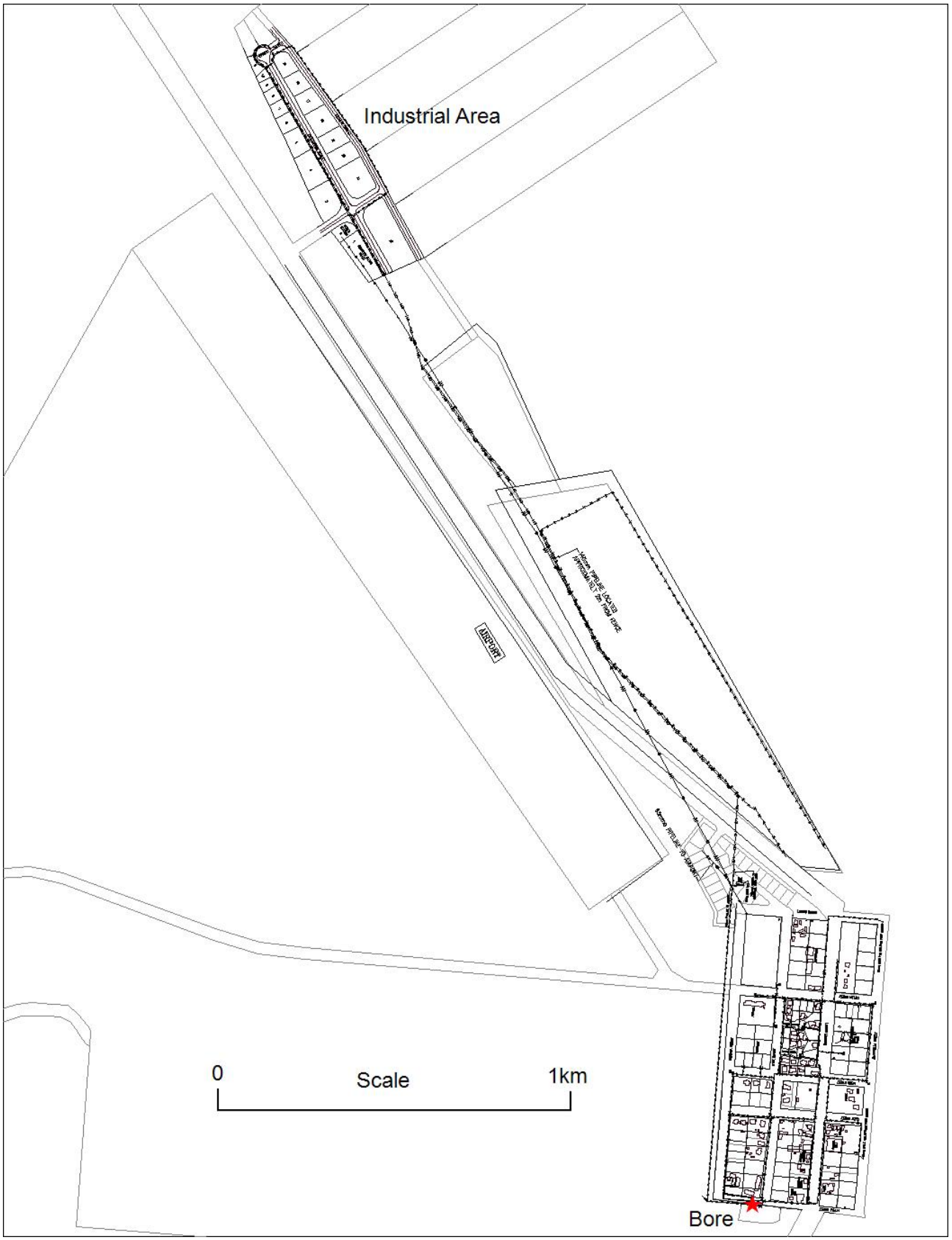
Organisation	Contact Name and Details	Relevance to management of drinking water quality	How the stakeholder is engaged in the DWQMP
Diamantina Shire Council	Leon Love Chief Executive Officer	Council CEO	Risk management participant, plan oversight
	Trevor Stewart Works Manager	Overall Supervisor	Risk management participant, plan implementation
	Kurt Ball Strategic Services Coordinator	Assistant Supervisor	Risk management participant, plan implementation
	Jodie Girdler Bedourie Town Services Foreman	Bedourie Supervisor	Risk management participant, plan implementation
	Jock McDonald Birdsville Town Services Foreman	Birdsville Supervisor	Risk management participant, plan implementation
KABZ Plumbing	Brent Krause P: 0427 463 124	Reticulation maintenance	
GBA Engineers	Stuart Bourne Senior Engineer P: (07) 4651 5177	Planning, design and construction of works	Risk management participant, engineering supervision, Preparation of DWQMP
Ergon	David Schild Generation Mechanical Technical Officer	Birdsville Geothermal Power Station Supervisor	Liaison re power station operation and maintenance
Bedourie Clinic	P: (07) 4746 1226	Local health service	Sensitive User
Birdsville Clinic	P: (07) 4656 3245	Local health service	Sensitive User
Bedourie State School	P: (07) 4746 1224	Sensitive User	Sensitive User
Birdsville State School	P: (07) 4656 3233	Sensitive User	Sensitive User
Queensland Health Public Health Unit	82-86 Bolsover Street, Rockhampton QLD 4700 PO Box 946, Rockhampton QLD 4700 P: (07) 4920 6989	Public Health	Public Health
SGS Environmental Services	P: (07) 3859 3000	Water Analysis Authority	Chemical Analysis/ Reporting Water Quality

2 Bedourie

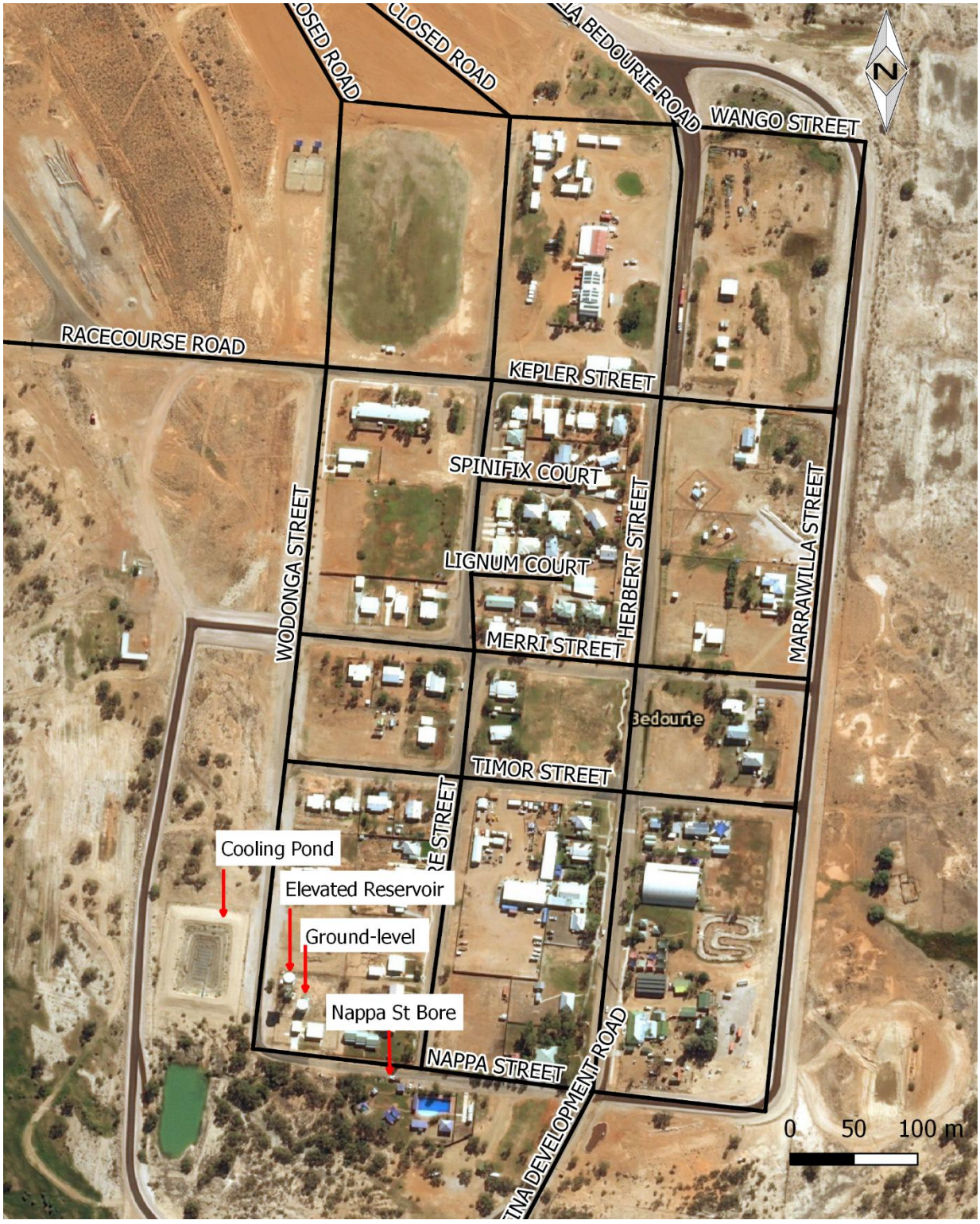
2.1 Supply Schematic



2.2 Overall Schematic



2.3 Infrastructure



Bedourie's bore is located in a fenced enclosure on the southern side of Nappa St. The water reticulation was constructed in 1996 and extended to the industrial area in 2000. The source is an existing artesian bore "Bedourie Town No 2". Water is reticulated through town by bore pressure (no pumps are required). The temperature before and after the cooling pond is approximately 45^0C and 25^0C respectively.

2.4 Infrastructure Details

Bedourie		
Component		**Details**
Source	Name	Bedourie Bore
	Type	Artesian RN 316 Depth 400m Allocation 150 ML/a See Appendix for DNRM Bore Card Report
	% of supply	100%
	Reliability	100%
		Closed head pressure 529 kPa Unrestricted flow 42 L/s
	Water quality issues	Temperature 45^0C
Source Infrastructure	Type	Cooling pond
	Description	Bore flows under artesian pressure through the cooling pond and direct into reticulation via pressure control valves
Treatment		Cooling is the only treatment provided
Disinfection		Not provided
Distribution and Reticulation System	**Pipe material**	**MDPE**
	Age range	20 years @ 2018
	Approx % of total length	48% (4,165m)
	Age range	18 years @ 2018
	Approx % of total length	4% (347m)
	Age range	16 years @ 2018
	Approx % of total length	48% (4,111m)
	Areas where potential long detention periods could be expected	Industrial subdivision
	Areas where low water pressure (eg < 12 m) could be expected during peak or other demand pds)	nil

Reservoirs	**Ground (No)**	1 (no longer used)
	Name	**Bedourie GLR**
	Capacity	400 kL
	Roofed (Y/N)	yes
	Vermin-proof (Y/N)	yes
	Runoff directed off roof (Y/N)	yes
	Elevated (No)	1 (no longer used)
	Name	**Bedourie Elevated Reservoir**
	Capacity	200 kL
	Roofed (Y/N)	Yes
	Vermin-proof (Y/N)	Yes
	Runoff directed off roof (Y/N)	Yes
There are no water quality responsibility changes		

The bore now supplies the town under artesian pressure with cooling via a manifold in the cooling pond. The reservoirs have been isolated from the distribution system due to the commissioning of the cooling pond, which being a sealed system reduces the risk of contamination.

2.4.1 Water Treatment

The bore water quality is good and generally meets the health and aesthetic guidelines in the ADWG. Total dissolved solids are just over the good quality range for taste but no treatment is warranted.

The water comes from a deep aquifer in the Eromanga Basin, the central region of the Great Artesian Basin, under pressure from a 400m depth to the customers' taps. It is sterile at its source and, because of the positive pressure throughout the system, there is no opportunity for contamination in normal operation.

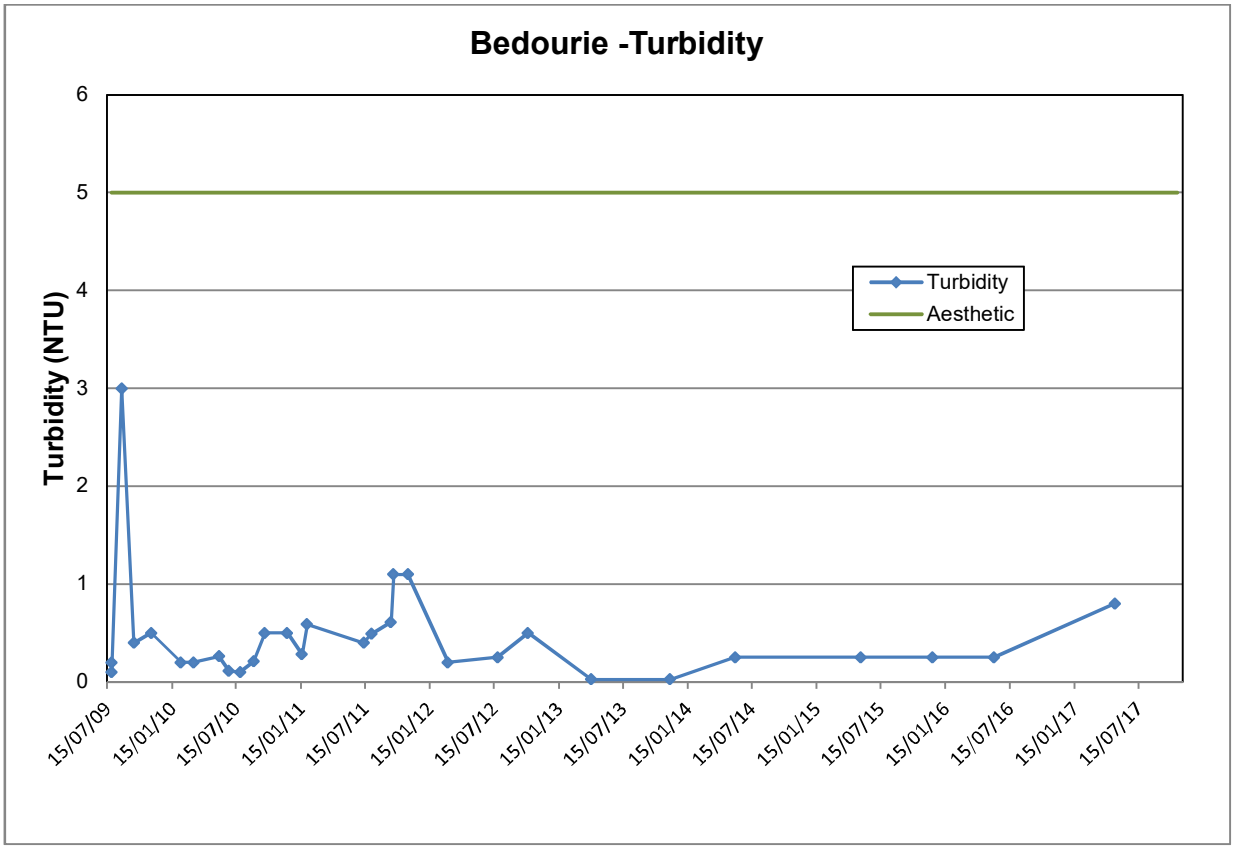
If a section of the reticulation is depressurised for repairs, then flushing of the affected section with chlorine solution is carried out to disinfect the affected section.

In order to control cost and complexity, continuous chlorine disinfection is not provided.

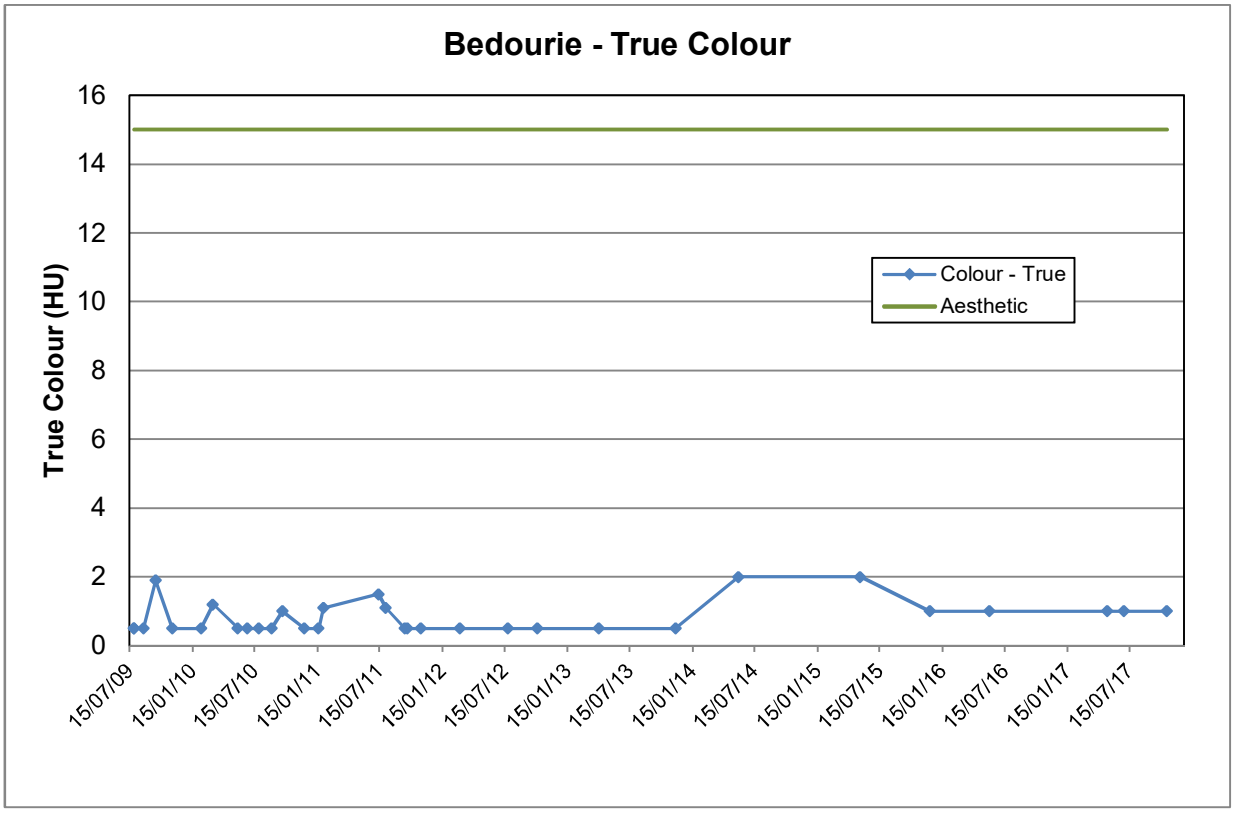
2.5 Bedourie Drinking Water Quality Results 2009 – 2017

Bedourie Water Supply										
Start Date: 28/08/2009				End Date: 09/12/2017						
Analyte	Scheme Component	Units	Sampling Frequency	Summary of Results						
				Number of Samples	Maximum Value	Average Value	Minimum Value	Std Dev	95th Percentile	Exceedances
E. coli	Distribution	CFU/100ml	Monthly	75	1	0.027	0	0.161	0	2
Turbidity	Source	NTU	Biannually	30	3	0.455	0.025	0.542	1.1	0
True Colour	Source	HU	Biannually	32	2	0.822	0.5	0.463	1.945	0
pH	Source	pH	Biannually	32	8.9	8.244	6.9	0.297	8.5	3
Conductivity	Source	µS/cm	Biannually	31	1200	946.774	880	63.163	1050	0
TDS	Source	mg/L	Biannually	10	770	561	460	74.626	675.5	0
Total Hardness	Source	Mg/L	Biannually	8	12	6.25	2.5	3.849	11.3	0
Residual Alkalinity	Source	mg/L	Biannually	9	32	8.278	0.05	8.865	22.24	0
Chloride	Source	mg/L	Biannually	11	100	88.455	81	4.812	96	0
Fluoride	Source	mg/L	Biannually	32	0.9	0.758	0.6	0.090	0.9	0
Calcium	Source	Mg/L	Biannually	8	8	4.488	0.5	3.421	8	0
Sodium	Source	mg/L	Biannually	11	220	202.727	190	12.129	220	0
Potassium	Source	mg/L	Biannually	9	3.7	3.122	2.4	0.346	3.58	0
Magnesium	Source	mg/L	Biannually	9	0.4	0.242	0.05	0.113	0.36	0
Aluminium	Source	µg/L	Biannually	32	180	17.799	0.0025	33.891	67.1	0
Iron	Source	µg/L	Biannually	32	150	61.534	0.05	42.603	134.5	0
Manganese	Source	µg/L	Biannually	32	18	11.938	0.012	4.567	18	0
Boron	Source	µg/L	Biannually	11	340	189.125	0.19	97.490	295	0
Copper	Source	µg/L	Biannually	11	150	21.818	0.5	42.882	101	0
Zinc	Source	µg/L	Biannually	11	13	2.637	0.005	3.444	7.75	0
Sulphate	Source	mg/L	Biannually	10	1	0.188	0.025	0.303	0.775	0
Nitrate	Source	mg/L	Biannually	9	0.1	0.022	0.0025	0.033	0.084	0
Aesthetic Guideline Exceedance										
Health Guideline Exceedance										

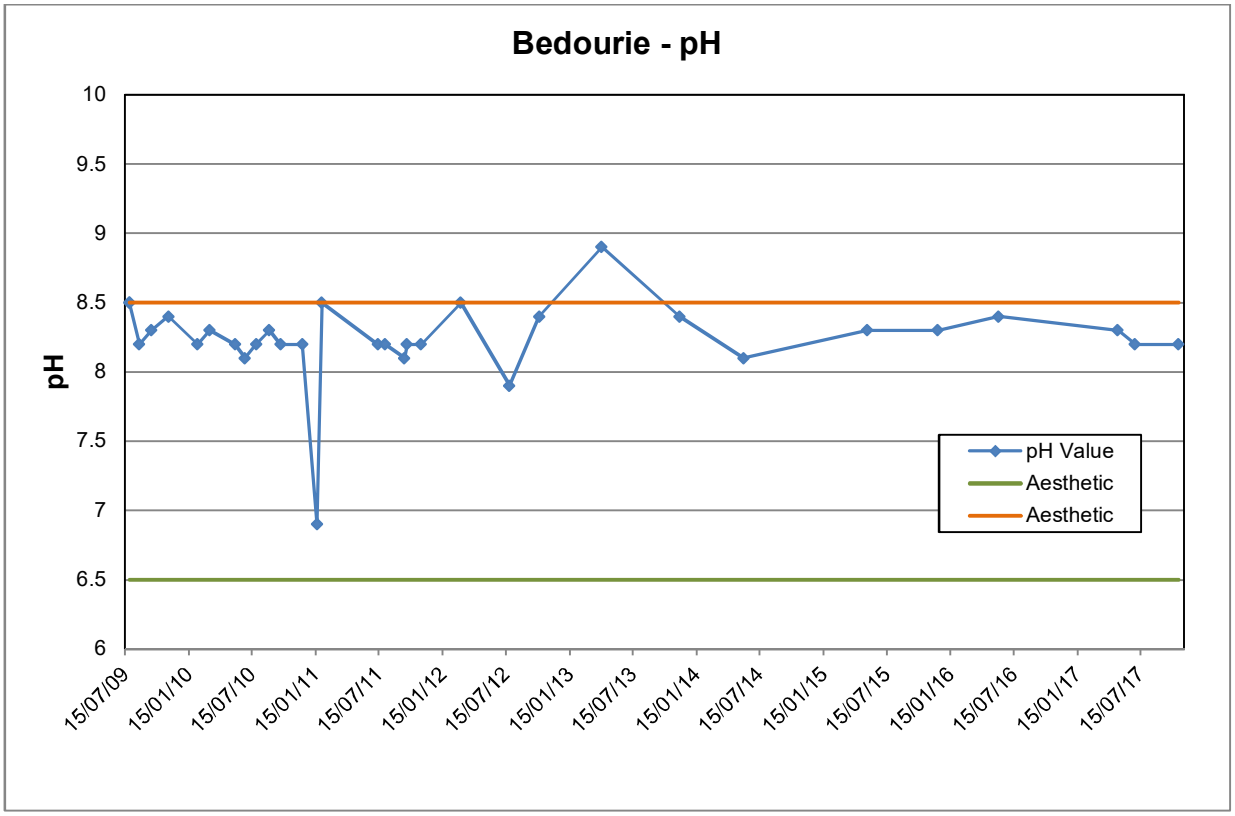
2.6 Water Quality Graphs



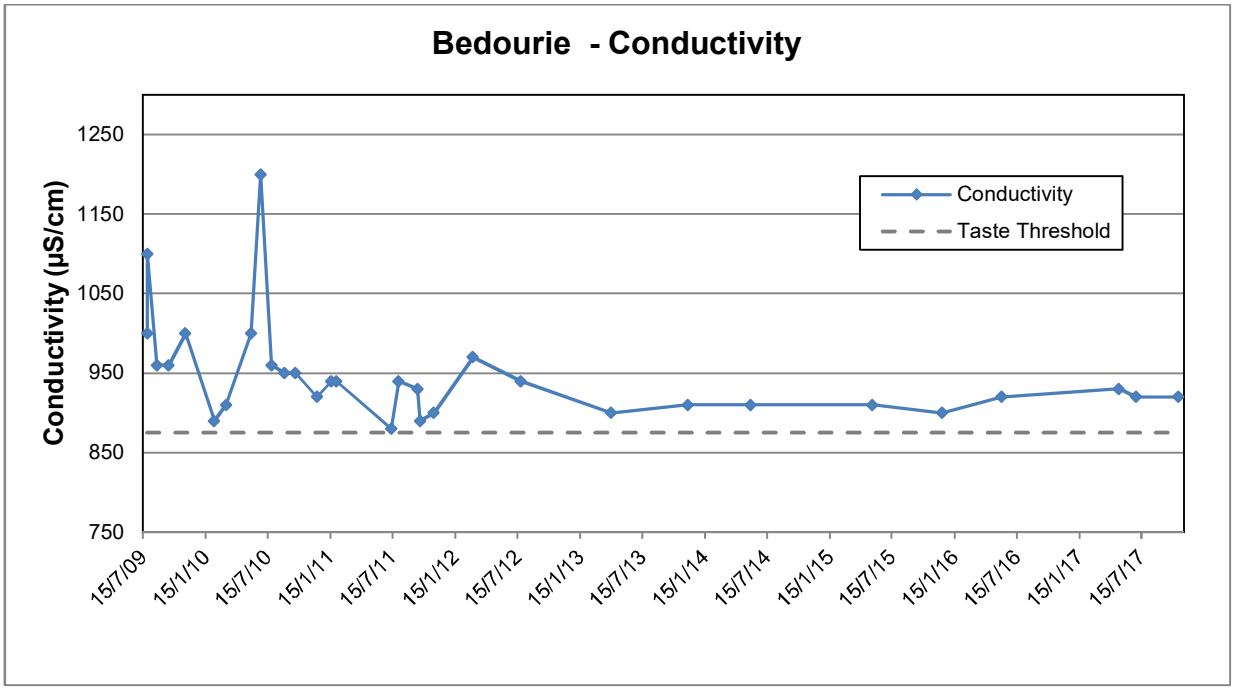
The bore water has low turbidity – not likely to be an issue in relation to water quality.



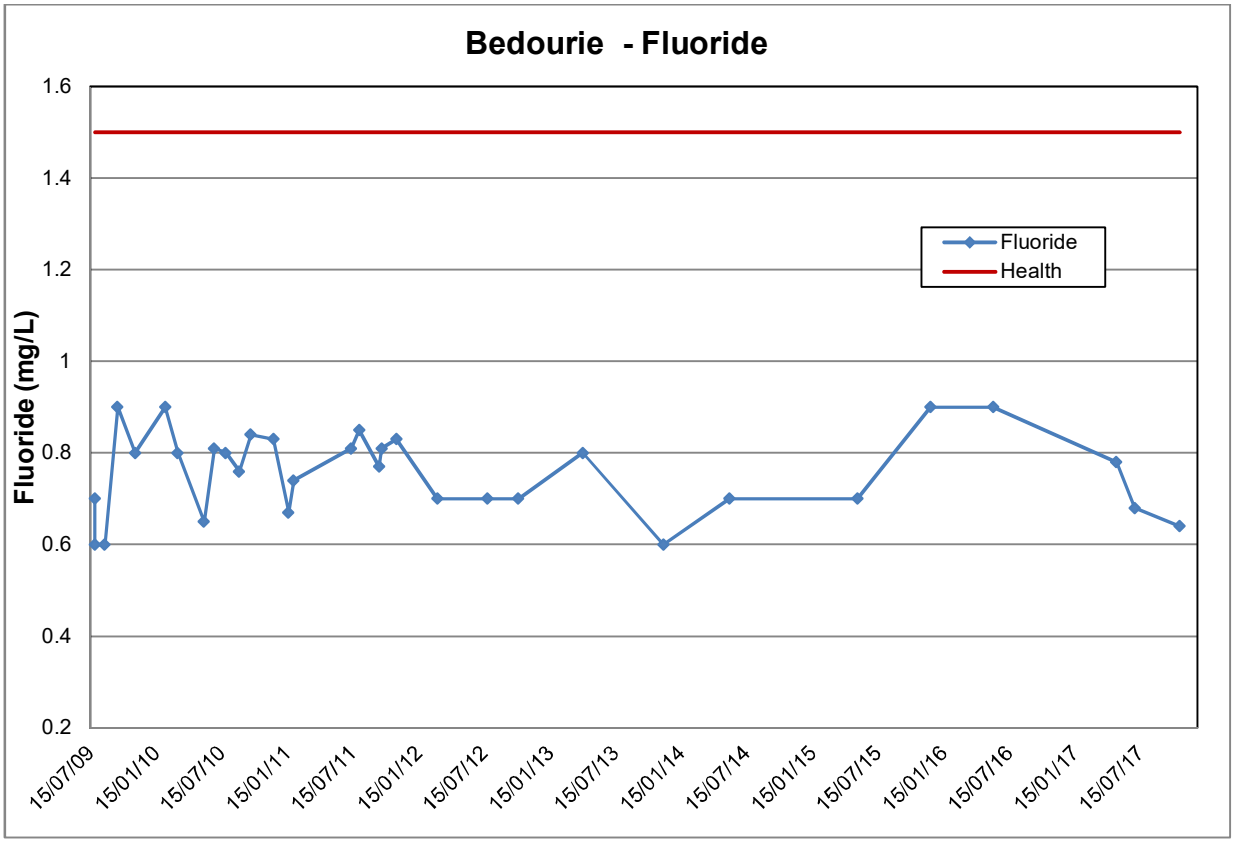
Colour is also excellent.



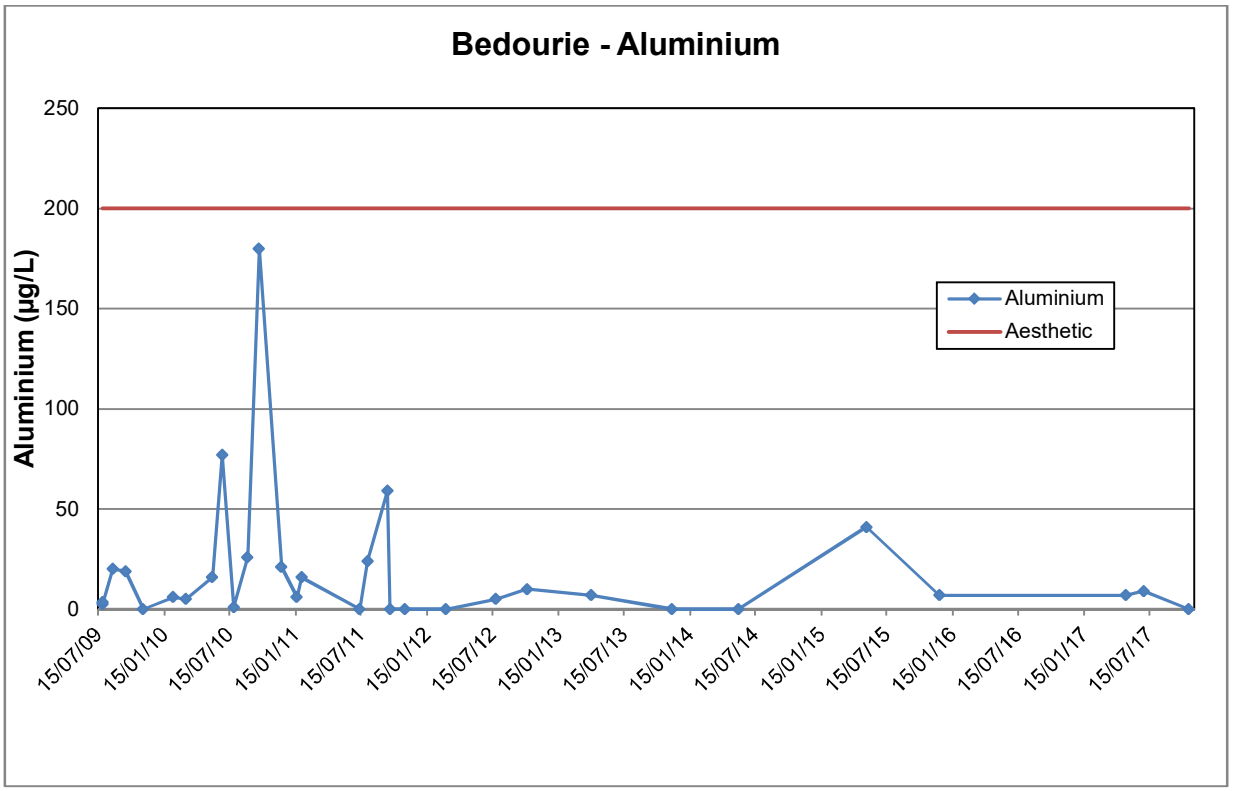
The pH of Bedourie bore water is generally in the range 8 to 8.5 and is regarded as satisfactory. It seems likely that the result of 6.9 was an error or perhaps a contaminated sample.



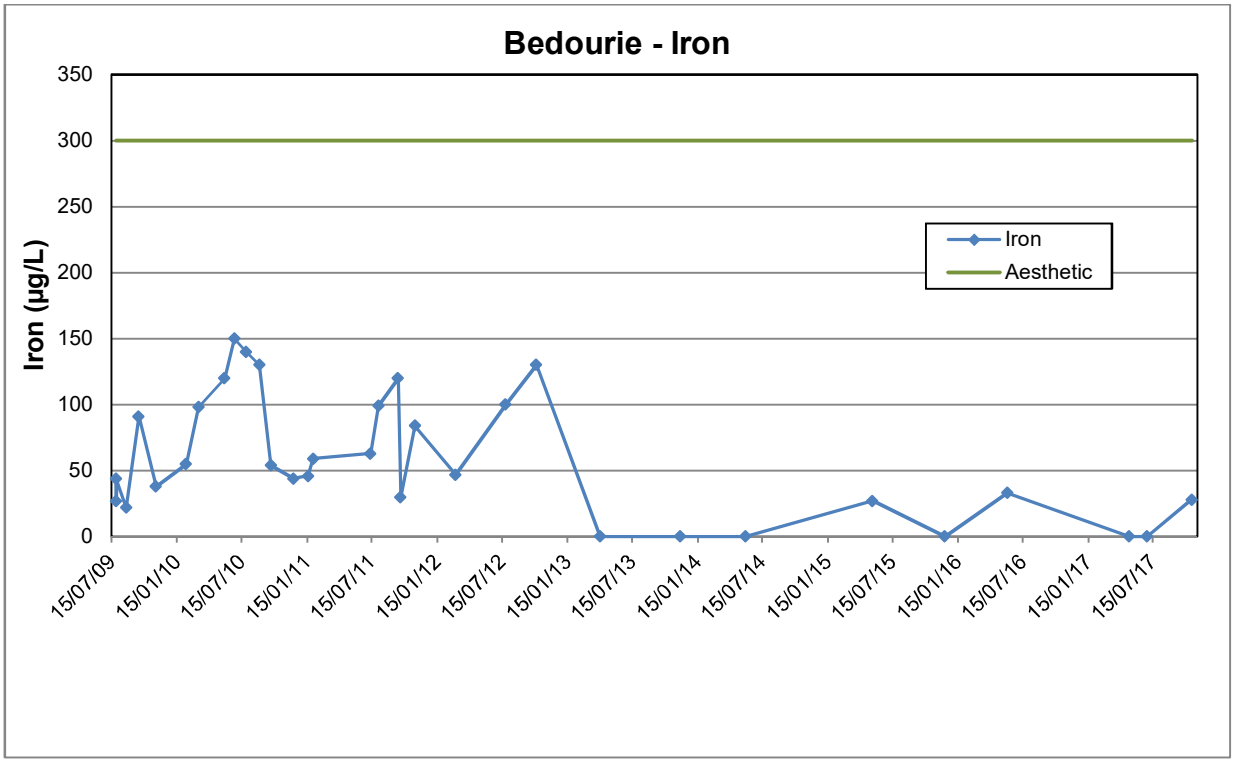
The upper limit of good quality water with regard to salinity is 600 mg/L TDS, which is approximately, equal to 880 µS/cm. The Bedourie water is just outside this range and at the top of the fair range for taste and irrigation purposes.



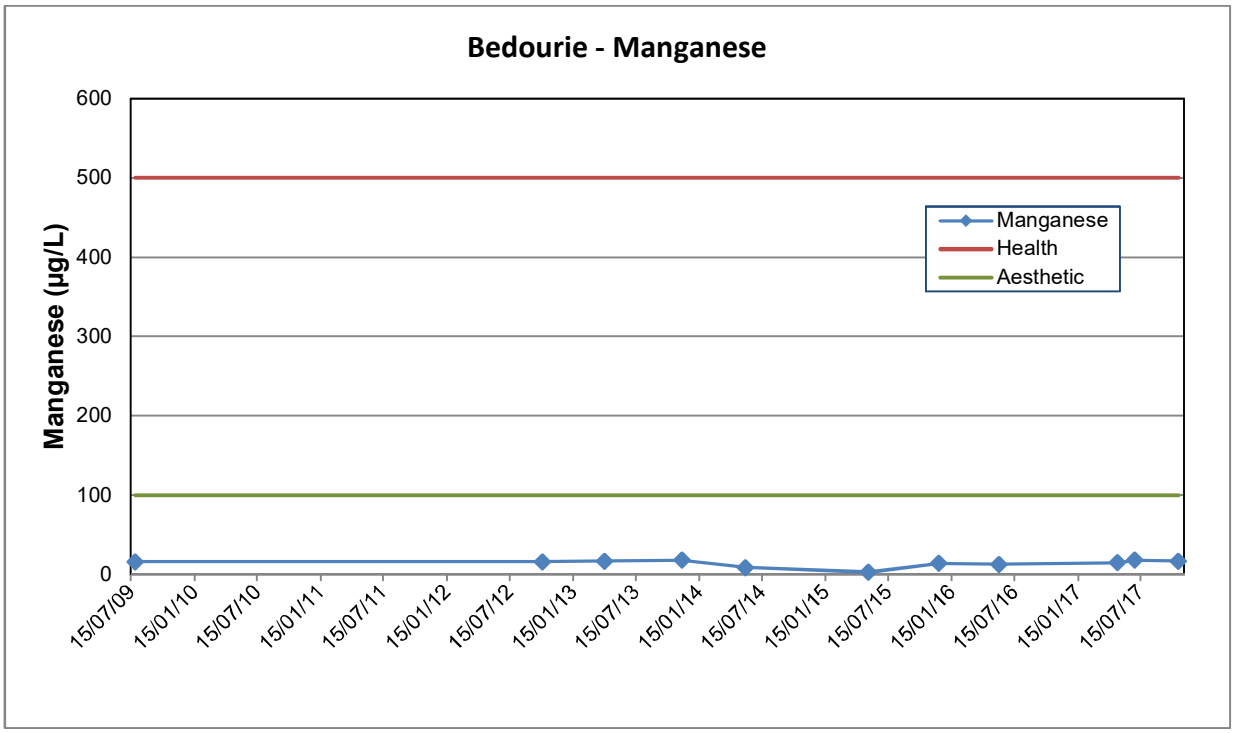
The fluoride level is fairly constant between 0.7 and 0.9 mg/L, averaging 0.76. This is well within the health guideline limit of 1.5 and very close to the recommended dose level of 0.7 mg/L if fluoride dosing were in place.



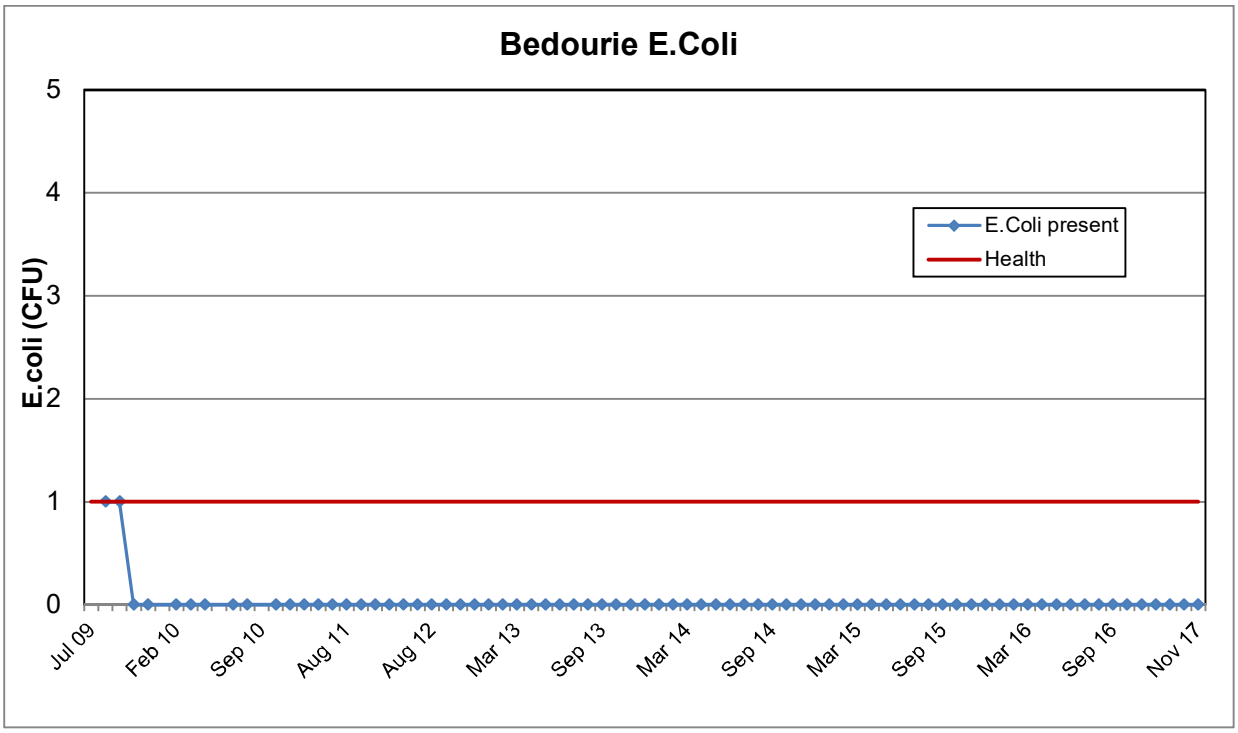
Aluminium is consistently under the aesthetic limit of 0.2 mg/L.



Iron level is well under the aesthetic limit.



Manganese is also well under the aesthetic limit and no dirty water or staining issues would be expected from this water

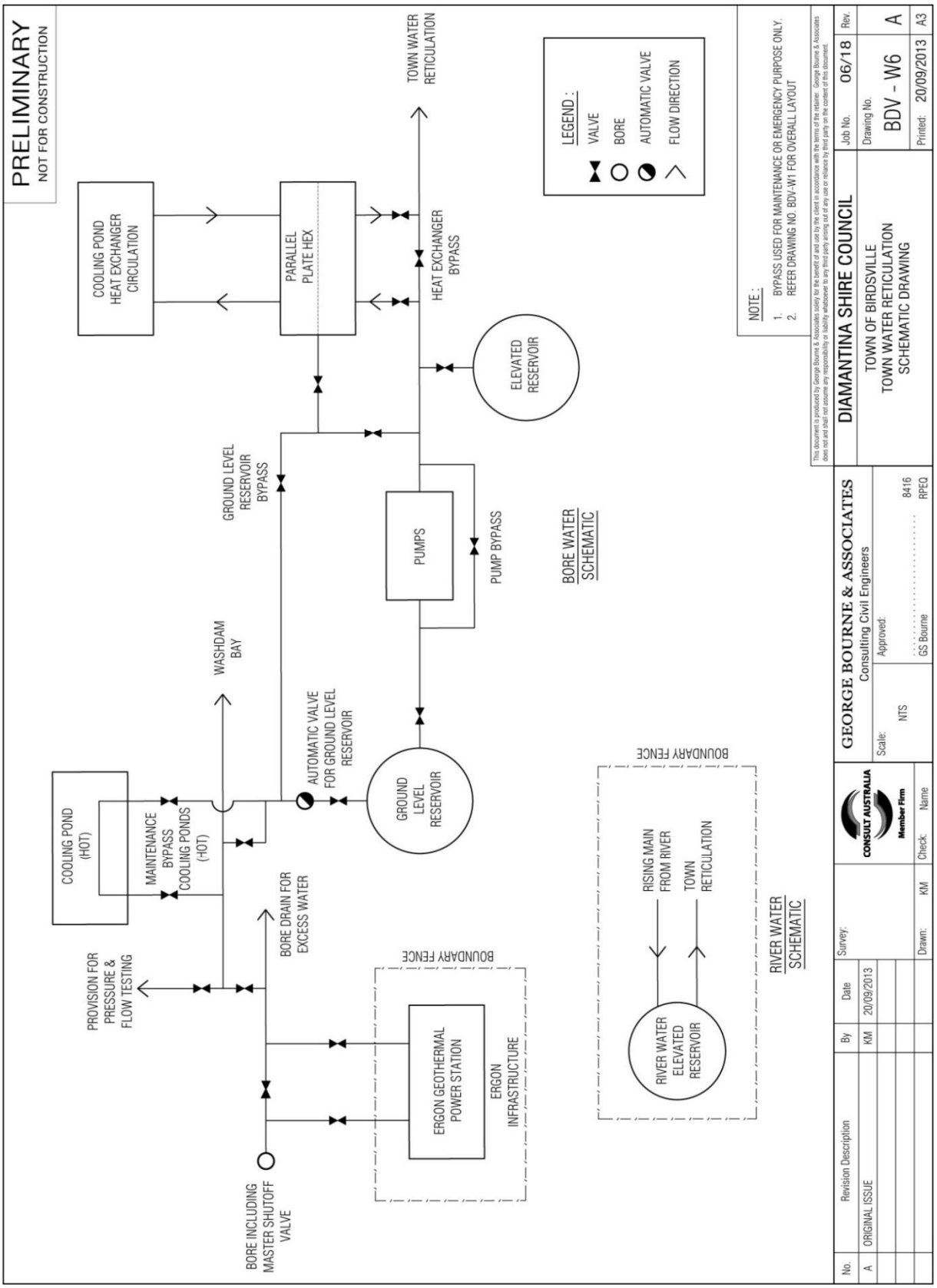


The positive E.coli readings in 2009 were tracked down to contamination during repairs to a reticulation main.

Samples have been clear since then, including the increased sampling of three per month taken since mid 2012.

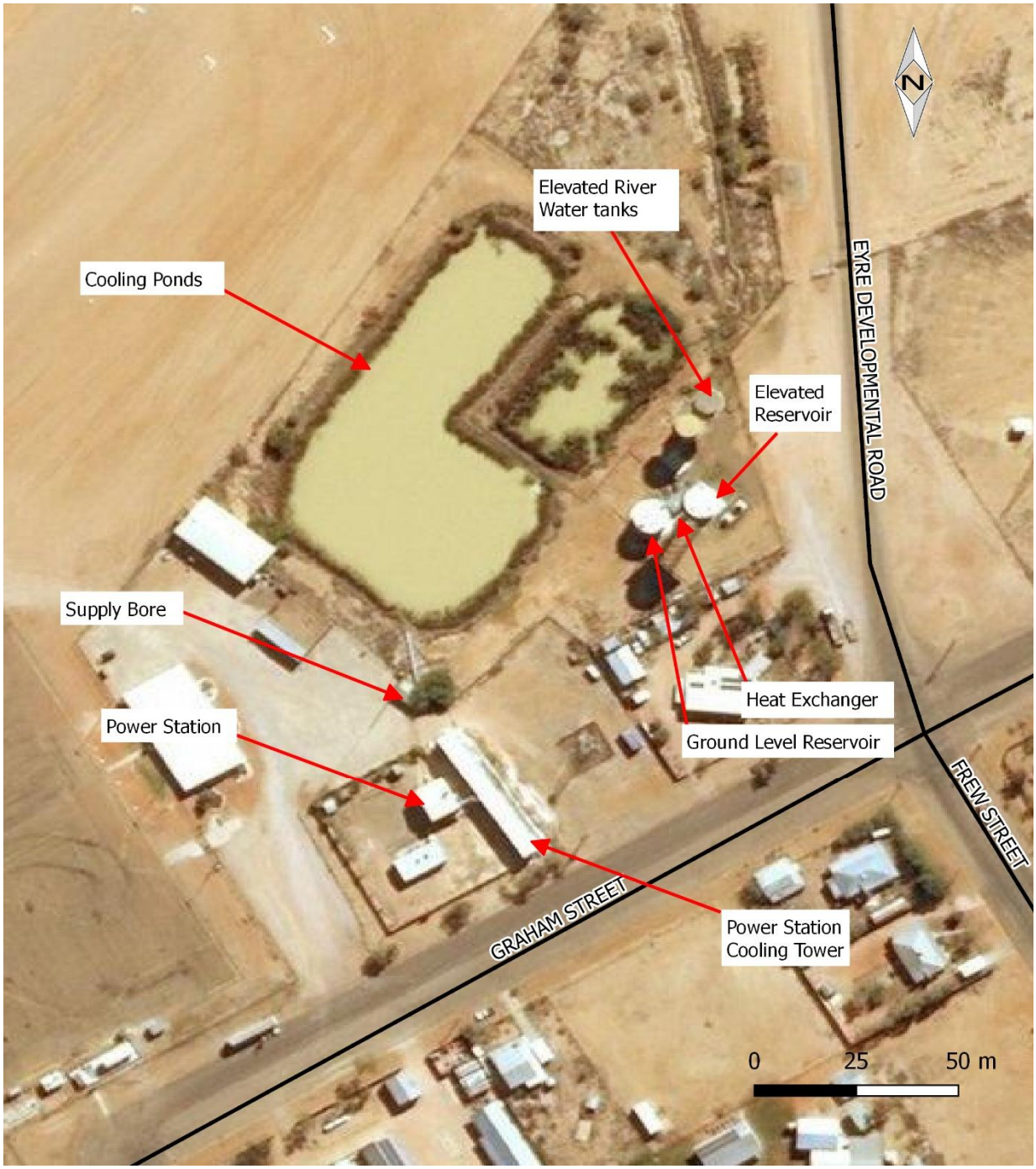
3 Birdsville

3.1 Supply Schematic



3.2 Overall Schematic

3.3 Infrastructure



Birdsville's bore within the fenced compound in the town area. It is not at significant risk from bushfires, flooding or damage by vehicles or machinery.

Birdsville has a dual reticulation system, with untreated river water reticulated throughout the town for irrigation use as well as the potable bore supply. The bore water reticulation scheme was constructed in 1984, supplied from the town bore which was constructed in 1961. The primary issue with this supply is the high temperature (99^{0}C) exiting the bore.

3.3.1 Water Treatment

The bore water quality is of a relatively high quality and generally meets the health and aesthetic guidelines in the ADWG. Total dissolved solids is at the top of the good quality range for taste but no treatment is warranted. Fluoride concentrations exceeding ADWG guidelines are commonly recorded in verification test results, concentrations generally range between 1 and 2.5mg/l. The management of elevated fluoride levels is discussed further in section 6. Risk Management and Improvement Items.

The water comes from a deep aquifer under pressure from 1200m depth to the ground level reservoir. It is sterile at its source and sealed against contamination in the two reservoirs. Thereafter it is pressurised throughout the system and there is no opportunity for contamination in normal operation.

If a section of the reticulation is depressurised for repairs, then flushing of the affected section with chlorine solution is carried out to disinfect the affected section.

In order to control cost and complexity, continuous chlorine disinfection is not provided.

3.4 Infrastructure Details

Birdsville		
Component		**Details**
Source	Name	Birdsville Town Bore
	Type	Artesian RN 14645 Depth 1,220m Allocation 343 ML/a See Appendix for DNRM Bore Card Report
	% of supply	100%
	Reliability	100%
		Closed head pressure 1,200 kPa Unrestricted flow 40 L/s
	Water quality issues	Temperature 99^0C
Source Infrastructure	Type	Cooling ponds
	Description	Bore flows under artesian pressure via power station (when operating) and cooling ponds to ground level reservoir, then pumped through parallel plate heat exchanger to the elevated reservoir
Treatment		Cooling is the only treatment provided
Disinfection		Not provided
Distribution and Reticulation System	**Pipe material**	**Galvanised steel**
	Age range	34 years @2018
	Approx % of total length	3% (105m)
	Pipe material	**uPVC**
	Age range	32 years @2018
	Approx % of total length	30% (1,256m)
	Pipe material	**MDPE**
	Age range	3 years @2018
	Approx % of total length	67% (2,783m)
	Areas where potential long detention periods could be expected	Industrial subdivision
	Areas where low water pressure (eg < 12 m) could be expected during peak or other demand pds)	nil

Reservoirs	**Ground (No)**	1
	Name	**Birdsville GLR**
	Capacity	400 kL
	Roofed (Y/N)	Yes
	Vermin-proof (Y/N)	Yes
	Runoff directed off roof (Y/N)	Yes
	Elevated (No)	1
	Name	**Birdsville Elevated Reservoir**
	Capacity	200 kL
	Roofed (Y/N)	Yes
	Vermin-proof (Y/N)	Yes
	Runoff directed off roof (Y/N)	Yes

3.4.1 Power Station Operation

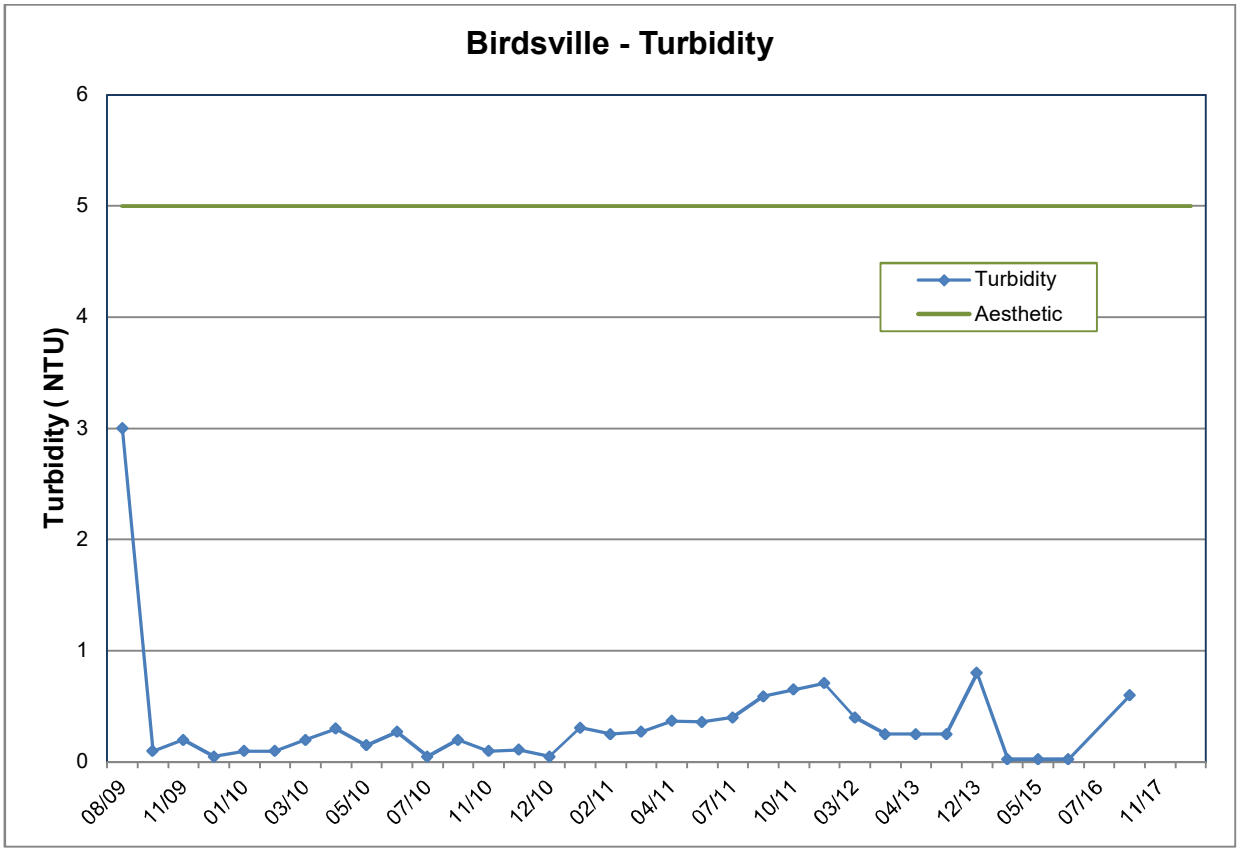
When the power station is in operation the water passes through the Ergon geothermal power station prior to entering the town cooling and storage systems. Supply to the power station is controlled by manual valves at the borehead. The borehead valves to the power station are in the council's fenced area and are under council control. In situations where the water supply to the power station is not required, for maintenance or emergency works Ergon is required to advise DSC to shutoff or actuate the valves.

3.5 Birdsville Drinking Water Quality Results 2009 – 2017

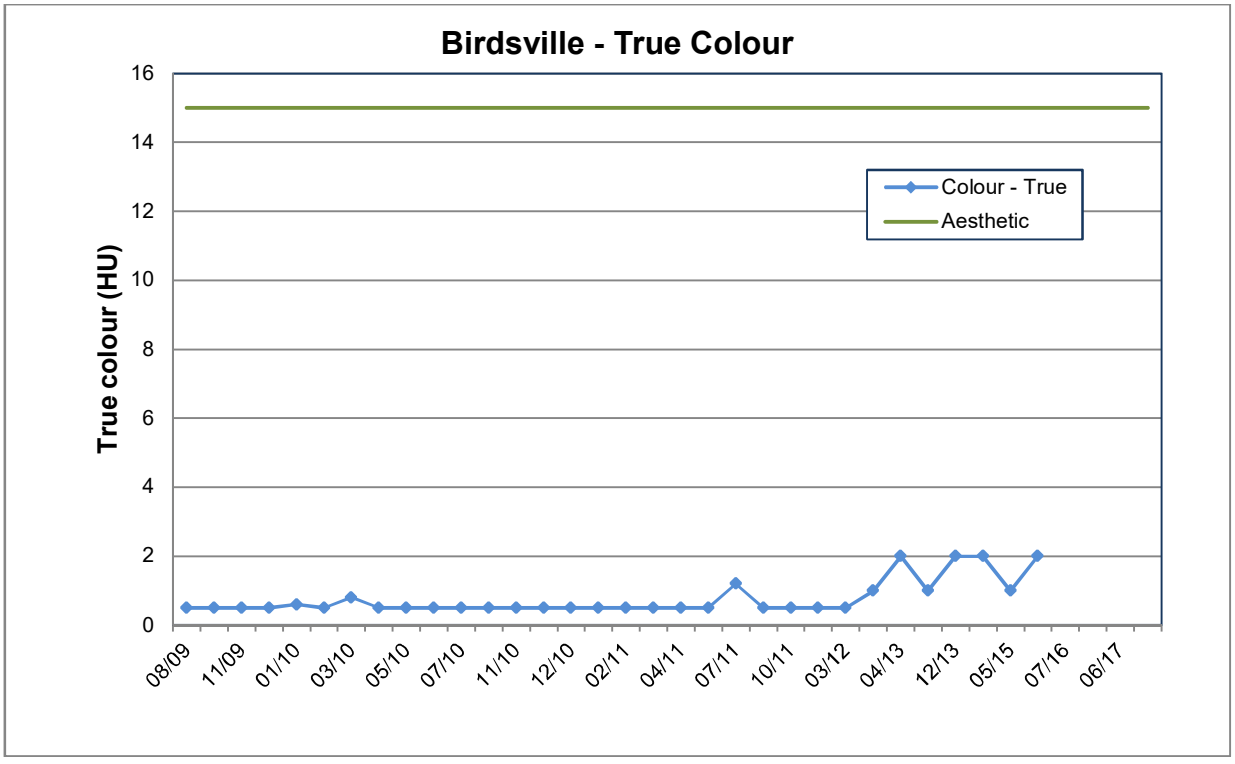
Birdsville Water Supply										
Start date: 28/08/2009 End Date: 09/12/2017										
Analyte	Scheme Component	Units	Sampling Frequency	Summary of Results						
				Number of Samples	Maximum Value	Average Value	Minimum Value	Std Dev	95th Percentile	Exceedances
E. coli	Distribution	CFU/100ml	Monthly	81	1	0.025	0	0.000	0	2
Turbidity	Source	NTU	Biannually	33	3	0.349	0.025	0.511	0.746	0
True Colour	Source	HU	Biannually	32	2	0.769	0.5	0.501	2	0
pH	Source	pH	Biannually	35	8.7	8.057	7.7	0.242	8.6	3
Conductivity	Source	µS/cm	Biannually	35	1000	839.143	750	48.778	943	0
TDS	Source	mg/L	Biannually	8	660	513.625	480	57.398	614.15	0
Total Hardness	Source	Mg CaCO3/L	Biannually	6	7.6	3.600	2.5	1.871	6.7	0
Residual Alkalinity	Source	mg/L	Biannually	5	50	15.620	6.9	17.191	41.46	0
Chloride	Source	mg/L	Biannually	8	65	55.250	49	4.815	63.25	0
Fluoride	Source	mg/L	Biannually	36	2.5	1.703	0.6	0.423	2.225	22
Calcium	Source	Mg/L	Biannually	6	4	2.967	0.5	1.350	4	0
Sodium	Source	mg/L	Biannually	6	190	180	150	14.142	190	0
Potassium	Source	mg/L	Biannually	6	5.9	5.550	5.1	0.263	5.875	0
Magnesium	Source	mg/L	Biannually	6	0.5	0.125	0.05	0.168	0.3875	0
Aluminium	Source	µg/L	Biannually	34	210	51.147	18	32.716	84.4	0
Iron	Source	µg/L	Biannually	35	230	47.814	2.5	38.474	91.1	0
Manganese	Source	µg/L	Biannually	35	36	17.743	3	6.217	27.1	0
Boron	Source	µg/L	Biannually	7	560	530	490	23.905	557	0
Copper	Source	µg/L	Biannually	7	580	191.714	1	214.656	532	0
Zinc	Source	µg/L	Biannually	8	150	28.063	2	46.691	105.2	0
Sulphate	Source	mg/L	Biannually	8	2	0.925	0.5	0.502	1.72	0
Nitrate	Source	mg/L	Biannually	6	0.67	0.435	0.1	0.171	0.63	0

Aesthetic Guideline Exceedance
Health Guideline Exceedance

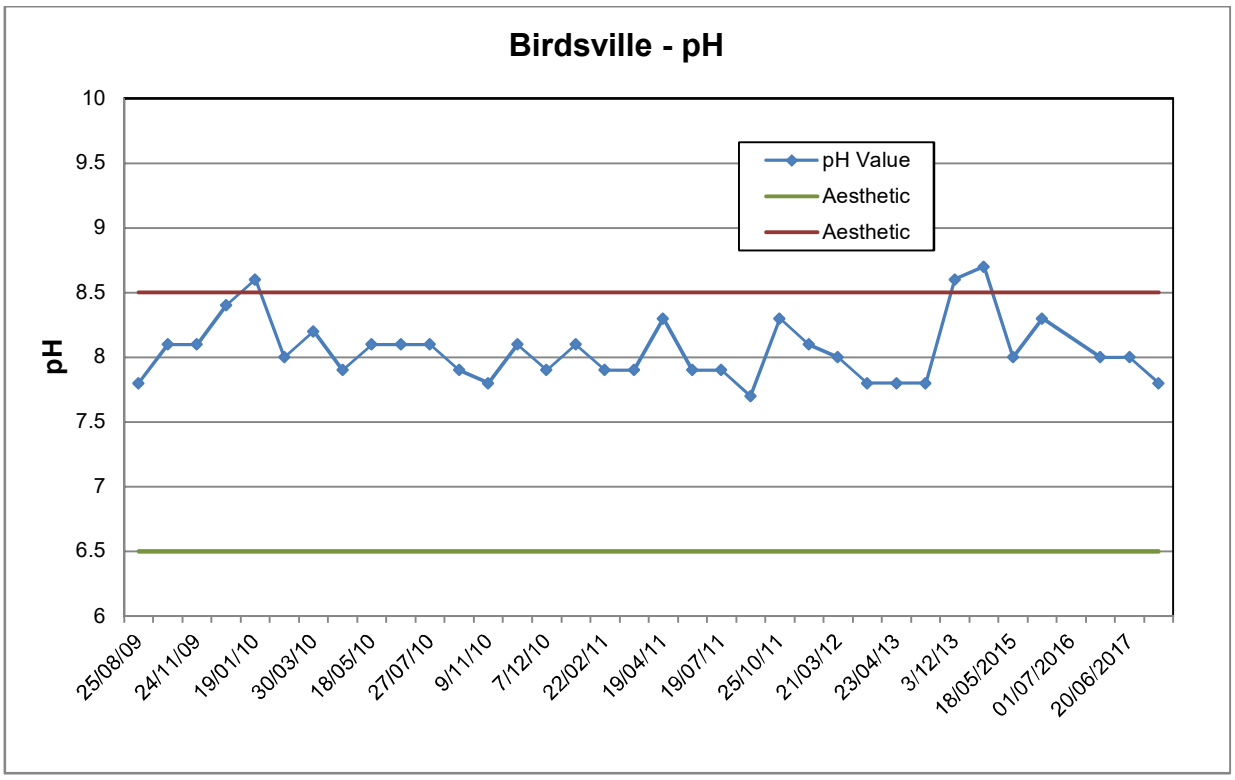
3.6 Water Quality Graphs



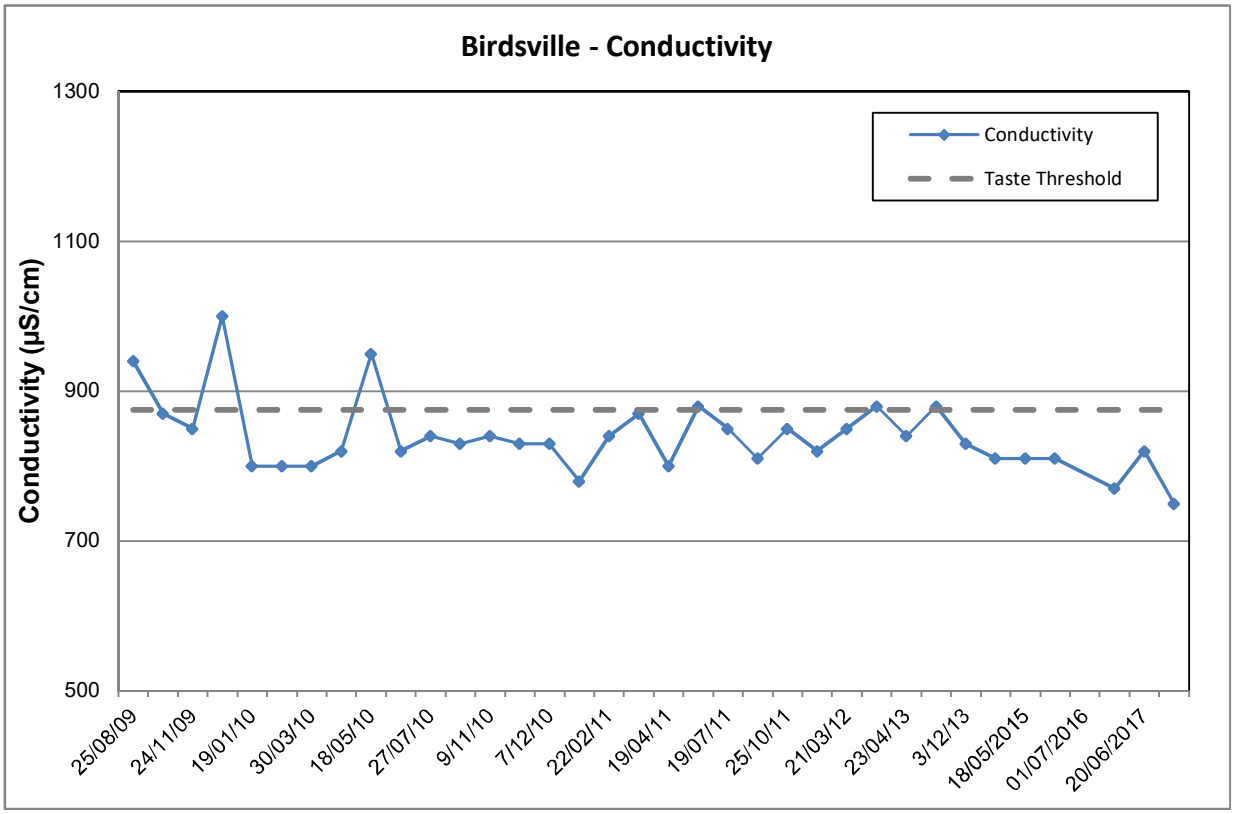
Tests show turbidity consistently less than 1 NTU – within guideline limits.



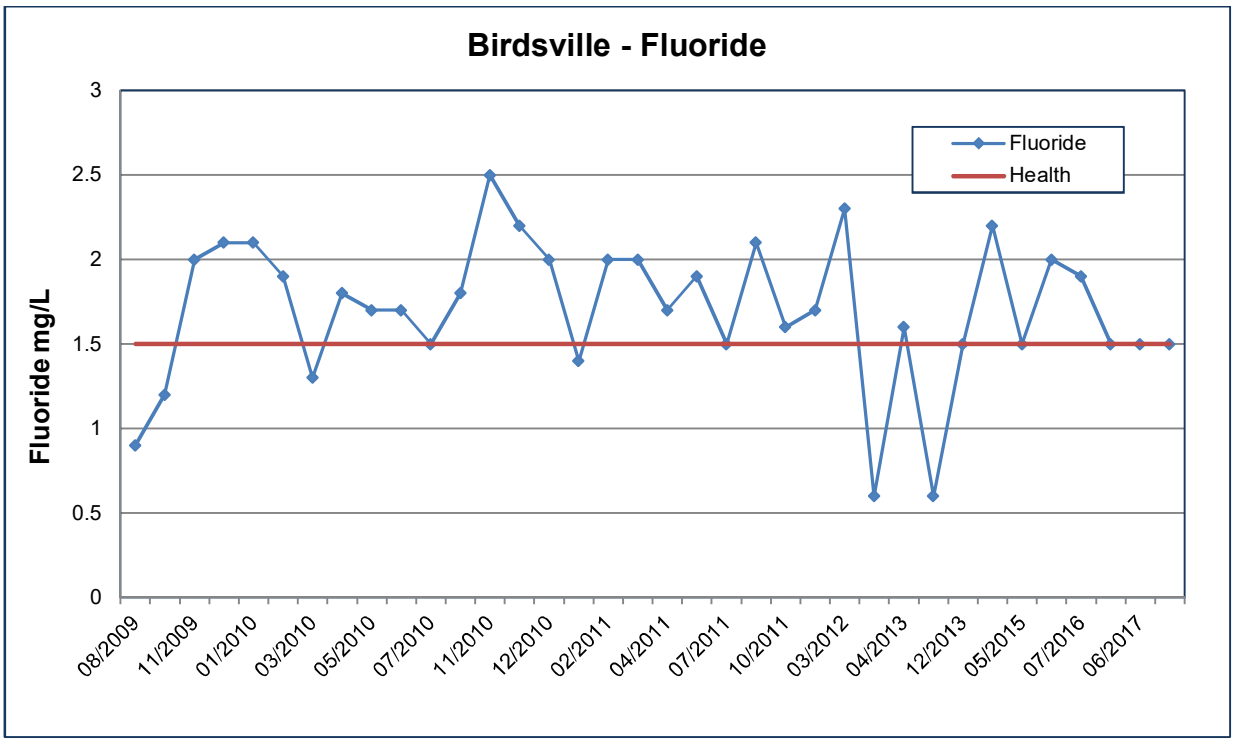
Colour averages well under 1 Hazen Unit, well within the guidelines.



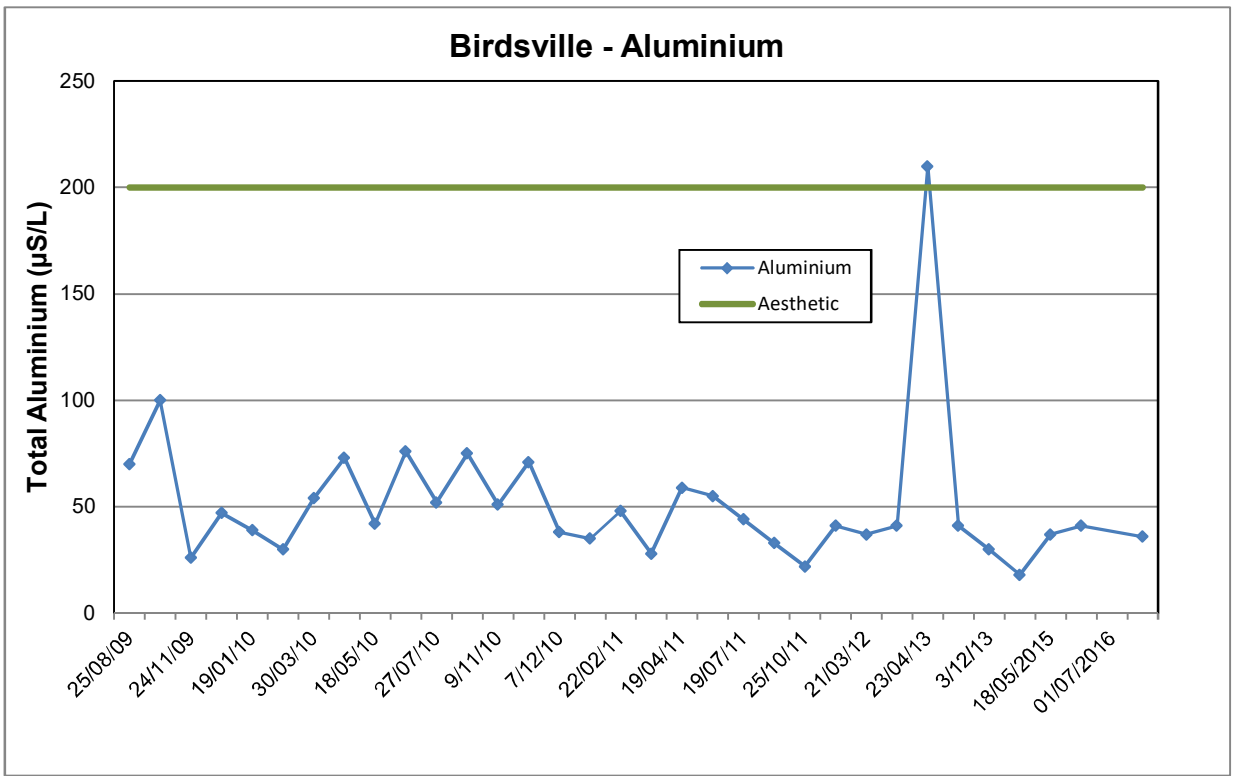
pH varies from 8.7 to 7.7. These slightly elevated pH values may have the potential to cause scaling of pipes and fittings; however values in this range should not cause aggressive scaling to occur.



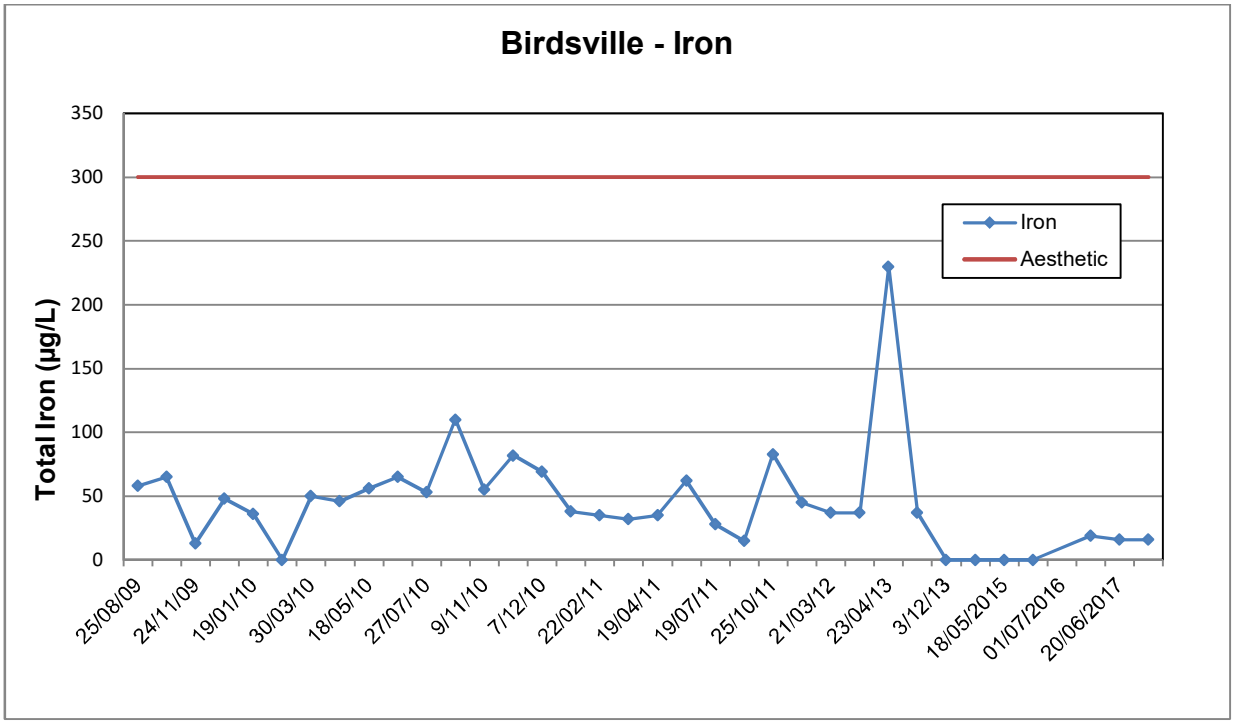
Assuming TDS of 0.685 times the conductivity, Birdsville water is on the borderline between good and fair salinity quality. There may be some issues with taste and irrigation use but certainly no health issues in this regard.

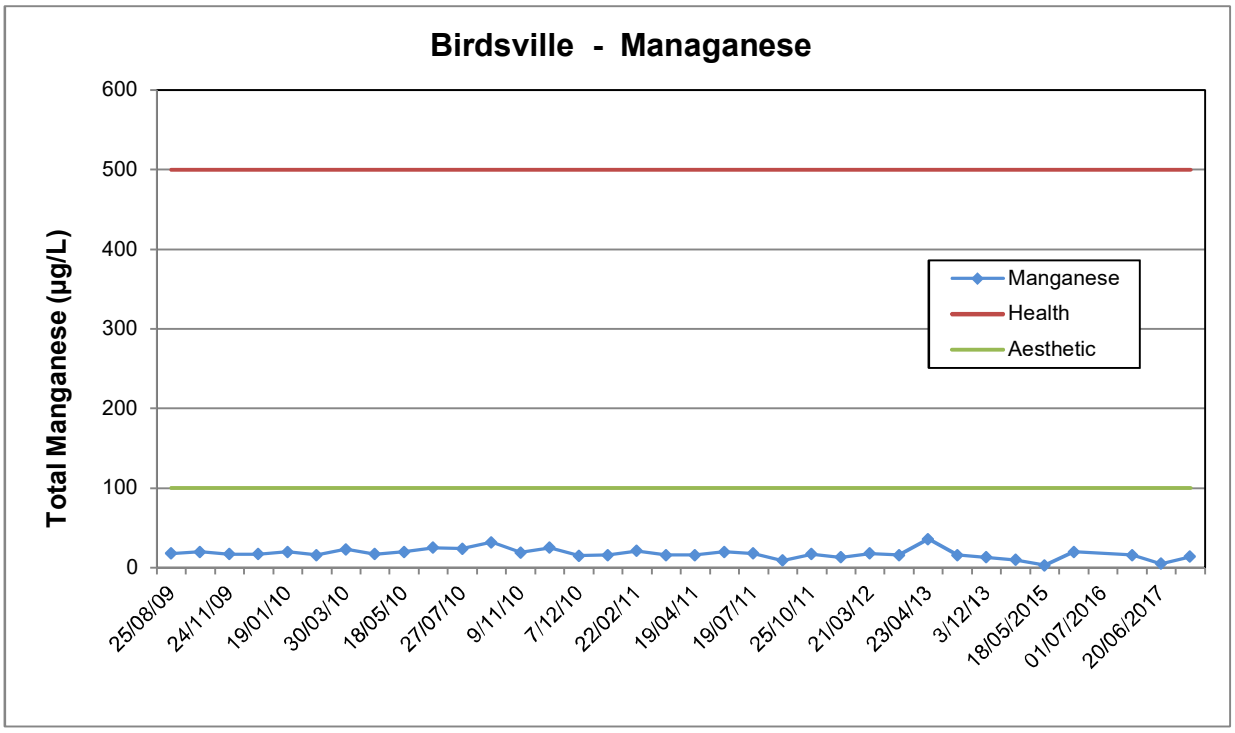


The fluoride level is generally above the guideline health level of 1.5 mg/L and averages 1.703mg/L. The fluoride issue is discussed in the risk management section. The fluoride fact sheet from the Australian Drinking Water Guidelines 2011 is attached in Appendix B for information.

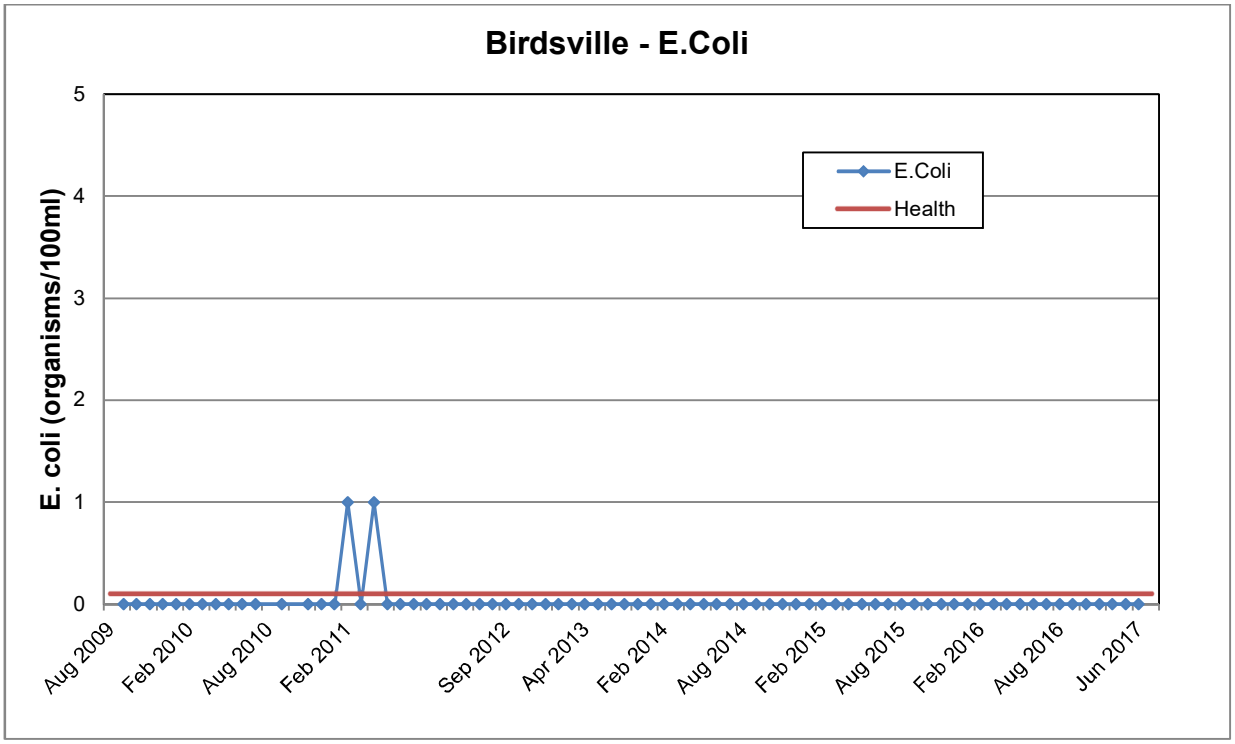


The aluminium values are generally well within the aesthetic guideline limit. An outlying value of 210µgl was identified April 2013, it is likely that this spike is due to maintenance works occurring on the reservoir at the time, including the replacement of the roof and cleaning of the reservoir.





Iron and manganese are well within the aesthetic limits – there should be no dirty water or staining problems with this water. An outlying value of 230µgl for iron was identified April 2013 it is likely that this spike is due to maintenance works occurring on the reservoir at the time, including the replacement of the roof and cleaning of the reservoir.



The positive E.coli readings in early 2011 were associated with failure of the reservoir roof. It had rusted badly and was allowing access for birds and possibly small animals. The roof was replaced and is now vermin-proof. No E.coli has been detected since.

Since Council obtained colilert equipment to do their own testing, Council has been testing three samples per month, with a check sample sent to an external lab every six months.

3.7 Water Quality Complaints

There is currently only an informal complaint recording system in place due to the low number of complaints and the small size of the population. Generally everyone in town knows they can talk directly to the plumber or town foreman responsible if they see a leak or similar.

In 2012, Council had two written complaints from Birdsville regarding water aesthetics (smell). Council had been repainting both bore water reservoirs as there were signs of rust starting. The complaints were that the water was foul smelling. When the reservoirs are in use the sulphur is aerated in the tanks and the sulphur smell leaves the water. However, as the water was running directly to town there was no opportunity to get rid of the smell. None the less Council issued a public notice regarding the water and additional testing was done which proved the water was safe.

In 2017, council had two written complaints from Birdsville regarding water turbidity. The complaints were that the tap water looked dirty. This was due to the fact that during the Birdsville races, fire trucks were removing large quantities of water from reticulation at a high flow rate. This stirred up the sediment in the system and caused it to become turbid. Since the water was in reticulation, there was no opportunity to rectify this issue.

Apart from these two occurrences there is no recollection of any previous complaints.

4 Risk Assessment

Because the two supply schemes are very similar and they are generally operated by the same people, a combined risk assessment workshop was conducted for the two. The methodology detailed in the departmental guideline was used with the definitions listed in the following tables.

4.1 Risk Classification

Likelihood	Descriptors
Almost certain	Likely to occur at least once a month or for a month per year
Likely	Likely to occur several times a year
Possible	Unlikely, but could happen once a year
Unlikely	Unlikely but may happen every 5 to 10 years and may require a combination of factors
Rare	May occur in exceptional circumstances, say 50 to 100 years

Consequence	Descriptors
Insignificant	Negligible injury or health effects, isolated complaints related to aesthetic parameters
Minor	Isolated exceedance of chronic health parameter, widespread aesthetic impact
Moderate	Potential acute health impact or potential chronic health impact
Major	Acute health impact, no declared outbreak expected
Catastrophic	One or more fatalities or large number of hospitalisations

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium-11	High-16	High-20	Extreme-23	Extreme-25
Likely	Medium-7	Medium-12	High-17	High-21	Extreme-24
Possible	Low-4	Medium-8	Medium-13	High-18	Extreme-22
Unlikely	Low-2	Low-5	Medium-9	Medium-14	High-19
Rare	Low-1	Low-3	Medium-6	Medium-10	High-15

4.2 Uncertainty

Level of Uncertainty	Definition
Certain	There is 5 years of continuous monitoring data, which has been trended and assessed, with at least daily monitoring; or The processes involved are thoroughly understood.
Confident	There is 5 years of continuous monitoring data, which has been collated and assessed, with at least weekly monitoring or for the duration of seasonal events; or There is a good understanding of the processes involved.
Reliable	There is at least a year of continuous monitoring data available, which has been assessed; or There is reasonable understanding of the processes involved.
Estimate	There is limited monitoring data available; or There is limited understanding of the processes involved.
Uncertain	There is limited or no monitoring data available; or The processes are not well understood.

4.3 Acceptable Risk Level

The acceptable risk level in relation to public health depends very much on the Likelihood and Consequence descriptors used for the assessment.

For the criteria used in Diamantina Shire a reasonable rule of thumb for acceptable risk would be “medium” or less.

However the decision on taking action to reduce a risk depends on two factors:

- the magnitude of the risk, and
- the cost/difficulty of action to reduce the risk.

Thus there will be cases when it is sensible to reduce a “Low” risk and others when it may not be practical to reduce a “Medium” or “High” risk.

4.4 Risk Assessment

Water Source

Risk No.	Hazardous Event	Hazard type	Likelihood	Consequence	Risk Level Before Control	Risk Description	Control Measures	Likelihood	Consequence	Risk Level after control	Uncertainty	Comments	Imp Plan Ref
1	Bore contamination from surface water	Bacteria	Rare	Moderate	Medium-6		Deep flowing bores always under positive pressure at the surface	Rare	Moderate	Medium-6	Confident	ALARP – **extremely** rare	
2	Water goes through power station before return to Council	Bacteria	Unlikely	Moderate	Medium-9	Bacterial contamination	Sealed system under pressure, water remains above 80^{0}C. Risk Assessment Workshop identified controls, such as plant shutdown after isopentane leaks	Rare	Moderate	Medium-6	Uncertain	Risk assessment workshop held with Ergon Energy, identifying risks and associated responses.	
3		Isopentane	Possible	Minor	Medium-8	Chemical contamination	Isolation valves prior to power plant Sealed system under pressure	Rare	Minor	Low-3	Uncertain		
4	Working on finished water pumps, heat exchanger	Bacteria	Possible	Moderate	Medium-13	(Birdsville only) Bacterial contamination	Always undertaken by one plumbing contractor Staff to exercise correct hygiene practices. SWIM Document identified safe working methods for implementing hygienic work practices Check for vermin prior to assembly of pumps, pipes and fittings.	Unlikely	Moderate	Medium-9	Reliable	Staff to be trained in good hygiene practices. Incorporate into work method statement.	
5	Long term power supply failure	Loss of supply	Unlikely	Minor	Low-5	(Birdsville only) Loss of water supply	Elevated storage reservoirs (3 days' supply) Bore pressure could be used to deliver to elevated tank in extreme circumstances	Rare	Insignificant	Low-1	Estimate	Bedourie system does not require power	
6	Bore failure	Loss of supply	Rare	Moderate	Medium-6	Dependent on single bore	Periodic (5 years) reassessment (CCTV, tools) of bores. Investigation conducted for alternative water sources and bore removal	Rare	Minor	Low-3	Reliable	Health effect could be controlled by trucking in water - main impact is financial. Birdsville could use alternative non-potable source. Council has committed to the construction of a new bore in Bedourie within the next 3 or 4 years.	S1
7	Supply of water above safe temperature	High temperature	Almost certain	Moderate	High-20	Birdsville bore temperature 99^{0}C	Cooling ponds, heat exchanger, and dual reservoir storage – bypass valves can only be operated by Council operators	Rare	Minor	Low-3	Reliable	As low as reasonably practical. Bedourie at 45^{0}C is not dangerous	

Risk No.	Hazardous Event	Hazard type	Likelihood	Consequence	Risk Level Before Control	Risk Description	Control Measures	Likelihood	Consequence	Risk Level after control	Uncertainty	Comments	Imp Plan Ref
8	Poor cooling pond water quality entering heat exchanger Birdsville	High temperature	Likely	Minor	Medium-12	Vegetation in pond clogging parallel plates in heat exchanger.	Coarse filter at intake from pond Inline filter to heat exchanger Cooling pond and reservoir storage to cool water	Likely	Minor	Medium - 12	Reliable	Cool water pond to be lined with HDPE liner to eliminate vegetation growth.	S2
9	Heating of water in exposed pipe Birdsville		Likely	Minor	Medium-12	Pipe between Cooling pond and GLR exposed to sunlight	None	Likely	Minor	Medium-12	Confident	Pipe between cooling pond and GLR to be insulted	S3
10	Birdsville bore water fluoride concentration above ADWG health threshold values	Fluoride	Likely	Minor	Medium - 12	Natural fluoride level averages 1.7mg/L	Currently only limited public awareness Distribution of Fluoride Facts Sheets to the public that identifies health risks and avoiding dental fluorosis Ongoing Monitoring of fluoride levels	Likely	Minor	Medium - 12	Confident	Treatment to reduce fluoride level is not financially feasible. Only 12% above ADWG value, potential chronic effect – would not affect visitors. Provide public information as suggested by ADWG, eg “The guideline value of 1.5 mg/L has been set to protect children from the risk of dental fluorosis. If this value is exceeded in circumstances where it is not practical to defluoridate, then parents should be advised to use rainwater or bottled water for children up to about 6 years to limit or prevent dental fluorosis.”	S4
11	Vehicular Damage to Bedourie Bore	Damage to Bore	Rare	Moderate	Medium-6	Vehicular Damage	Fenced enclosure and gates protect bore. Risk assessment conducted	Rare	Minor	Low-3	Reliable		
12	Pipe breakage in cooling pond	Bacteria, protozoa	Unlikely	Moderate	Medium-9	Pond water could enter town water manifold during shut-down for repair	SWMS developed identifying connect maintenance procedures New copper pipe cooling system installed	Rare	Moderate	Medium-6	Estimate		

Distribution System

Risk No.	Hazardous Event	Hazard type	Likelihood	Consequence	Risk Level Before Control	Risk Description	Control Measures	Likelihood	Consequence	Risk Level after control	Uncertainty	Comments	Imp Plan Ref
13	Repairs to reticulation water mains	Bacteria	Likely	Moderate	High-17	Contamination at work site	Always undertaken by the one licenced plumbing contractor, familiar with requirements	Unlikely	Moderate	Medium-9	Estimate	SWIM identifies flushing and hygienic work practices	
		Turbidity	Likely	Insignificant	Medium-7		SWIM Document identifies safe work methods for implementing hygienic work practices and flushing method for contaminated areas	Unlikely	Insignificant	Low-2	Estimate		
14	Repairs to reticulation water mains	Bacteria	Unlikely	Moderate	Medium-9	Backflow	Water services have non-return valve fitted. Flushing of the repaired water main is carried out	Rare	Moderate	Medium-6	Reliable	Develop work method statement SWIM identifies flushing and hygiene practices	
15	Reticulation water main detention times	Bacteria	Possible	Moderate	Medium-13	Bacterial contamination	Flushing water mains that have long detention times based on bacteriological test results.	Unlikely	Moderate	Medium-9	Reliable	Compact retic systems, long main to Birdsville racecourse flushed before event	
16	Commissioning new water mains	Bacteria	Possible	Moderate	Medium-13	Bacterial contamination	Disinfection procedure in contract specification Supervised by site inspector	Unlikely	Moderate	Medium-9	Confident	SWIM identifies flushing and hygiene practices	
17	Lack of or failure of backflow prevention devices in reticulation system	Bacteria	Possible	Moderate	Medium-13	Contamination of potable water supply	Positive pressure in reticulation system. New, small systems - shut-downs are rare. Water services have non-return valve fitted	Unlikely	Moderate	Medium-9	Reliable		
18	Illegal access to mains water supply	Bacteria	Rare	Moderate	Medium-6	Contamination of potable water supply	Both are small towns where activities would be noticed	Rare	Moderate	Medium-6	Estimate	As low as reasonably practical	
19	Illegal access to finished water storage reservoirs	Bacteria	Unlikely	Moderate	Medium-9	Contamination of potable water supply	Security fences and locked gates	Rare	Moderate	Medium-6	Estimate	Establish inspection schedule and recording system	
20	Reservoir contamination	Bacteria	Unlikely	Moderate	Medium-9	Contamination of potable water supply	New roof recently installed on Birdsville GLR, reservoirs are now vermin-proof. Ongoing inspections	Rare	Moderate	Medium-6	Confident		

Risk No.	Hazardous Event	Hazard type	Likelihood	Consequence	Risk Level Before Control	Risk Description	Control Measures	Likelihood	Consequence	Risk Level after control	Uncertainty	Comments	Imp Plan Ref
21	Ingress of contamination from cross-connection to untreated river water	Bacteria	Possible	Moderate	Medium-13	Birdsville only - dual reticulation	River water pipes colour coded purple, operate at lower pressure. Both clearly marked and include non-return valves at each property service point. River water has high turbidity. All maintenance done by one contractor familiar with system. Turbidity readings done monthly alongside Bacteriological sampling	Unlikely	Moderate	Medium-9	Reliable		
22	Dependence on single Contract plumber	Bacteria	Possible	Moderate	Medium-13	Contractor may not be fully aware of risks and controls	Council engineer has knowledge of system and associated risks Up to date system drawings maintained for the scheme.	Unlikely	Moderate	Medium-9	Reliable		
23	Maintaining skills and training	Various	Unlikely	Minor	Low-5	Skills possibly not readily available in remote area	Council has training matrix, Council can use alternative plumbers if necessary	Unlikely	Insignificant	Low-2	Estimate		
24	Water network drawings are not up to date	Loss of supply	Possible	Insignificant	Low-4	Prolonged repair time	Current contractor has good knowledge of system Drawing updated on Oct 17 Regular updates now occurring in response to upgrades/changes	Unlikely	Insignificant	Low-2	Estimate	As constructed drawings in place with updates occurring as required	

5 Risk Management Improvement Program

5.1 Improvement Items

Ref	Hazard/ Hazardous Event	Actions	Priority	Target Date	Estimated Cost	Responsibility
S1	Loss of supply due to bore failure	In 2017, council has committed to the construction of a new bore in Bedourie within the next 3 or 4 years.	medium	19-Feb-21	5,000	CEO
S2	Cool water pond water quality	Clean pond of vegetation and line.	High	30-Jun-18	20,000	CEO
S3	Heating of water in exposed pipe Birdsville	Pipe between cooling pond and GLR to be insulted	High	20 Dec 18	5,000	CEO
S4	Birdsville bore water fluoride concentration above guideline limit	Provide public information as suggested by ADWG, eg “The guideline value of 1.5 mg/L has been set to protect children from the risk of dental fluorosis. If this value is exceeded in circumstances where it is not practical to defluoridate, then parents should be advised to use rainwater or bottled water for children up to about 6 years to limit or prevent dental fluorosis.”	high	30-Jun-14	5,000	CEO

Abbreviation	**Position**
CEO	Council Chief Executive Officer
Eng	Council Engineer

5.2 Birdsville and Bedourie Operation and Maintenance Documentation

Document	Documented procedure	Version date	Process for maintaining	Process for implementing the procedure (Activity and Frequency)
SWIM Document	Procedure for Mains repair	April 2013	Yearly Revisions Updates as required	DWQMP Operating Plan
	Procedure for new water service	April 2013		DWQMP Operating Plan
	Procedure for Sampling Water Quality	October 2017	Yearly Revisions Updates as required	DWQMP Operating Plan Drinking Water Monitoring Schedule
Fluoride Fact Sheet	Operational procedures for risk	Endorsed 1996	Updates as required	Fluoride Fact Sheet
Diamantina Network Drawings	'As constructed' Schematic Drawings available	October 2017	Updates as required	Diamantina Network Drawings
Risk Assessment Workshop: Birdsville ORC Geothermal Power Station	Operational procedures of power plant & drinking water supply	April 2015	Yearly Revisions Updates as required	DWQMP Operating Plan
Options Assessment Bedourie Bore	Procedure for managing bore failure	September 2015	Updates as required	Council Meetings, Action approved

6 Monitoring

6.1 Bedourie and Birdsville Operational Monitoring

In the Bedourie and Birdsville supply schemes the water is delivered from the bores with stable and suitable water quality and free of pathogens. Council's operational efforts are directed to ensuring that water quality is maintained throughout the system and that no contamination occurs in the supply system or distribution system.
The table below identifies the operational monitoring program for the supply schemes of the provider.

6.1.1 Bedourie and Birdsville Operational Monitoring Table

Site	Location	Monitoring Frequency	Parameter	Target value	ADWG Health Guideline	Positions Responsible
Bedourie						**Overall Responsibility:** Chief Executive Officer **Implementation, review and actions:** Director of Works **Operations:** Water Operator
Raw Water	• Bedourie Town Bore	Weekly	Bore Pressure	529 kPa	N/A	
			Bore-head Integrity	Sealed	N/A	
Distribution System	3 samples tested from the following: • Council Depot • Sports Oval • Workshop tap • Or random location in distribution system if sample points offline	Monthly	E coli	0	1	
			Total Coliforms	0	N/A	
	• Inlet and outlet of cooling pond	Weekly	Temperature	<45°	Not Necessary	
Birdsville						
Raw Water	• Birdsville Town Bore	Weekly	Bore Pressure	1,200 kPa	N/A	
			Bore-head Integrity	Sealed	N/A	
Distribution System	3 samples tested from the following: • Caravan Park • Airport • Council Depot • Or random location in distribution system if sample points offline	Monthly	E coli	0	1	
			Total Coliforms	0	N/A	
			Turbidity	<1	<5	
	• Outlet of cooling ponds and outlet of heat exchanger		Temperature	50°C from ponds 45°C from heat exchanger	N/A	
	Reservoirs	Weekly	Integrity	Sealed	N/A	

6.2 Bedourie and Birdsville Verification Monitoring

6.2.1 Monitoring Strategy

Both Bedourie and Birdsville are supplied with artesian water from deep bores which is known to have stable quality. With the exception of the slightly elevated fluoride levels in the Birdsville supply, the water quality parameters are well within health guidelines. Samples from the two bores are sent away for chemical analysis every six months to verify the chemical quality.

The main potential issue of concern to Diamantina is bacterial contamination. Because of the remoteness of the towns it is difficult to get samples to an external laboratory reliably in time for testing. In 2012 Council purchased Colilert test equipment in order to undertake its own testing. Council tests three samples from each town each month in accordance with the "Procedure for Water Quality Monitoring (Escherichia coli)" developed by GBA. In the absence of any disruption to supply or issues or complaints this is considered a realistic testing regime to monitor bacteriological quality.

Every six months Council sends a check sample away for testing by an external laboratory for each of the following characteristics (SGS Analytical).

6.2.2 Bedourie and Birdsville Verification Monitoring Table

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Location		Positions Responsible
				Bedourie	Birdsville	
Microbial Quality	E.coli*	Nil Detected	Bacteria	Council Depot or Sports Oval	Council Depot or Airport or Caravan Park	**Overall Responsibility:** Chief Executive Officer **Implementation, review and actions:** Manager of Engineering Services **Operations:** Water Operator
	Total Coliforms	Nil Detected				
Physical	Conductivity	N/A	Hazard that arises from the Natural Geological Processes in the aquifer			
	Dissolved Organic Carbon	N/A				
	Dissolved Oxygen	>85% - Aesthetic				
	pH	pH 6.5 – 8.5				
	Total Dissolved Solids	N/A				
Inorganics	Aluminium	.2mg/L - Aesthetic				
	Chloride	250mg/L – Aesthetic				
	Fluoride	1.5mg/L – Health				
	Selenium	0.010mg/L – Health				
	Sodium	180mg/L – Aesthetic				
	Total Iron	0.3mg/L -Aesthetic				
	Soluble Iron	N/A				
	Total Manganese	0.5mg/L – Health				
	Soluble Manganese	N/A				

7 Incidents and Emergencies

Sample Water Quality Incident/Emergency Events

Incident / Emergency level	Description of level
Level 5	• Widespread outbreak of waterborne disease • Declared disaster • Major loss of supply likely, eg >24 hours over wide area • Gross exceedance of ADWG health guideline values for a chemical parameter (e.g. more than five times the ADWG health guideline limit).
Level 4	• High level of E. coli (e.g. > 5 CFU/ 100 mL) or any pathogens detected in reticulation • Failure of supply infrastructure (severe or emergency level supply restrictions required to maximise continuity of supply)
Level 3	• Detection of 1-5 CFU/100 mL E. coli in reticulation • Failure of supply infrastructure (ability to supply water compromised – short term water restrictions may be required) • Minor exceedance of ADWG health guideline value for chemical parameter (determined value is close to guideline value).
Level 2	• Failure of infrastructure or source supply (water quality or supply unlikely to be compromised - alternate process available to provide drinking water) • Abnormal exceedance of ADWG aesthetic guideline (customer complaints possible)
Level 1	• Exceedance of operational limit managed through operational and maintenance procedures

The following abbreviations are used in the following Incident Action Plan:

CEO	Chief Executive Officer
WM	Works Manager
ENG	Engineer (Consulting)
CSO	Customer Service Officer
TO	Testing Officer

Incident/Emergency Action Plan

Level	Incident or emergency	Summary of actions to be taken (with documented procedure listed)	Position/s responsible for Action/s
5	Waterborne disease	Ensure CEO is alerted	All
		Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au	CEO
		Determine potentially affected area, isolate if possible. Issue Boil Water alert or other precautions required.	CEO
		Provide additional/temporary chlorine dosing if practical and test for residual in reticulation	CEO
		Undertake comprehensive contamination investigation and take necessary corrective actions	CEO
		Upon resolution, provide written report to regulator (Part 2 incident form)	CEO
	Declared disaster	Ensure CEO is alerted	All
		Liaise with Disaster Management centre to monitor potential effect on water supply and sewerage services	CEO
		If water supply is affected take actions according to the relevant section(s) of this plan	CEO
	Loss of Supply	Ensure CEO is alerted	WM
		Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au	CEO
		Determine potentially affected area. Advise affected consumers via local radio and television including temporary restrictions if appropriate.	CEO
		Make temporary supply arrangements if practical	WM
		Rectify the problem	WM
		Investigate options to avoid any recurrence	WM
		Upon resolution, provide written report to regulator (Part 2 incident form)	CEO
	Gross exceedance of ADWG health limit	Ensure CEO is alerted	TO
		Check with laboratory to confirm result (a sudden gross exceedance, ~5 times, is only likely to occur as the result of sabotage or an unreported spill)	CEO
		Report details to the Water Supply Regulator, Drinking Water	CEO

Level	Incident or emergency	Summary of actions to be taken (with documented procedure listed)	Position/s responsible for Action/s
		Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au	
		Determine potentially affected area. Advise affected consumers via local radio and television not to drink town water.	WM
		Make temporary supply arrangements including bottled potable water if practical	WM
		Rectify the problem	WM, Eng
		Investigate options to avoid any recurrence	CEO
		Upon resolution, provide written report to regulator (Part 2 incident form)	CEO
4	Detection of >5 CFU/100mL E.coli in reticulation	Alert CEO	TO
		Determine potentially affected area, flush mains. Consider Boil Water alert.	CEO
		Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au	CEO
		Resample for E. coli in potentially affected infrastructure	WM
		Undertake comprehensive contamination investigation	WM, ENG
		Undertake necessary corrective actions	DM
		Upon resolution, provide written report to regulator (Part 2 incident form)	CEO
	Failure of supply infrastructure (restrictions required)	Ensure CEO is alerted	WM
		Determine potentially affected area	WM
		Obtain authorisation for restrictions and advise affected consumers via local radio and television	CEO
		Commence street patrols to ensure restrictions are known and observed	WM
		Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au	CEO
		Make temporary supply arrangements if practical	WM
		Rectify the problem	WM
		Investigate options to avoid any recurrence	WM, ENG

Level	Incident or emergency	Summary of actions to be taken (with documented procedure listed)	Position/s responsible for Action/s
		Upon resolution, provide written report to regulator (Part 2 incident form)	CEO
3	Detection of 1-5 CFU/100mL E.coli in reticulation	Alert CEO Determine potentially affected area, flush mains. Consider Boil Water alert. Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au Resample for E. coli and disinfectant residual in potentially affected infrastructure Undertake comprehensive contamination investigation Undertake necessary corrective actions Upon resolution, provide written report to regulator (Part 2 incident form)	TO CEO CEO WM WM, ENG WM CEO
	Failure of supply infrastructure (minor restrictions indicated)	Ensure CEO is alerted Determine potentially affected area Obtain authorisation for restrictions and advise affected consumers via local radio and television Commence street patrols to ensure restrictions are known and observed Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au Make temporary supply arrangements if practical Rectify the problem Investigate options to avoid any recurrence Upon resolution, provide written report to regulator (Part 2 incident form)	WM WM CEO WM CEO WM WM WM, ENG CEO
	Minor exceedance of ADWG health guideline	Ensure CEO is alerted Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au Estimate whether quality can be corrected, time and resources required	TO CEO WM

Level	Incident or emergency	Summary of actions to be taken (with documented procedure listed)	Position/s responsible for Action/s
		Consult with OWSR and Qld Health to determine whether public alert is warranted – e.g not likely in the case of chronic health effect	CEO
		Advise consumers and make temporary supply arrangements including bottled potable water if warranted	CEO
		Rectify the problem or inform consumers of ongoing water quality limitation	WM
		Upon resolution, provide written report to regulator (Part 2 incident form)	CEO
2	Failure of infrastructure (supply unlikely to be compromised	Monitor the situation to provide warning if supply may be compromised – initiate appropriate action if so	WM
		Rectify the problem	WM
	Abnormal exceedance of ADWG aesthetic guideline (customer complaints possible	Alert CEO and Customer Service	WM
		Estimate time to rectify and inform Customer Service	WM
		Inform concerned customers of the details of the incident and anticipated progress	CSOs
1	Exceedance of operational limit	If simple adjustment required, make the adjustment and record in plant log	WM
		If more substantial system change is required, e.g to overcome recurrent problem, advise CEO	WM
		Organise the change or list for capital works as appropriate	WM

8 Information Management

Diamantina Shire Council is a relatively small organisation with a records system that is available to all relevant staff.

Engineering services are provided by George Bourne and Associates (GBA), consultants based in Barcaldine. GBA provide the technical support for Council's water operations, preparing tender documents and specifications for new works and as-constructed data for completed works.

Colilert test results provided to council are initially entered into a spreadsheet on the Council server in Bedourie and sent to Council's engineer at GBA. GBA analyses and maintains a consolidated record of test results in water quality spreadsheets that are provided to council.

GBA also develops, maintains and distributes the works procedures to cover construction, maintenance, testing and inspections to control risks to water supply quality.

All records are computerised and kept indefinitely – at least for 7 years.

9 Appendix A DNRM Bore Sheets

DATE 10/10/2001

BORE CARD REPORT

REG NUMBER 14645

REGISTRATION DETAILS

OFFICE	Longreach	BASIN	0021	LATITUDE	25-54-08	MAP-SCALE	254
D/O FILE NO.	140/044(3)	SUB-AREA		LONGITUDE	139-21-05	MAP-SERIES	M
R/O FILE NO.	25/12/B/2	SHIRE	650-DIAMANTINA	EASTING	334846	MAP-NO	SG54-5
H/O FILE NO.	00065	LOT		NORTHING	7134097	MAP NAME	BIRDSVILLE
		PLAN		ZONE	54	PROG SECTION	
		ORIGINAL DESCRIPTION	TOWN RESERVE	ACCURACY		PRES EQUIPMENT	NE
				GPS ACC			
GIS LAT	-25.9022222222	PARISH NAME	4467-TAWVALE			ORIGINAL BORE NO	
GIS LNG	139.3513888889	COUNTY	ROSEBERY			BORE LINE	-
CHECKED		PROPERTY NAME	BIRDSVILLE				
		FIELD LOCATION				POLYGON	
						RN OF BORE REPLACED	
FACILITY TYPE	AF	DATE DRILLED	25/04/1961			DATA OWNER	
STATUS	EX	DRILLERS NAME				CONFIDENTIAL	
ROLES	GM	DRILL COMPANY					
		METHOD OF CONST.	ROTARY RIG				

LICENSE DETAILS

		LICENSED DEPTH(M)	1221.00	CLIENT	DIAMANTINA SHIRE COUNCIL
LICENCE NO	14645J	ALLOCATION (ML)	343	ADDRESS	HERBERT STREET
ISSUE DATE	04/10/1996	ALLOCATION (HA)			
STATUS OF LICENCE	ISSUED				BEDOURIE
EXPIRY DATE	31/01/2005				QLD 4829
STATUS DATE	08/10/1996	RN SHOWING ALLOC			
DOC MAN REF	LGH-25/12/B/01	CLIENT REF	12504J		

PURPOSE OF WORK

COD	DESCRIPTIO
TW	TOWN WATER SUPPLY

SUPPLIED PARCELS

TOWN NAME	PLAN	PARCEL TYPE	MINING LEASE	LOT	HISTORICAL PARCEL
	CP888177	LOT/PLAN (TITLED)		10	

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)

BORE CARD REPORT

REG NUMBER 14645

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	05/05/1961	1	Steel Casing (unspecified)		WT	203	0.00	144.20
A	05/05/1961	2	Steel Casing (unspecified)		WT	152		1220.00
A	05/05/1961	3	Perforated or Slotted Casing		AP			1220.00
A	05/05/1961	4	Grout					

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	27.43	STONE
2	27.43	38.10	SANDSTONE
3	38.10	67.06	CLAY
4	67.06	275.84	MUDSTONE, SANDSTONE BANDS
5	275.84	455.68	SHALE AND SANDSTONE
6	455.68	496.82	SANDSTONE, SHALE AND COAL
7	496.82	710.18	SHALE BANDS SANDSTONE
8	710.18	752.86	SHALE BANDS LIMESTONE
9	752.86	792.48	HARD SHALE
10	792.48	821.44	SANDY SHALE
11	821.44	1112.52	HARD SHALE
12	1112.52	1176.53	SHALE AND SANDSTONE
13	1176.53	1219.20	SANDSTONE
902			00/04/1961 SWL +133.70 M TMP NUL C
903			00/04/1961 DISCH " M3D DRILLER
910	1176.50		QUALITY DESCRIP/CONDUCT: 820

STRATIGRAPHY DETAILS

SOURCE	RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
DNR	1	0.00		QUATERNARY DUNE SANDS
DNR	2		49.40	TERTIARY
DNR	3	49.40	423.70	WINTON FORMATION

BORE CARD REPORT

REG NUMBER 14645

SOURCE	RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
DNR	4	423.70	589.80	MACKUNDA FORMATION
DNR	5	589.80	908.30	ALLARU MUDSTONE
DNR	6	908.30	918.40	TOOLEBUC FORMATION
DNR	7	918.40	1126.50	WALLUMBILLA FORMATION
DNR	8	1126.50	1175.60	CADNA-OWIE FORMATION
DNR	9	1175.60	1221.00	HOORAY SANDSTONE

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	1176.50		SDST							PS	HOORAY SANDSTONFORM

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF Q PR (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	01/05/1961	20	14645	1176.50		0.00	F/F	FR						
A	01/12/1964	20	14645	1176.50		0.00	F/F	FR						
A	18/06/1988	1	14645			0.87	ART	FR ST DT					111.75	6.02
A	24/04/1991	1												
A	30/07/1992	1	14645			1.00	ART	ST					97.05	
A	08/06/2001	1	14645			1.01	ART	ST FR ST					53.63	

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	01/05/1961	20						40.05								
A	01/12/1964	20		123.70				40.05								
A	18/06/1988	1	280	121.08			110.25	18.29	15	18.98	124.39				94	

BORE CARD REPORT

REG NUMBER 14645

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	24/04/1991	1														
A	30/07/1992	1	60	126.67	60						132.18				96	
A	08/06/2001	1	135	116.46			110.84	41.94	1	43.61	121.39				96	

BORE CONDITION

DATE	DRAIN DETAILS TOT LEN (km)	MAX RUN (km)	C D N	HEADWORKS RET LEN (km)	C D N	C T L	LEA K	FLOW IRREGULARITY	PRECIPITATE	EST USE (ML/yr)	STOCK CATTLE	STOCK SHEEP	COMMENT
08/06/2001					G	F							

ELEVATION DETAILS

PIP	DATE	ELEVATION	PRECISIO N	DATUM	MEASUREMENT POINT	SURVEY SOURCE
X	05/05/1961	48.80	SVY	STD	N	

WATER ANALYSIS PART1

PIPE	DATE	RD	ANALYST	QAN	DEPTH (m)	RMK	SRC	COND (uS/cm)	pH	Si (mg/L)	TOTAL IONS (mg/L)	TOTAL SOLIDS (mg/L)	HARD	ALK	FIG. OF MERIT	SAR	RAH
A	10/06/1970	1	GCL	046450	1176.00	PU	GB	820	8.1		714.00	0.00	8	358	0.0	32.4	7.01
A	02/10/1986	1	GCL	117988	1221.00	PU	GB	810	8.5	62	680.00	520.00	10	325	0.0	25.3	6.30

WATER ANALYSIS PART 2

PIPE	DATE	RD	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	10/06/1970	1	204.0		3.0			437.0			66.0	2.00		2.0				
A	02/10/1986	1	195.0	5.1	1.8	0.0	0.02	410.0	0.02	9.0	72.0	1.80	0.0	2.3				

WATER LEVEL DETAILS

PIPE	DATE	MEASURE (m)	N/R	RMK	PIPE	DATE	MEASURE (m)	N/R	RMK	PIPE	DATE	MEASURE (m)	N/R	RMK
X	05/05/1961	133.70	N											

BORE CARD REPORT

REG NUMBER 14645

WIRE LINE LOG DETAILS

**** NO RECORDS FOUND ****

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	METH	SOURCE
A	08/06/2001		747	8.4	99.9				PU	

SPECIAL WATER ANALYSIS

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 1

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 2

**** NO RECORDS FOUND ****

GENERAL NOTES

**** NO RECORDS FOUND ****

METERED USE

**** NO RECORDS FOUND ****

BORE CARD REPORT

REG NUMBER 316

REGISTRATION DETAILS

OFFICE Longreach
D/O FILE NO. 25/12/B/1
R/O FILE NO. 25/12/B/1
H/O FILE NO. L05527B

BASIN 0011
SUB-AREA
SHIRE 650-DIAMANTINA
LOT
PLAN
ORIGINAL DESCRIPTION RESERVE 1

LATITUDE 24-22-08
LONGITUDE 139-28-08
EASTING 344691
NORTHING 7304071
ZONE 54
ACCURACY
GPS ACC

MAP-SCALE 254
MAP-SERIES M
MAP-NO SG54-1
MAP NAME BEDOURIE
PROG SECTION
PRES EQUIPMENT

GIS LAT -24.3688888889
GIS LNG 139.4688888889
CHECKED

PARISH NAME 374-BEDOURIE
COUNTY EURINYE
PROPERTY NAME BEDOURIE TOWN
FIELD LOCATION

ORIGINAL BORE NO BEDOURIE TOWN NO.2
BORE LINE -

POLYGON
RN OF BORE
REPLACED

FACILITY TYPE AF
STATUS EX
ROLES

DATE DRILLED 01/01/1905
DRILLERS NAME
DRILL COMPANY
METHOD OF CONST. CABLE TOOL

DATA OWNER
CONFIDENTIAL

LICENSE DETAILS

LICENCE NO 00316J
ISSUE DATE 02/06/1940
STATUS OF LICENCE ISSUED
EXPIRY DATE 01/02/2010
STATUS DATE 16/02/2000
DOC MAN REF LON/140/044(3)

LICENSED DEPTH(M) 400.50
ALLOCATION (ML) 60
ALLOCATION (HA)

RN SHOWING ALLOC
CLIENT REF 12505J

CLIENT DIAMANTINA SHIRE COUNCIL
ADDRESS ***

BEDOURIE .
QLD AUSTRALIA 4829

PURPOSE OF WORK

COD	DESCRIPTIO
TW	TOWN WATER SUPPLY

SUPPLIED PARCELS

TOWN NAME	PLAN	PARCEL TYPE	MINING LEASE	LOT	HISTORICAL PARCEL

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)

BORE CARD REPORT

REG NUMBER 316

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	01/01/1905	1	Steel Casing (unspecified)		WT	254	0.00	60.70
A	01/01/1905	2	Steel Casing (unspecified)		WT	203	0.00	119.20
A	01/01/1905	3	Steel Casing (unspecified)		WT	152	0.00	362.70
A	01/01/1905	4	Open End				362.70	400.50
A	19/01/1981	6	Steel Casing (unspecified)	4.760	WT	127	0.00	363.30
X	01/01/1905	5	Grout				0.00	
X	19/01/1981	7	Grout				0.00	363.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	9.75	SAND AND COPIE
2	9.75	19.20	CLAY, SAND, COPIE GRAVEL
3	19.20	31.39	SOAPSTONE, DRIFT SAND, GRAVEL
4	31.39	35.97	CLAY, MUD
5	35.97	52.73	CLAY CARRING COPIE
6	52.73	77.72	CLAY
7	77.72	86.87	FINE SAND AND CLAY
8	86.87	100.58	DRIFT SAND GRAVEL
9	100.58	104.24	SAND
10	104.24	114.30	SAND AND CLAY
11	114.30	201.17	SHALE
12	201.17	227.08	SHALE LAYERS CLAY
13	227.08	288.04	SHALE
14	288.04	297.18	SAND AND COPIE
15	297.18	319.74	SHALE STREAKS AND LIMESTONE
16	319.74	350.52	SHALE
17	350.52	365.15	SHALE SAND LIMESTONE AND CLAY
18	365.15	385.88	SANDSTONE
19	385.88	390.14	SAND GRAVEL AND SANDSTONE
20	390.14	400.51	SANDSTONE

BORE CARD REPORT

REG NUMBER 316

STRATIGRAPHY DETAILS

SOURCE	RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
DNR	1	0.00	31.40	QUATERNARY ALLUVIUM
DNR	2	31.40	121.90	MACKUNDA FORMATION
DNR	3	121.90	192.00	ALLARU MUDSTONE
DNR	4	192.00	214.90	TOOLEBUC FORMATION
DNR	5	214.90	342.60	WALLUMBILLA FORMATION
DNR	6	342.60	400.50	LONGSIGHT SANDSTONE

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	12.50		SDST							PS	QUATERNARY ALLUALUV
2	77.70		SDST							PS	MACKUNDA FORMATFORM
3	107.60		SDST							PS	MACKUNDA FORMATFORM
4	354.20		SDST							PS	LONGSIGHT SANDSFORM
5	362.70	366.70	SDST							PS	LONGSIGHT SANDSFORM
6	377.00	389.50	SDST							PS	LONGSIGHT SANDSFORM
7	390.10		SDST							PS	LONGSIGHT SANDSFORM

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF Q PR (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	11/08/1905	1	316				F/F							
A	11/08/1923	1	316											
A	11/08/1930	1	316											
A	11/08/1938	1	316											
A	01/07/1947	20	316	362.70	390.10	0.00	F/F	FR						
A	11/08/1947	1	316											
A	11/08/1965	1	316											

BORE CARD REPORT

REG NUMBER 316

A	03/06/1970	1 316		1.50 ART	ST		
A	18/01/1981	1 316		0.80 ART	DT		
A	03/07/1990	1 316		1.00 ART	FR ST		51.79
A	01/08/2001	1 316		0.73 ART	ST FR ST		52.30

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	11/08/1905	1						120.16								
A	11/08/1923	1						69.18								
A	11/08/1930	1						61.50								
A	11/08/1938	1						65.28								
A	01/07/1947	20						63.40								
A	11/08/1947	1						63.39								
A	11/08/1965	1						58.68								
A	03/06/1970	1	120	50.59					120						177	0.00000000
A	18/01/1981	1	342	51.83			37.70	34.48	120			33.60	0.00		155	0.00000000
A	03/07/1990	1	240	54.04			43.52	41.65	30	44.28	56.06				144	
A	01/08/2001	1	230	52.30			50.26	41.28	60	45.45	54.13				145	

BORE CONDITION

DATE	DRAIN DETAILS TOT LEN (km)	MAX RUN (km)	C D N	HEADWORKS RET LEN (km)	C D N	C T L	LEA K	FLOW IRREGULARITY	PRECIPITATE	EST USE (ML/yr)	STOCK CATTLE	STOCK SHEEP	COMMENT
01/08/2001					G	F							

ELEVATION DETAILS

PIP	DATE	ELEVATION	PRECISIO	DATUM	MEASUREMENT POINT	SURVEY SOURCE
X	01/01/2100	91.40	SVY	STD	N	

BORE CARD REPORT

REG NUMBER 316

WATER ANALYSIS PART1

PIPE	DATE	RD ANALYST	QAN	DEPTH (m)	RMK	SRC	COND (uS/cm)	pH	Si (mg/L)	TOTAL IONS (mg/L)	TOTAL SOLIDS (mg/L)	HARD	ALK	FIG. OF MERIT	SAR	RAH
A	01/01/1966	1 GCL	33000		PU	GB	900	8.3		741.60	535.74	8	348			6.80
A	03/06/1970	1 GCL	46449		PU	GB	900	8.3		763.35	543.76	11	354		29.1	6.86
A	01/01/1975	1 GCL	66036		PU	GB	935	8.2		708.40	500.51	21	342		18.6	6.41
A	03/07/1990	1 GCL	137085		MA	GR	863	8.5	17	733.52	546.47	9	345	0.0	32.2	6.71

WATER ANALYSIS PART 2

PIPE	DATE	RD	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	01/01/1966	1	226.0		3.2	0.0		405.0		9.6	92.0	0.80		5.0				
A	03/06/1970	1	224.0		4.0	0.3		432.0			100.0	0.05	0.0	3.0				
A	01/01/1975	1	195.0	3.0	7.5	0.5		409.0		3.7	89.0	0.70						
A	03/07/1990	1	221.9	4.7	3.1	0.3	0.00	402.2	0.00	8.9	91.5	0.84	0.0	0.0				

WATER LEVEL DETAILS

**** NO RECORDS FOUND ****

WIRE LINE LOG DETAILS

**** NO RECORDS FOUND ****

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	METH	SOURCE
A	11/08/1965				43.0				PU	GB
A	18/01/1981				44.0				PU	GB
A	03/07/1990				45.0				PU	GB
A	01/08/2001		897		44.0				PU	GB

SPECIAL WATER ANALYSIS

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 1

REGDET	CASING	STRLOG	AQUIFR	PUMTES	ELVDET	WLVDET	FIELDQ

REG NUMBER 316

Y 01/02/1991	Y 01/02/1991	Y 20/11/2000	Y 01/02/1991	Y 01/02/1991		Y 01/02/1991	Y 01/02/1991

VALIDATION LOG - PART 2

WATANL	SAMPLE	STRTIG	WIRLOG	MULCND	BRCOND	FPREAD	GNOTES
Y 01/02/1991							

GENERAL NOTES

**** NO RECORDS FOUND ****

METERED USE

**** NO RECORDS FOUND ****

10 Appendix B Fluoride Fact Sheet (from ADWG 2011)

Fluoride

(endorsed 1996)

GUIDELINE

Based on health considerations, the concentration of fluoride in drinking water should not exceed 1.5 mg/L.

GENERAL DESCRIPTION

Fluoride occurs naturally in seawater (1.4 mg/L), soil (up to 300 parts per million) and air (from volcanic gases and industrial pollution). Naturally occurring fluoride concentrations in drinking water depend on the type of soil and rock through which the water drains. Generally, concentrations in surface water are relatively low (<0.1–0.5 mg/L), while water from deeper wells may have quite high concentrations (1–10 mg/L) if the rock formations are fluoride-rich.

Inorganic fluorine compounds are used in aluminium production, as a flux in the steel and glass fibre industries, and in phosphate fertilisers, bricks, tiles and ceramics.

Virtually all foodstuffs contain traces of fluoride. In particular, high amounts can be found in dried tea leaves because of natural concentration by the tea plant. Total daily intake from all sources varies considerably, but has been estimated at 0.46 mg to 5.4 mg, with about 10% coming from unfluoridated drinking water.

Fluoride is used to protect teeth against dental caries. It is present in most brands of toothpaste, and it is often added to drinking water supplies.

TYPICAL VALUES IN AUSTRALIAN DRINKING WATER

In unfluoridated supplies, fluoride concentrations are typically less than 0.1 mg/L, but can range from less than 0.05 mg/L up to 1.5 mg/L, with the higher values reported from groundwater sources.

In fluoridated supplies, the target fluoride concentration is between 0.7 and 1 mg/L, with the lower concentrations applying where the climate is hot, to allow for a higher average consumption of water.

TREATMENT OF DRINKING WATER

Fluoride concentrations in drinking water can be reduced by dilution with other sources, or by using activated alumina or bone char. Conventional coagulation with alum is much less effective.

MEASUREMENT

The fluoride concentration in drinking water can be determined using an ion-specific electrode (APHA Method 4500-F^- Part C 1992). The limit of determination is 0.1 mg/L.

HEALTH CONSIDERATIONS

Because fluoride is widely dispersed in the environment, all living organisms are exposed to it and all tolerate modest amounts. It has been claimed that fluoride is an essential trace element for humans, but this is difficult to establish conclusively, and no data are available on the minimum amount needed. Fluoride is absorbed quickly following ingestion. It is not metabolised, but diffuses passively into all body compartments. About 40% is excreted in urine within 9 hours, and about 50% over 24 hours. Fluoride has an affinity for mineralising tissues of the body: in young people, bone and teeth; in older people, bone. Thus excretion is somewhat greater in adults because they have proportionately less mineralising tissue than children.

NOTE: Important general information is contained in PART II, Chapter 6

Fluoride has been shown to prevent dental caries very effectively, and knowledge of its anti-caries effect came from the observed association of low caries prevalences with naturally occurring fluoride in drinking water (at about 1 mg/L). The NHMRC has extensively reviewed health aspects of fluoride and its prevention of dental disease. Many health authorities around the world recommend fluoridation of public water supplies as an important public health measure.

Concentrations above 1.5 mg/L may disturb tooth mineralisation in children up to about 6 to 8 years, leading to dental fluorosis, a mottling of the teeth which can occasionally occur to an unsightly degree.

Skeletal fluorosis, characterised by hypermineralisation and thus brittle bones, has occurred in association with high fluoride concentrations in drinking water, and also with occupational exposure to fluoride-containing dust. It generally occurs after prolonged exposure (several years) and is reversible: if the exposure is removed, the fluoride levels in bones gradually decline.

Regular consumption of water with fluoride concentrations above about 4 mg/L involves progressively increasing risks of skeletal fluorosis. The United States Environmental Protection Agency has set this level as the maximum acceptable for drinking water: above it, communities are required to lower the fluoride concentration by treatment to remove it, or by dilution.

People with kidney impairment have a lower margin of safety for fluoride intake. Limited data indicate that their fluoride retention may be up to three times normal.

There is no substantiated epidemiological evidence that fluoride or fluoridation causes cancer. One animal study showed an increased incidence of bone tumours in some male rats that were exposed to very high concentrations of fluoride in water, but female rats and mice were not affected.

Tests for mutagenicity with strains of bacteria have been negative. Chromosome aberrations have been reported in tests with mammalian cells but only at extremely high fluoride concentrations.

The International Agency for Research on Cancer has concluded that fluoride is not classifiable as to its carcinogenicity in humans (Group 3, inadequate evidence in humans and in animals) (IARC 1987).

DERIVATION OF GUIDELINE

It was recognised in setting the guideline value of 1.5 mg/L that there is a narrow margin between concentrations producing beneficial effects to teeth and those producing objectionable fluorosis.

The minimum concentration required for a protective effect against dental caries is about 0.5 mg/L, and concentrations around 1 mg/L in temperate climates are optimal for caries prevention. At concentrations between 1.5 and 2 mg/L, mottling of teeth due to dental fluorosis may occur, sometimes to an objectionable degree.

The guideline value of 1.5 mg/L has been set to protect children from the risk of dental fluorosis. If this value is exceeded in circumstances where it is not practical to defluoridate, then parents should be advised to use rainwater or bottled water for children up to about 6 years to limit or prevent dental fluorosis.

The guideline value should not be regarded as a recommended value for fluoridation of water supplies.

REFERENCES

APHA Method 4500-F^- Part C (1992). Fluoride: Ion-selective electrode method. Standard Methods for the Examination of Water and Wastewater, 18th edition. American Public Health Association, Washington.

IARC (International Agency for Research on Cancer) (1987). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Overall Evaluations of Carcinogenicity. An updating of IARC monographs volumes 1 to 42. World Health Organization, IARC, Supplement 7.

NHMRC (1991). The effectiveness of water fluoridation. National Health and Medical Research Council, and Department of Health, Housing and Community Services, Canberra.

NOTE: Important general information is contained in PART II, Chapter 6

11 Appendix C Information Notice DWQMP Amendment Approval

File number: 099/0004579-001
SPID 42

Queensland Government

Department of
Natural Resources, Mines and Energy

6 July 2018

Chief Executive Officer
Diamantina Shire Council
17 Herbert Street
Bedourie QLD 4829

Dear Mr Love

Drinking Water Quality Management Plan Amendment Application – Information Notice for the Decision

I refer to Diamantina Shire Council's application to the Director-General of the Department of Natural Resources, Mines and Energy (the Regulator) for approval of amendments to its approved Drinking Water Quality Management Plan (DWQMP), received by Operations Support on 13 April 2018 and the further amended DWQMP, received on 28 June 2018, which was submitted by George Bourne and Associates, on behalf of Council.

I advise that Council's application for amendment of the approved DWQMP has been approved with conditions.

Enclosed is the *Information Notice for the decision* (this notice), given under subsection 99(1)(b), pursuant to subsection 100(3) of the *Water Supply (Safety and Reliability) Act 2008.*

Please note that you may apply for a review of the decision within 30 business days after the day you are given this notice (see section 11.0 of this notice).

If you have any enquiries, please contact Christian Dresing on telephone number 3199 4882 or by email at: drinkingwater.reporting@dnrme.qld.gov.au

Yours sincerely

T Aldred

Ted Aldred
Manager Assessment and Compliance
Water Supply Regulation, Operations Support
Delegate of the Regulator
under the *Water Supply (Safety and Reliability) Act 2008*

Cc: - Stuart Bourne, George Bourne and Associates
William Green, George Bourne and Associates

1 William Street Brisbane
PO Box 15216 City East
Queensland 4002 Australia
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Operations Support

INFORMATION NOTICE

Water Supply (Safety and Reliability) Act 2008
(Section 99, subsection (1)(b))

Queensland Government

Department of
Natural Resources, Mines and Energy

1.0 Citation

1.1 This notice, dated 6 July 2018, may be cited as the Information Notice for the Decision to approve an amendment of the Diamantina Shire Council approved Drinking Water Quality Management Plan.

2.0 Power to give notice

2.1 This notice is given under subsection 99(1)(b), pursuant to subsection 100(3) of the *Water Supply (Safety and Reliability) Act 2008* (the Act).

3.0 Reference to service provider

3.1 A reference to service provider in this notice is a reference to the drinking water service provider specified in section 3.2 of this notice.

3.2 This notice is given to:

Diamantina Shire Council
17 Herbert Street
Bedourie QLD 4829

who may be referred to in the remainder of this notice as 'you' and 'your', as applicable.

4.0 Reason for Notice

4.1 Pursuant to section 98 of the Act, the Director-General of the Department of Natural Resources, Mines and Energy (the Regulator) must consider and decide to approve or refuse to approve an amendment of an approved Drinking Water Quality Management Plan lodged by a service provider under section 100 of the Act.

4.2 Subsection 100(3) provides that subsections 95(2) and 95(3) and sections 96 to 99 apply to the application and the proposed amended drinking water quality management plan as if a reference in the sections to the drinking water quality management plan was a reference to the amended drinking water quality management plan.

4.3 Subsection 99(1)(b) provides that the Regulator may approve a Drinking Water Quality Management Plan with conditions.

4.4 If the Regulator, under subsection 99(1)(b) of the Act, approves a Drinking Water Quality Management Plan with conditions, the Regulator must give the service provider an Information Notice for the decision.

5.0 Scheme details

5.1 This notice applies to the Diamantina Shire Council drinking water service, which includes the following schemes:

- Bedourie; and
- Birdsville.

6.0 Decision made

6.1 On 6 July 2018, the delegate of the Regulator decided under section 98 of the Act, to approve the amended Drinking Water Quality Management Plan submitted by Diamantina Shire Council with the conditions stated in this notice.

6.2 The decision was made on the basis of an assessment of the sections of the Drinking Water Quality Management Plan detailed in the Drinking Water Quality Management Plan amendment application form as having been amended including:

- Assessment of risks
- Risk management measures
- Risk management improvement program
- Operational monitoring
- Verification monitoring

6.3 The approved amended Drinking Water Quality Management Plan includes all the documents and information submitted to the Regulator under section 95 and 96 of the Act, as a component of the amendment application made on 13 April 2018, including:

- Diamantina Shire Council's amended Drinking Water Quality Management Plan June 2018, received 28 June 2018.

6.4 The approval of the amended Drinking Water Quality Management Plan, pursuant to this notice, does not include the content of its support programme documents, such as templates, forms and operational procedures.

Standard Conditions	
1. Water Quality Criteria	Water quality criteria (as defined in Schedule 3 of the *Water Supply (Safety and Reliability) Act 2008*) for drinking water, means all of the following: (i) the standards for the quality of drinking water prescribed in a regulation under the *Public Health Act 2005*; (ii) the criteria stated in a guideline, if any, made by the Regulator about the quality of drinking water; (iii) the criteria for the quality of drinking water stated in a condition applying to a Drinking Water Quality Management Plan. For the purpose of (iii), the following applies: All parameters that have health guideline values in the most current version of the Australian Drinking Water Guideline are deemed to be water quality criteria that apply, to this Drinking Water Quality Management Plan. Parameters with only aesthetic guideline values are NOT considered water quality criteria and are not required to be reported under this condition. You must implement the verification monitoring program as detailed in the approved amended Drinking Water Quality Management Plan and report any non-compliance with the water quality criteria for the parameters monitored, in accordance with Section 102 of the *Water Supply (Safety and Reliability) Act 2008*.

	Additionally, if during the course of this monitoring or other activity, you become aware of a detection of a parameter in the drinking water supply that exceeds a health guideline value set in the Australian Drinking Water Guideline, that is not part of the verification monitoring program, you must notify this detection to the Regulator in accordance with Section 102 of the *Water Supply (Safety and Reliability) Act 2008*.
2. Additional reporting requirements (a) events; and (b) where a parameter has no water quality criteria	The following additional reporting requirements apply to the approved amended Drinking Water Quality Management Plan. These additional reporting requirements relate to: (a) Event(s), and (b) Where a parameter has no water quality criteria. An event is deemed to be anything that has happened to you or your service which has escalated beyond your ability to control and you believe or are concerned that public health may be adversely impacted as a result. A parameter with no water quality criteria is deemed to be any parameter with ▪ no standards prescribed in the *Public Health Regulation 2005* ▪ no criteria prescribed in the Water Quality and Reporting Guideline for a Drinking Water Service issued by the Regulator; and ▪ no guideline value in the most current version of the Australian Drinking Water Guidelines. Parameters with aesthetic guideline value only in the most current version of the Australian Drinking Water Guidelines are NOT considered parameters with no water quality criteria and are not required to be reported under this condition. The detection of a parameter with no water quality criteria must be reported to the Regulator if you believe this parameter cannot be managed under your approved amended Drinking Water Quality Management Plan and you believe, or are concerned, that public health may be impacted. You must immediately report these additional reporting requirements to the Regulator and then follow up this initial report within 24 hours, by submitting a *Notification of a drinking water event or detection of a parameter with no water quality criteria* form. The condition is imposed to verify that events and detections of a parameter that have no water quality criteria are appropriately managed to ensure the final water quality minimises any impact on public health. This condition will cease to apply upon commencement of the 'prescribed incidents' regulation as detailed in section 102A (4) of the *Water Supply (Safety and Reliability) Act 2008*.
3. Research projects and additional reporting requirements	If you are involved in any water quality research activity and become aware of the detection of or detect a parameter that must be reported as: ▪ non-compliance with water quality criteria as per Section 102 of the *Water Supply (Safety and Reliability) Act 2008* ▪ an event or ▪ a parameter with no water quality criteria you must immediately report it to the Regulator, then follow up this initial report in writing within 24 hours, unless you have sought and obtained formal acknowledgement of the research activity by the Regulator. If you are operating under a research activity formally acknowledged by the Regulator, detections of parameters arising from this research activity must be reported as detailed in the formal acknowledgement.

4. Financial outlays	The State of Queensland accepts no liability for any financial outlay incurred by complying with the approved amended Drinking Water Quality Management Plan and the conditions in this approval.

7.0 Evidence or other material on which findings of fact were based (material considered)

7.1 The delegate of the Regulator in making the decision mentioned in section 6.0 'Decision Made' above had regard to the following material:

- *Water Supply (Safety and Reliability) Act 2008*
- *Water Supply (Regulator) Delegation (No. 2) 2018*
- Drinking Water Quality Management Plan Guidelines, September 2010
- Australian Drinking Water Guideline, September 2011, Version 3.4 updated October 2017
- Diamantina Shire Council amendment application detailing sections of the approved Drinking Water Quality Management Plan that were amended
- Diamantina Shire Council's amended Drinking Water Quality Management Plan March 2018, received 13 April 2018
- Diamantina Shire Council's further amended Drinking Water Quality Management Plan June 2018 submitted by George Bourne & Associates Consulting Engineers, received 28 June 2018
- Recorded correspondence between the department and Diamantina Shire Council
- Departmental file 099/0004579-001

8.0 Findings on material questions of fact

8.1 The delegate of the Regulator in making the decision mentioned in section 6.0 'Decision Made' above, made the following findings of fact:

- Diamantina Shire Council has an approved Drinking Water Quality Management Plan, in accordance with section 95 of the Act;
- Diamantina Shire Council amended its approved Drinking Water Quality Management Plan and applied for approval of this amended plan on 13 April 2018; and
- George Bourne and Associates Consulting Engineers submitted a further amended Drinking Water Quality Management Plan on 28 June 2018.

9.0 Reasons for the decision

9.1 The delegate of the Regulator made the decision for the following reasons:

- Diamantina Shire Council amended its approved Drinking Water Quality Management Plan and submitted an amendment application to the Regulator on 13 April 2018;
- Diamantina Shire Council made a further amendment to its approved Drinking Water Quality Management Plan and submitted this to the Regulator on 28 June 2018; and
- Diamantina Shire Council's Drinking Water Quality Management Plan June 2018, received 28 June 2018, meets the requirement of the Act and relevant guidelines for the schemes addressed.

10.0 Reviews, audits and annual reporting requirements under the Act

10.1 Pursuant to subsections 99(2)(b) and section 106 of the Act, regular reviews of the approved amended Drinking Water Quality Management Plan must be undertaken at specified intervals.

You must review your plan by 31 December 2019.

Further reviews are required to be completed every two (2) years from that date.

10.2 Pursuant to subsection 99(2)(c) of the Act, regular audits of the approved Drinking Water Quality Management Plan are required at specified intervals.

The next regular audit of your plan must be conducted by 30 June 2022.

Further regular audits are required to be completed every four (4) years from that date. You are also required to provide the Regulator with regular audit reports in accordance with section 108 of the Act.

10.3 Pursuant to sections 141 and 142 of the Act, a Drinking Water Quality Management Plan Report must be prepared for each financial year after the financial year in which the Drinking Water Quality Management Plan was approved and must be given to the Regulator within 120 business days after the end of the financial year to which it relates.

Your next Drinking Water Quality Management Plan Report must be given to the Regulator by 18 December 2018.

11.0 Internal review of decision

11.1 Subsections 512(1) and 512(2)(b) of the Act provide that a person who has been given an information notice by the Regulator may apply for an internal review of the decision in the notice.

11.2 An internal review application must be:

- in the approved form (WSR004 - Internal review of decision application) which can be obtained at www.dews.qld.gov.au or by visiting your local departmental office.
- accompanied by a statement of the grounds on which the applicant seeks review of the decision.
- supported by sufficient information to enable the reviewer to make a decision.
- made to the Regulator at the address below within 30 business days after the day the applicant is given this information notice.

Director, Water Supply Regulation
Operations Support
Department of Natural Resources, Mines and Energy
PO Box 15216
City East Qld 4002

Or

by email sent to: drinkingwater.reporting@dnrme.qld.gov.au

11.3 Making an internal review application does not delay the person's obligation to comply with the notice. A person who has been given an information notice by the Regulator under the Act may apply to a court with jurisdiction for a stay of the decision.

11.4 The latest version of the Act is available at www.legislation.qld.gov.au and detailing the review and appeal rights in Chapter 7. This process may not be the only right of review and you are encouraged to seek legal advice.

This notice is given on Friday, the 6th day of July 2018.

Ted Aldred

Delegate of the Regulator
under the *Water Supply (Safety and Reliability) Act 2008*

Manager Assessment and Compliance, Water Supply Regulation
Operations Support
Department of Natural Resources, Mines and Energy