Balonne Shire Council

Service Provider No 6

DRINKING WATER QUALITY MANAGEMENT PLAN

March 2023

Document Control					
Revision	**Author**	**Reviewer**	**Approved for Issue**		
			Name	**Signature**	**Date**
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B (Updated following information request)	Michael Shellshear	Dianne Francisco	Michael Shellshear		26/11/2012
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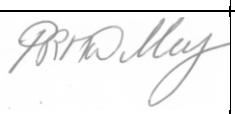
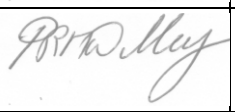
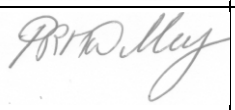
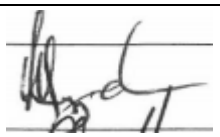
G(Updated following audit)	Peter Willey	Ross Drabble	Peter Willey		30/11/2017
H (Updated following Internal Review)	Peter Willey	Andrew Boardman	Peter Willey		30/11/2020
I (Updated following Amendment Notice)	Peter Willey	Andrew Boardman	Peter Willey		07/04/2021
J (Updated following Audit)	Ashleigh Morrow	Rohan Geddes	Rohan Geddes		26/09/2022
K (Updated following Audit)	Kimberley Morgan	Michael Lynch	Michael Lynch		17/03/2023

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1.0 Registered Service Details

1.1. Service Provider Identification Number (SPID) – 6

Balonne Shire Council
118 Victoria Street
PO Box 201
St George QLD 4487

ABN 49 655 876 831
Telephone: (07) 4620 8888

Schemes serviced by Balonne Shire Council:

Table 1.1 Current (2022/2023) Potable Water Scheme Data

Scheme/Township	Current Population Serviced	Current Connections	Current Average Demand (kL/day)
St George	3,130	1,153	651
Dirranbandi	610	301	578
Bollon	174	113	186
Thallon	231	82	142
Hebel	62	33	35
Mungindi	124	62	44

An average population growth rate of -0.16% per annum was applied in accordance with the office of economic and statistical research profiles to generate the projected scheme information. Whilst the population growth may be in slight decline, it is know that the number of connections and water consumption does necessarily decrease in proportion with the population. For purposes of this plan, the projected connections and water consumption data has been left unchanged, notwithstanding the slight fall in population estimated over the next five years.

Table 1.2 Projected (2027/2028) Potable Water Scheme Data

Scheme	Projected Population Serviced	Projected Connections	Projected Average Demand (kL/day)
St George	3,105	1,153	651
Dirranbandi	605	301	578
Bollon	173	113	186
Thallon	229	82	142
Hebel	62	33	35
Mungindi	123	62	44

1.2. Annual Report

Drinking water service providers must prepare a drinking water quality management plan (DWQMP) report, under the requirements of the *Water Supply (Safety and Reliability) Act 2008*.

The purpose of the report is to demonstrate to our customers, stakeholders and the water supply regulator that we have satisfactorily implemented the approved DWQMP each financial year. The report must contain the following information:

- actions the service provider took to implement the DWQMP
- details of compliance with water quality criteria for drinking water
- incidents reported to the regulator
- drinking water quality related customer complaints
- DWQMP review outcomes
- DWQMP audit findings.

DWQMP reports are to be submitted to the department in December each year and made publicly available by publishing it on our website.

To ensure the report has been completed by the deadline prescribed preparation for the annual report will begin before the December deadline. Initially an audit will be conducted of the plan by a suitability qualified person on Council's list of approved suppliers/auditor. Once the audit has been completed Council will begin the process of actioning any recommendations as part of the auditing process.

1.2.1. Review Panel

The DWQMP will be reviewed by a panel, each reiteration and version will be documented in the Document Control table at the beginning of the document and the stakeholders on the review panel will be documented in the table below.

2.0 Details of Infrastructure for Providing the Service

2.1. Schematics

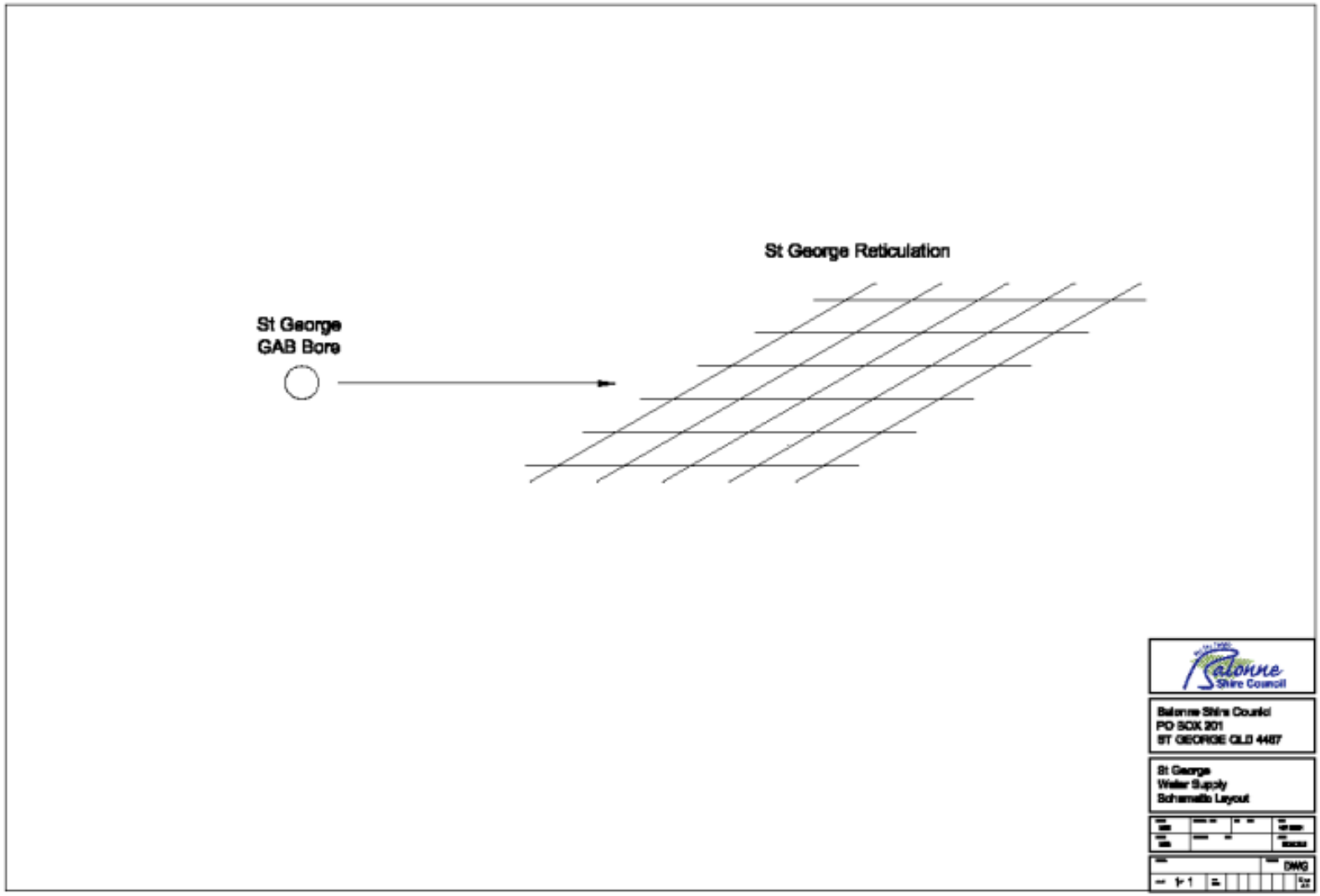

Figure 2.1 St George Water Supply Schematic

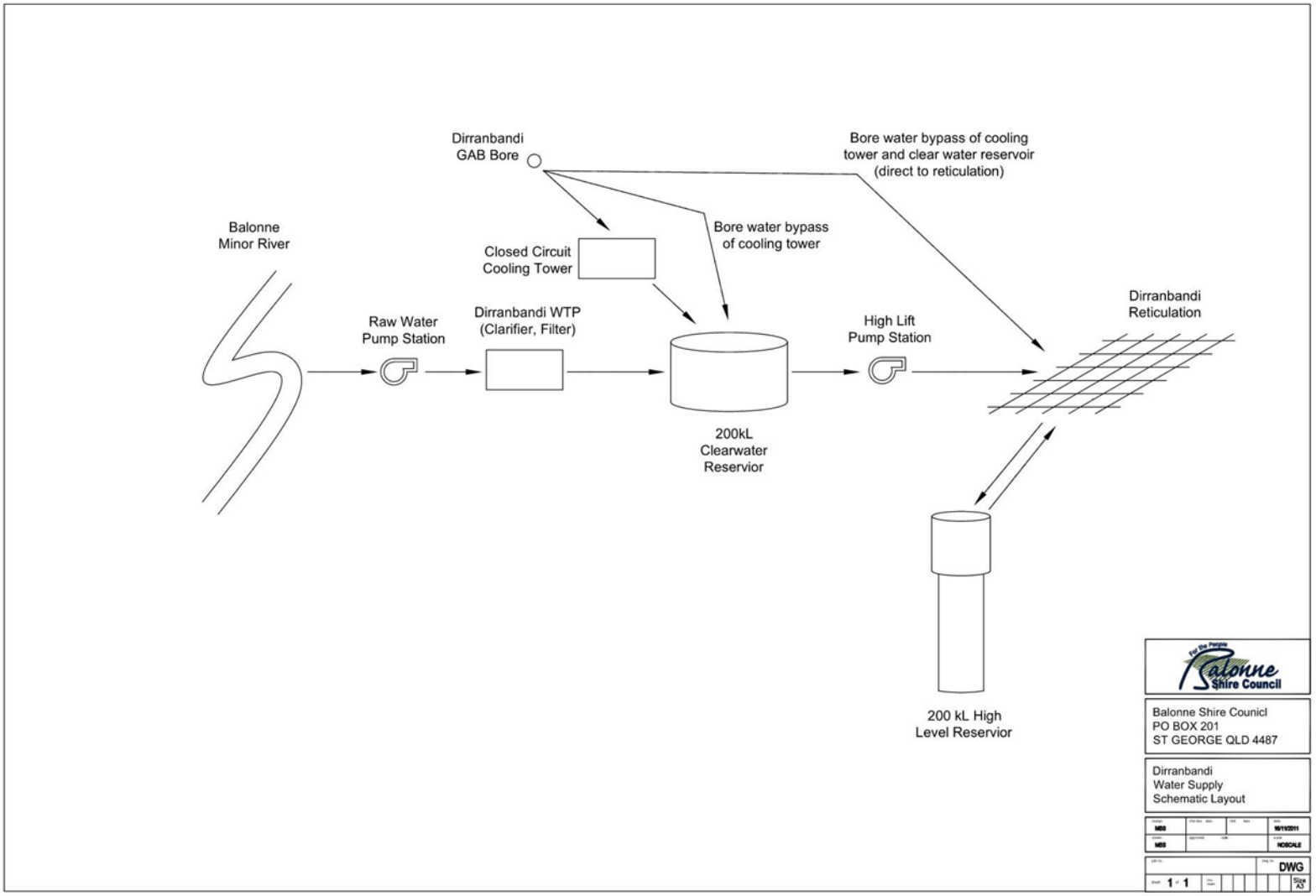

Figure 2.2 Dirranbandi Water Supply Schematic

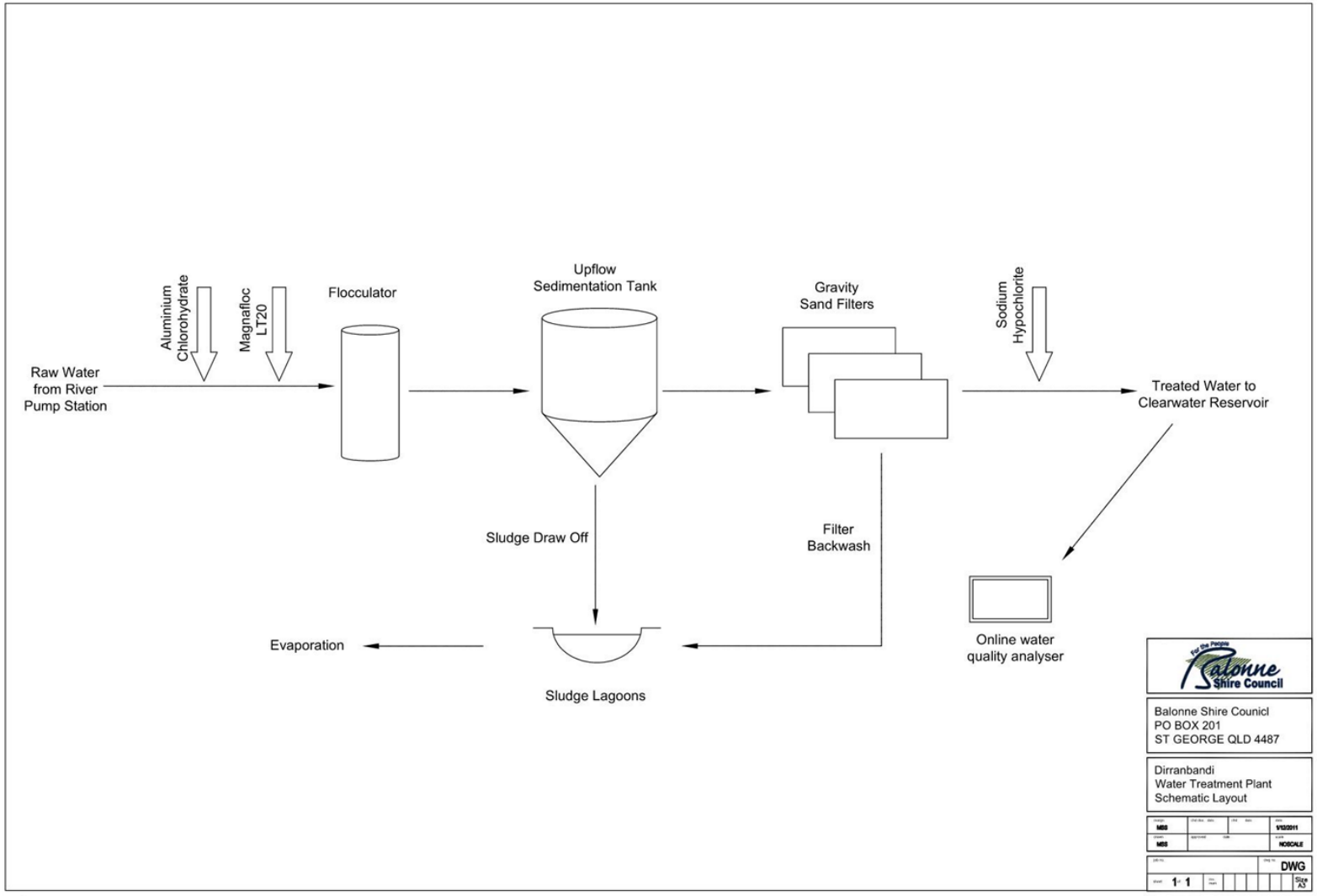

Figure 2.3 Dirranbandi Water Treatment Plant Schematic

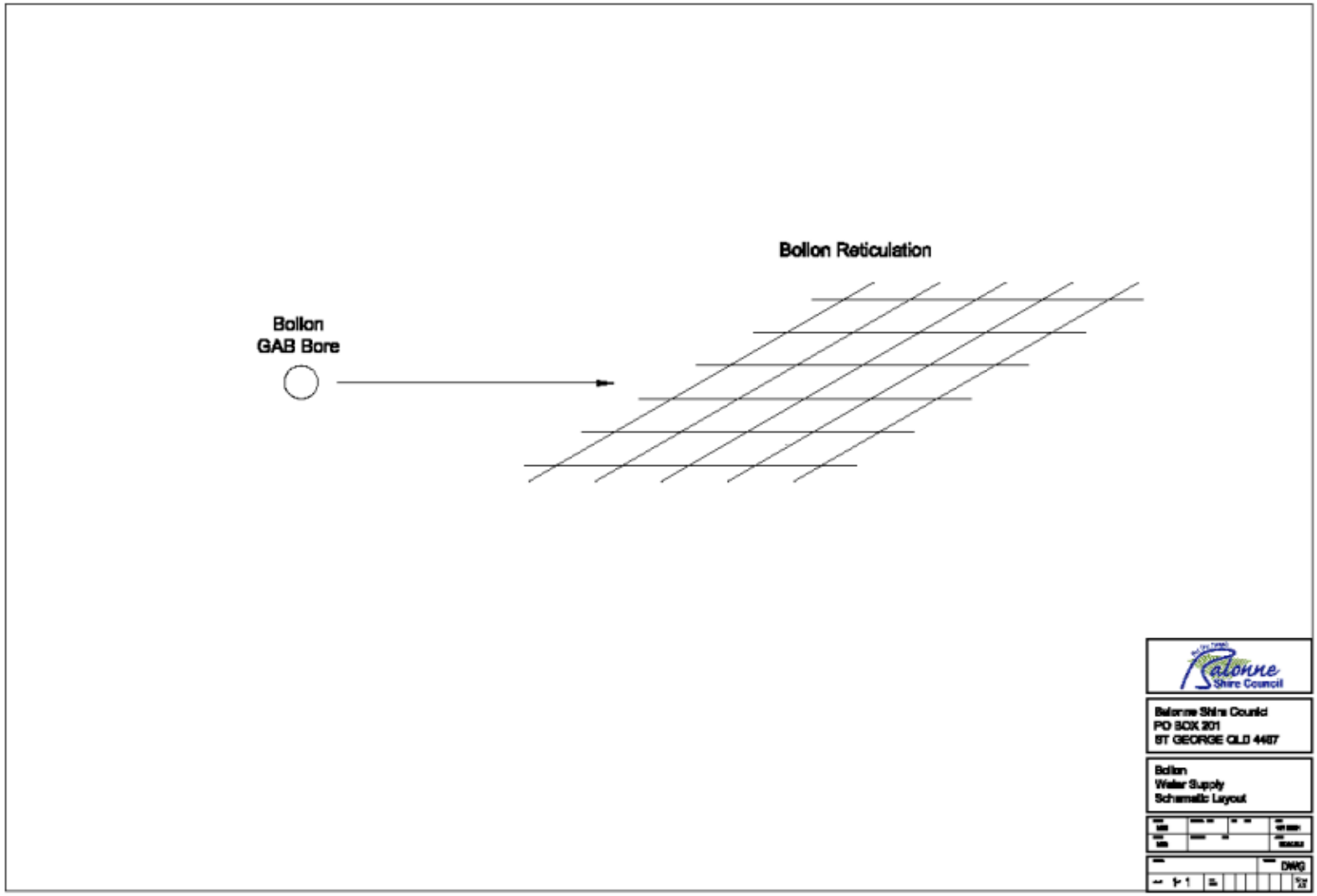

Figure 2.4 Bollon Water Supply Schematic

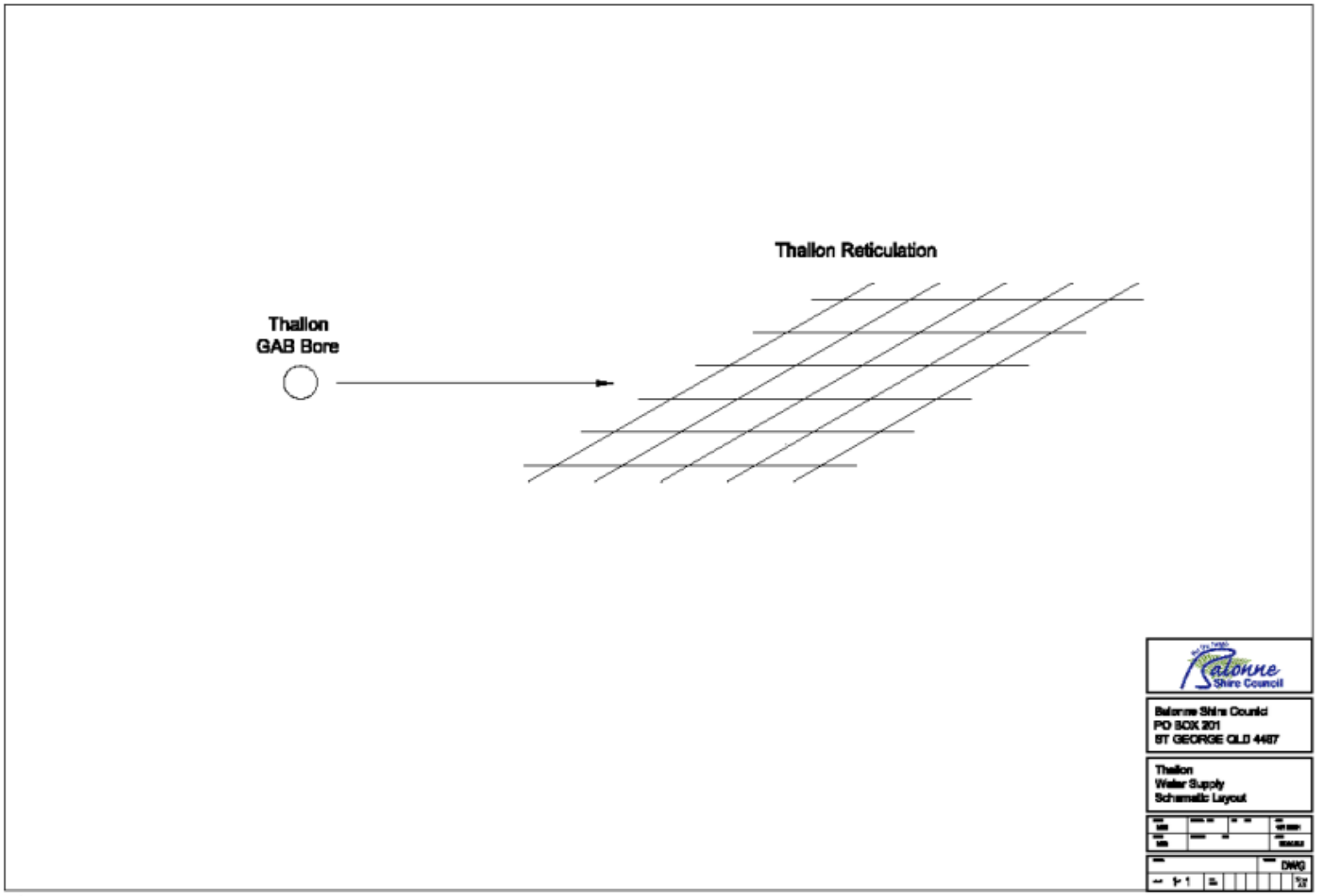

Figure 2.5 Thallon Water Supply Schematic

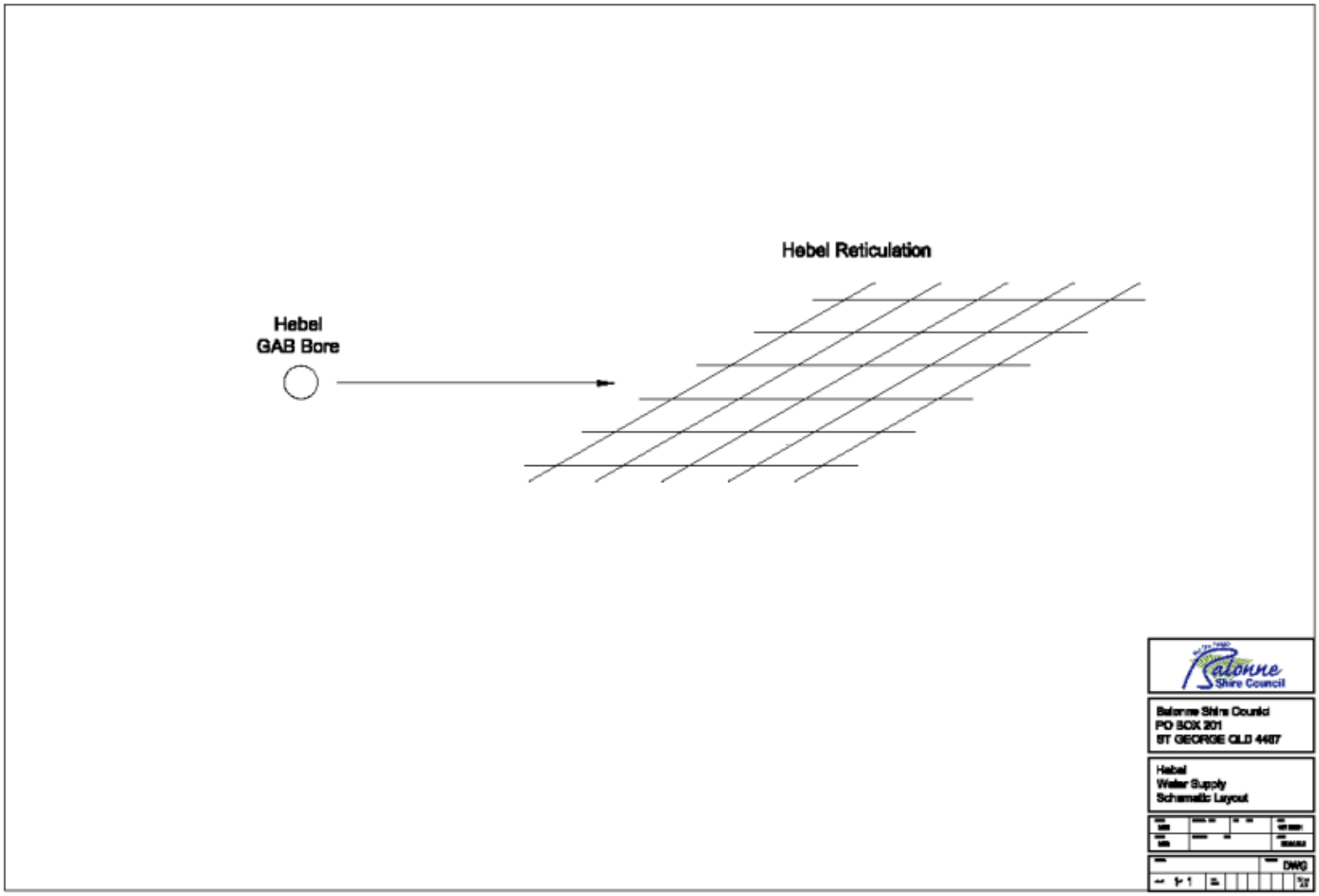

Figure 2.6 Hebel Water Supply Schematic

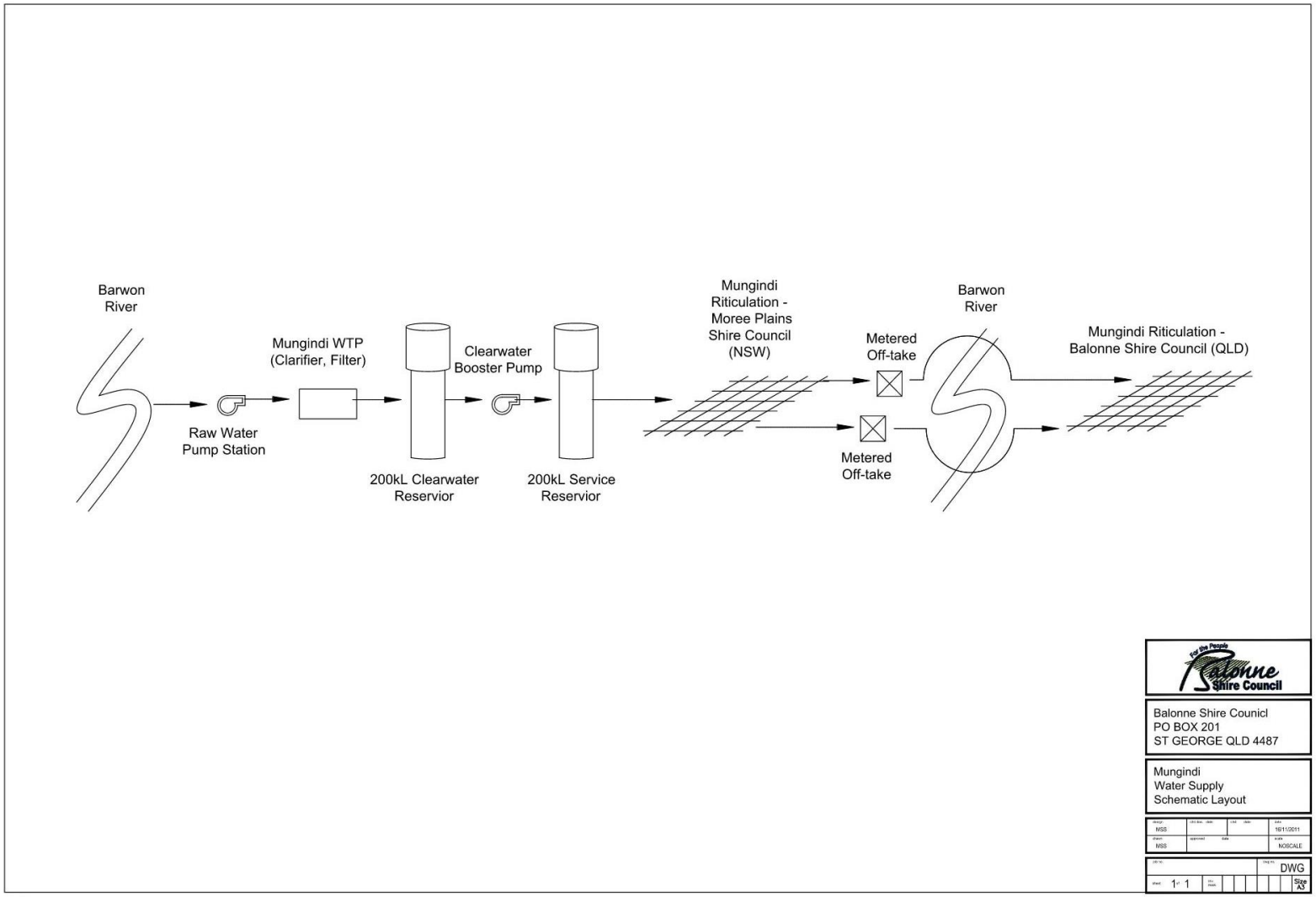

Figure 2.7 Mungindi Water Supply Schematic

No schematic has been prepared for the Mungindi Water Treatment Plant as the plant is owned and operated by Moree Plains Shire Council. Balonne Shire Council purchase potable water from Moree Plains Shire Council. The water is supplied from two (2) offtakes on the New South Wales side of the Barwon River at Mungindi.

2.2. Source, treatment and distribution details

Table 2.1 St George Infrastructure Details

Component		St George Water Supply	
Sources	***Name***	**St George Bore**	
	Drill Date	3 March 2006	
	Type	GAB Bore – Free flow - Fully cased (welded steel tube and pressure cemented to 1100m depth)	
	% of supply	100%	
	Production Capacity (Q at Max DD)	Unknown	
	Reliability	Excellent (No flow or pressure reductions recorded since commissioning of bore)	
	Water quality issues	TDS, Sodium, pH	
Sourcing Infrastructure	*Type (pumped/gravity/equipped bore/etc)*	Free flow	
	Description	- GAB Bore – Total Depth 1177m – Gubberamunda Sandstone Aquifer	
Are there any sources that do not undergo treatment prior to supply?	Yes, water sourced from the GAB bore is of a consistent quality and water quality data does not indicate any requirement for treatment. The bore is cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers.		
Treatment Plant A	***Name***	N/A	
	Process	N/A	
	Design Capacity (20 hr operation)	N/A	
	Daily flow range	N/A	
	Chemicals added	N/A	
	Standby chemical dosing facilities (Y/N)	N/A	
	Water sourced from and %	N/A	
	% of average day demand provided	N/A	
	% of scheme supply *Distribution area supplied*	N/A	
	Bypasses / Variations	N/A	
Are there any sources that do not undergo disinfection prior to supply?	Yes, water sourced from the GAB bore is of a consistent quality and water quality data does not indicate any requirement for disinfection. The bore is cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers.		
Disinfection	*Location*	N/A	
	Type	N/A	
	Dose rate	N/A	
	Target residual levels	N/A	
	Duty/standby	N/A	
	Dosing arrangements	N/A	
	Alarms	N/A	
	Auto shut-off arrangements	N/A	
Distribution and Reticulation System	*Pipe material*	AC	10,524 metres
		DICL	6 metres
		PVC	21,756 metres

Component		St George Water Supply	
		CICL	0 metres
		HDPE	2,905 metres
		TOTAL	**35,191 metres**
	Age range	0 –10 Years	4,679 metres
		10 –20 Years	10,033 metres
		20-30 Years	5,519 metres
		30 – 40 Years	4,436 metres
		40 –50 Years	0 metres
		50 –60 Years	0 metres
		60 + Years	10,524 metres
		TOTAL	**35,191 metres**
	Areas where potential long detention periods could be expected	All dead ends including those located at: Hill St Hume St Klinge Ln Whytes Rd Bowen St Commissioners Point Rd Anderson Ln Grey St Thuraggi Rd Dyball St Boronia Ave Kilroy St Isles St McGahan St Turvey Ct Carnarvon Hwy St George's Tce	
	Areas where low water pressure (eg < 12 m) could be expected during peak or other demand periods)	Unknown. No current modelling available to identify areas of low pressure. The network is not used for fire fighting purposes.	
Reservoirs A	***Ground (No)***	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
	Elevated (No)	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
Water quality responsibility changes	*Upstream location*	Nil	
	Downstream location	Nil	

Table 2.2 Dirranbandi Infrastructure Details

Component		Dirranbandi Water Supply
Sources (Surface Water)	***Name***	**Balonne Minor River**
	Type	River intake
	% of supply	Maximum 75%. Less during drought
	Production Capacity (Q at Max DD)	32.58 L/s
	Reliability	Unreliable in drought. Variable water quality
	Water quality issues	Turbidity
Sources (Ground Water)	***Name***	**Dirranbandi Bore**
	Drill Date	16 March 1994
	Type	GAB Bore – Free flow - Fully cased (welded steel tube and pressure cemented)
	% of supply	Min. 25%. More during drought.
	Reliability	Excellent (No flow or pressure reductions recorded since commissioning of bore)
	Water quality issues	TDS, Sodium, pH
Sourcing Infrastructure	*Type (pumped/gravity/equipped bore/etc)*	River water pumped. Bore water free flow
	Description	- River water intake at Balonne Minor River - GAB Bore – Total Depth1180m – Gubberamunda Sandstone Aquifer
Are there any sources that do not undergo treatment prior to supply?	Yes, water sourced from the GAB bore is of a consistent quality and water quality data does not indicate any requirement for treatment. The bore is cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers. 100% GAB bore water can be supplied to the scheme in the event of treatment plant breakdown or to conduct maintenance on the treatment plant.	
Treatment Plant A	***Name***	**Dirranbandi Water Treatment Plant**
	Process	Flocculation, clarification and filtration. Filter backwash conducted daily. Clarifier de-sludged via auto valve operated on timer. Owing to the age of the existing system the design capacity of each of the process steps is unknown and controlled by operator experience. Bore supply is cooled by a closed-circuit cooling tower to a target temperature of 30°C.
	Design Capacity (20 hr operation)	1.00 ML/d
	Daily flow range	0.00 – 1.00 ML/d
	Chemicals added	Aluminium Chlorohydrate, BASF Magnafloc LT20, Sodium Hypochlorite
	Standby chemical dosing facilities (Y/N)	Y
	Water sourced from and %	Balonne Minor River Intake 100%
	% of average day demand provided	75%
	% of scheme supply *Distribution area supplied*	100%
	Booster Pumping Equipment	2 x Southern Cross 100 x 65 -200 (18.5 kW) (duty/standby)

Component		Dirranbandi Water Supply
	Bypasses / Variations	Untreated GAB bore water may be used when the treatment plant is off-line. Bore water can bypass either the cooling tower to the clearwater reservoir or bypass the WTP altogether and into the reticulation under the natural pressure of the bore. Pipework that enabled raw surface water to fully or partially bypass the treatment plant has been disconnected.
	Monitoring Conducted	Continuous on-line monitoring of free chlorine, turbidity, temperature and pH from clear water reservoir. Daily - Sample point at discharge of high-lift pumps. and filter outlet - Turbidity (Target <0.3 NTU) Controlled by chemical concentration, filter backwash and clarifier de-sludge. - pH (Target 7.5) Controlled by bore water blend % - Chlorine (Target 2.5mg/L) Controlled by Sodium Hypochlorite pump setting
Are there any sources that do not undergo disinfection prior to supply?	No.	
Disinfection	*Location*	Dirranbandi Water Treatment Plant
	Type	Sodium Hypochlorite
	Dose rate	2.5 mg/L
	Target residual levels	- 2.5mg/L in WTP Clearwater Reservoir - Greater than 0.2 mg/L in all Reticulation Mains
	Duty/standby	Standby dosing pump available
	Dosing arrangements	Sodium Hypo dosed into filter discharge line prior to clear water storage reservoir. High dose of chlorine added to treated water before being diluted with GAB bore water in 200kL WTP reservoir. Dosing maintained for GAB bore water in WTP reservoir when plant off-line.
	Alarms	No
	Auto shut-off arrangements	No. Online monitoring.

Component		Dirranbandi Water Supply	
Distribution and Reticulation System	*Pipe material*	PVC	10,064 metres
		CICL	2,037 metres
		HDPE	6,038 metres
		Other	193 metres
		TOTAL	**18,332 metres**
	Age range	0 –10 Years	5,698 metres
		10 –20 Years	2,818 metres
		20-30 Years	7,735 metres
		30 – 40 Years	21 metres
		40 –50 Years	0 metres
		50 –60 Years	0 metres
		60 + Years	2,060 metres
		TOTAL	**18,332 metres**
	Areas where potential long detention periods could be expected	All dead ends including those located at: • Wyenbah Rd • Riverside Park • Dirranbandi Showgrounds • Railway Yards • Dirranbandi Golf Club	
	Areas where low water pressure (eg < 12 m) could be expected during peak or other demand periods)	Unknown. No current modelling available to identify areas of low pressure.	
Reservoirs A	***Ground (No)***	1	
	Name	Dirranbandi WTP Clearwater Storage	
	Capacity (ML)	0.2 ML	
	Roofed (Y/N)	Y	
	Vermin-proof (Y/N)	Y	
	Runoff directed off roof (Y/N)	Y	
	Elevated (No)	1	
	Name	Dirranbandi Water Tower	
	Capacity (ML)	0.2 ML - High-lift pumps start when level drops to 80%	
	Roofed (Y/N)	Y	
	Vermin-proof (Y/N)	Y	
	Runoff directed off roof (Y/N)	Y	
Water quality responsibility changes	*Upstream location*	Nil	
	Downstream location	Nil	

Table 2.3 Bollon Infrastructure Details

Component		Bollon Water Supply
Sources	***Name***	**Bollon Bore**
	Drill Date	01 November 2003
	Type	GAB Bore – Free flow - Fully cased (welded steel tube and pressure cemented to 560m depth)
	% of supply	100%
	Production Capacity (Q at Max DD)	unknown
	Reliability	Excellent (No flow or pressure reductions recorded since commissioning of bore)
	Water quality issues	TDS, Sodium, pH
Sourcing Infrastructure	*Type (pumped/gravity/equipped bore/etc)*	Free flow
	Description	- GAB Bore – Total Depth 805m – Gubberamunda Sandstone Aquifer
Are there any sources that do not undergo treatment prior to supply?	Yes, water sourced from the GAB bore is of a consistent quality and water quality data does not indicate any requirement for treatment. The bore is cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers.	
Treatment Plant A	***Name***	N/A
	Process	N/A
	Design Capacity (20 hr operation)	N/A
	Daily flow range	N/A
	Chemicals added	N/A
	Standby chemical dosing facilities (Y/N)	N/A
	Water sourced from and %	N/A
	% of average day demand provided	N/A
	% of scheme supply *Distribution area supplied*	N/A
	Bypasses / Variations	N/A
Are there any sources that do not undergo disinfection prior to supply?	Yes, water sourced from the GAB bore is of a consistent quality and water quality data does not indicate any requirement for disinfection. The bore is cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers.	
Disinfection	*Location*	N/A
	Type	N/A
	Dose rate	N/A
	Target residual levels	N/A
	Duty/standby	N/A
	Dosing arrangements	N/A
	Alarms	N/A
	Auto shut-off arrangements	N/A

Component		Bollon Water Supply	
Distribution and Reticulation System	*Pipe material*	AC	0 metres
		DICL	5 metres
		PVC	4,258 metres
		CICL	0.00 metres
		HDPE	350 metres
		TOTAL	**4,613 metres**
	Age range	0 –10 Years	2,656 metres
		10 –20 Years	1,205 metres
		20-30 Years	454 metres
		30 – 40 Years	298 metres
		40 –50 Years	0 metres
		50 –60 Years	0 metres
		60 + Years	0 metres
		TOTAL	**4,613 metres**
	Areas where potential long detention periods could be expected	All dead ends including those located at: • Bollon Cemetry • Works Depot / Camp • Bollon Showgrounds • Belmore St • Mary St • Main St	
	Areas where low water pressure (eg < 12 m) could be expected during peak or other demand periods)	Unknown. No current modelling available to identify areas of low pressure.	
Reservoirs A	***Ground (No)***	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
	Elevated (No)	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
Water quality responsibility changes	*Upstream location*	Nil	
	Downstream location	Nil	

Table 2.4 Thallon Infrastructure Details

Component		Thallon Water Supply
Sources	***Name***	**Thallon Bore**
	Drill Date	23 October 1980
	Type	GAB Bore – Free flow - Fully cased (welded steel tube and pressure cemented to 950m depth)
	% of supply	100%
	Production Capacity (Q at Max DD)	3.50 L/s
	Reliability	Excellent (No flow or pressure reductions recorded since commissioning of bore)
	Water quality issues	TDS, Sodium, pH
Sourcing Infrastructure	*Type (pumped/gravity/equipped bore/etc)*	Free flow
	Description	- GAB Bore – Total Depth 1183m – Gubberamunda Sandstone Aquifer
Are there any sources that do not undergo treatment prior to supply?	Yes, water sourced from the GAB bore is of a consistent quality and water quality data does not indicate any requirement for treatment. The bore is cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers.	
Treatment Plant A	***Name***	N/A
	Process	N/A
	Design Capacity (20 hr operation)	N/A
	Daily flow range	N/A
	Chemicals added	N/A
	Standby chemical dosing facilities (Y/N)	N/A
	Water sourced from and %	N/A
	% of average day demand provided	N/A
	% of scheme supply *Distribution area supplied*	N/A
	Bypasses / Variations	N/A
Are there any sources that do not undergo disinfection prior to supply?	Yes, water sourced from the GAB bore is of a consistent quality and water quality data does not indicate any requirement for disinfection. The bore is cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers.	
Disinfection	*Location*	N/A
	Type	N/A
	Dose rate	N/A
	Target residual levels	N/A
	Duty/standby	N/A
	Dosing arrangements	N/A
	Alarms	N/A
	Auto shut-off arrangements	N/A

Component		Thallon Water Supply	
Distribution and Reticulation System	*Pipe material*	AC	8 metres
		DICL	3 metres
		PVC	3,665 metres
		CICL	0 metres
		HDPE	589 metres
		TOTAL	**5,076 metres**
	Age range	0 –10 Years	1993 metres
		10 –20 Years	776 metres
		20-30 Years	691 metres
		30 – 40 Years	797 metres
		40 –50 Years	0 metres
		50 –60 Years	0 metres
		60 + Years	821 metres
		TOTAL	**5,076 metres**
	Areas where potential long detention periods could be expected	All dead ends including those located at: • Thallon Graincorp Depot • Garrah St • Pine St	
	Areas where low water pressure (eg < 12 m) could be expected during peak or other demand periods)	Unknown. No current modelling available to identify areas of low pressure.	
	Age range	0 – 65 Years	
	Approx % of total length		
	Areas where potential long detention periods could be expected	All dead ends.	
	Areas where low water pressure (eg < 12 m) could be expected during peak or other demand periods)	Unknown. No current modelling available to identify areas of low pressure.	
Reservoirs A	***Ground (No)***	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
	Elevated (No)	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
Water quality responsibility changes	*Upstream location*	Nil	
	Downstream location	Nil	

Table 2.5 Hebel Infrastructure Details

Component		Hebel Water Supply
Sources	***Name***	**Hebel Bore**
	Drill Date	7 February 1997
	Type	GAB Bore – Free flow - Fully cased (welded steel tube and pressure cemented)
	% of supply	100%
	Production Capacity (Q at Max DD)	Unknown
	Reliability	Excellent (No flow or pressure reductions recorded since commissioning of bore)
	Water quality issues	TDS, Sodium, pH
Sourcing Infrastructure	*Type (pumped/gravity/equipped bore/etc)*	Free flow
	Description	- GAB Bore – Total Depth 1180m – Gubberamunda Sandstone Aquifer
Are there any sources that do not undergo treatment prior to supply?	Yes, water sourced from the GAB bore is of a consistent quality and water quality data does not indicate any requirement for treatment. The bore is cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers.	
Treatment Plant A	***Name***	N/A
	Process	N/A
	Design Capacity (20 hr operation)	N/A
	Daily flow range	N/A
	Chemicals added	N/A
	Standby chemical dosing facilities (Y/N)	N/A
	Water sourced from and %	N/A
	% of average day demand provided	N/A
	% of scheme supply *Distribution area supplied*	N/A
	Bypasses / Variations	N/A
Are there any sources that do not undergo disinfection prior to supply?	Yes, water sourced from the GAB bore is of a consistent quality and water quality data does not indicate any requirement for disinfection. The bore is cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers.	
Disinfection	Location	N/A
	Type	N/A
	Dose rate	N/A
	Target residual levels	N/A
	Duty/standby	N/A
	Dosing arrangements	N/A
	Alarms	N/A
	Auto shut-off arrangements	N/A

Component		Hebel Water Supply	
Distribution and Reticulation System	*Pipe material*	**AC**	0 metres
		PVC	1,874 metres
		CICL	0 metres
		HDPE	1,757 metres
		TOTAL	**3,631 metres**
	Age range	0 –10 Years	1,821 metres
		10 –20 Years	1,810 metres
		20-30 Years	0 metres
		30 – 40 Years	0 metres
		40 –50 Years	0 metres
		50 –60 Years	0 metres
		60 + Years	0 metres
		TOTAL	**3,631 metres**
	Areas where potential long detention periods could be expected	All dead ends including those located at: • Maud St • James St (Both Ends) • Hebel Sportsground	
	Areas where low water pressure (eg < 12 m) could be expected during peak or other demand periods)	Unknown. No current modelling available to identify areas of low pressure. The network is not used for fire fighting purposes.	
Reservoirs A	***Ground (No)***	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
	Elevated (No)	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
Water quality responsibility changes	*Upstream location*	Nil	
	Downstream location	Nil	

Table 2.6 Mungindi Infrastructure Details

Component		Mungindi Water Supply	
Sources	***Name***	**Moree Plains Shire Council Off-take**	
	Type	Water Supply from Neighbouring Council	
	% of supply	100%	
	Reliability	Excellent (No flow or pressure reductions recorded since commissioning of bore)	
	Water quality issues	Turbidity	
Sourcing Infrastructure	*Type (pumped/gravity/equipped bore/etc)*	Gravity (From Moree Plains Reservoirs)	
	Description	2 x Connections (1 x 100m and 1 x 150mm)	
Are there any sources that do not undergo treatment prior to supply?	No, All water treated by Moree Plains Shire Council at Mungindi WTP.		
Treatment Plant A	***Name***	N/A	
	Process	N/A	
	Design Capacity (20 hr operation)	N/A	
	Daily flow range	N/A	
	Chemicals added	N/A	
	Standby chemical dosing facilities (Y/N)	N/A	
	Water sourced from and %	N/A	
	% of average day demand provided	N/A	
	% of scheme supply *Distribution area supplied*	N/A	
	Bypasses / Variations	N/A	
Are there any sources that do not undergo disinfection prior to supply?	No		
Disinfection	*Location*	N/A	
	Type	N/A	
	Dose rate	N/A	
	Target residual levels	N/A	
	Duty/standby	N/A	
	Dosing arrangements	N/A	
	Alarms	N/A	
	Auto shut-off arrangements	N/A	
Distribution and Reticulation System	*Pipe material*	AC	326 metres
		PVC	3,044 metres
		CICL	0 metres
		HDPE	0 metres
		TOTAL	**3,370 metres**
	Age range	0 –10 Years	2,581 metres
		10 –20 Years	463 metres
		20-30 Years	0 metres

Component		Mungindi Water Supply	
		30 – 40 Years	0 metres
		40 –50 Years	0 metres
		50 –60 Years	0 metres
		60 + Years	326 metres
		TOTAL	**3,370 metres**
	Areas where potential long detention periods could be expected	All dead ends including those located at: • Two Mile Hotel • NSW DPI Wash-down Facility • Tully St • River Parkland • Barwon St • Gregory St	
	Areas where low water pressure (eg < 12 m) could be expected during peak or other demand periods)	Unknown. No current modelling available to identify areas of low pressure. The network is not used for fire fighting purposes.	
Reservoirs A	***Ground (No)***	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
	Elevated (No)	N/A	
	Name	N/A	
	Capacity (ML)	N/A	
	Roofed (Y/N)	N/A	
	Vermin-proof (Y/N)	N/A	
	Runoff directed off roof (Y/N)	N/A	
Water quality responsibility changes	*Upstream location*	Nil	
	Downstream location	Nil	

2.3. Key Stakeholders

Table 2.7 Stakeholders

Organisation	Contact Name and Details	Relevance to management of drinking water quality	How the stakeholder is engaged in the DWQMP
Balonne Shire Council	Matthew Magin – Chief Executive Officer (07) 4620 8888	Overall supervision of drinking water quality management	Review and introduction of DWQMP
Balonne Shire Council	Chris Whitaker – Director of Infrastructure Services (07) 4620 8888	Overall supervision of drinking water quality management	Review and introduction of the DWQMP.
Balonne Shire Council	Michael Lynch – Manager Urban Infrastructure (07) 4620 8888	Overall supervision of drinking water quality management	Review of DWQMP.
Balonne Shire Council	Dylan Sherriff – Water and Sewerage Supervisor (07) 4620 8888	Construction, operation and maintenance of all BSC water supply schemes.	Provision of information required for the preparation and review of the DWQMP.
Balonne Shire Council	Ronald Cooke – Dirranbandi Town Supervisor (07) 4620 8888	Operation and maintenance of the Dirranbandi and Hebel water supply schemes.	Provision of information required for the preparation and review of the DWQMP.
Balonne Shire Council	Timothy Hamper – Ganger (07) 4620 8888	Assist in operation and maintenance of the Dirranbandi and Hebel water supply schemes.	Provision of information required for the preparation of the DWQMP.
Balonne Shire Council	Lindsay Flick – Thallon Town Supervisor (07) 4620 8888	Operation and maintenance of the Thallon and Mungindi water supply schemes.	Provision of information required for the preparation and review of the DWQMP.
Balonne Shire Council	Michael Nancarrow– Bollon Town Supervisor (07) 4620 8888	Operation and maintenance of the Bollon water supply scheme.	Provision of information required for the preparation and review of the DWQMP.
Balonne Shire Council	Di Francisco Environmental Health Officer (07) 4620 8888	Supervision of drinking water quality management	Provision of information required for the preparation and review of the DWQMP.
Queensland Health	Peter Boland Manager Environmental Health 0417 791607	Regulatory body.	N/A
Department of Regional Development, Manufacturing and Water	Engineer 1300 596 709	Regulatory body.	Provided advice regarding the preparation and review of the DWQMP.
Moree Plains Shire Council	Chief Executive Officer (02) 67573222	Supplier of potable water to Balonne Shire Council	Provides advice and details of Mungindi water operations.
Coogee Chemicals (Elite)	(07) 3893 7506	Supplier of Sodium Hypochlorite to Balonne Shire Council.	N/A
Water Floc Pty Ltd	Vince Foley 0408444760	Supplier of Aluminium Chlorohydrate to Balonne Shire Council.	N/A

Critical Customers	Refer to Council's Critical Customers Register	Vulnerable customers potentially impacted by water quality incidents.	Customers contacted and updated on water quality incidents.

3.0 Identify Hazards and Hazardous Events

3.1. Information Gathering – water quality and catchment characteristics

Table 3.1 St George Raw / Treated / Reticulated Water Quality Data

Summary Page	
Scheme	St George
Sampling Location	BSC Administration Building
Laboratory Used	Queensland Health Forensic and Scientific Services

Parameter	Units	Frequency of Reporting	ADWG Limit		No. Samples	Summary of Results			No. Exceeding		Comment
			Aesthetic	Health		Maximum Value	Average Value	Minimum Value	Aesthetic	Health	
PH		Quarterly	6.5-8.5		4	8.54	8.47	8.34	2	0	Some Non-Compliances - ADWG Aesthetic Limit
Total Hardness	mg/L	Quarterly	200.00		4	7.9	7.55	7.3	0	0	ADWG Compliant
Alkalinity	mg/L	Quarterly			4	290	282.50	280	0	0	ADWG Compliant
Total Dissolved Ions	mg/L	Quarterly			4	686	682.75	680	0	0	ADWG Compliant
Total Dissolved Solids	mg/L	Quarterly	500.00		4	550	550.00	550	4	0	Some Non-Compliances - ADWG Aesthetic Limit
Colour	PCU	Quarterly	15.00		4	<1	N/A	0	0	0	ADWG Compliant
Turbidity	NTU	Quarterly	5.00		4	<1	N/A	<1	0	0	ADWG Compliant
Sodium	mg/L	Quarterly	180.00		4	210	207.50	200	4	0	Some Non-Compliances - ADWG Aesthetic Limit
Potassium	mg/L	Quarterly			4	2.3	2.25	2.2	0	0	ADWG Compliant
Calcium	mg/L	Quarterly			4	3.1	3.00	2.9	0	0	ADWG Compliant
Magnesium	mg/L	Quarterly			4	0	#DIV/0!	0	0	0	ADWG Compliant
Chloride	mg/L	Quarterly	250.00		4	89	87.75	87	0	0	ADWG Compliant
Fluoride	mg/L	Quarterly		1.50	4	0.37	0.36	0.35	0	0	ADWG Compliant
Nitrate	mg/L	Quarterly		50.00	4	0.06	N/A	<0.05	0	0	ADWG Compliant
Sulphate	mg/L	Quarterly	250.00	500.00	4	48	47.50	47	0	0	ADWG Compliant
Iron	mg/L	Quarterly	0.30		4	0.02	N/A	<0.01	0	0	ADWG Compliant
Manganese	mg/L	Quarterly	0.10	0.50	4	0.011	N/A	<0.01	0	0	ADWG Compliant
Zinc	mg/L	Quarterly	3.00		4	<0.01	N/A	<0.01	0	0	ADWG Compliant
Aluminium	mg/L	Quarterly	0.20		4	<0.05	N/A	0	0	0	ADWG Compliant
Copper	mg/L	Quarterly	1.00	2.00	4	0.04	N/A	0.009	0	0	ADWG Compliant
E. Coli	CFU/100mL	Weekly		0.00	51					0	ADWG Compliant

There are no treatment processes conducted for the St George water supply. The above table is representative of the raw reticulated water quality. As can be seen in the above table, water sourced from the St George Artesian Bore is of very consistent quality. Parameters such as Total Dissolved Solids and Sodium consistently exceed the ADWG aesthetic limits. The water quality data included in the table is based on water quality testing from the 2021/2022 financial year. Testing for heavy metals on an annual basis is to be included in the monitoring routine.

Alternative monitoring sites for the St George Raw/Treated/Reticulated Water Quality Data include the above sampled BSC Administration Building, BSC Works Depot and the Show Grounds.

Table 3.2 Dirranbandi Raw Water Quality Data

No historical raw water quality data exists for the Dirranbandi Water Supply Scheme.

Table 3.3 Dirranbandi Treated / Reticulated Water Quality Data

Summary Page	
Scheme	Dirranbandi
Sampling Location	Dirranbandi Works Depot
Laboratory Used	Queensland Health Forensic and Scientific Services

Parameter	Units	Frequency of Reporting	ADWG Limit		No. Samples	Summary of Results			No. Exceeding		Comment
			Aesthetic	Health		Maximum Value	Average Value	Minimum Value	Aesthetic	Health	
PH		Quarterly	6.5-8.5		4	8.57	8.46	8.32	**6**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Total Hardness	mg/L	Quarterly	200.00		4	24	14.03	8.5	0	0	ADWG Compliant
Alkalinity	mg/L	Quarterly			4	420	312.50	200	0	0	ADWG Compliant
Total Dissolved Ions	mg/L	Quarterly			4	842	629.00	406	0	0	ADWG Compliant
Total Dissolved Solids	mg/L	Quarterly	500.00		4	620	470.00	310	**2**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Colour	PCU	Quarterly	15.00		4	<1	N/A	0	0	0	ADWG Compliant
Turbidity	NTU	Quarterly	5.00		4	<1	N/A	<1	0	0	ADWG Compliant
Sodium	mg/L	Quarterly	180.00		4	240	180.00	120	**2**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Potassium	mg/L	Quarterly			4	3.4	2.95	2.5	0	0	ADWG Compliant
Calcium	mg/L	Quarterly			4	5.9	4.00	3	0	0	ADWG Compliant
Magnesium	mg/L	Quarterly			4	2.2	1.01	0.26	0	0	ADWG Compliant
Chloride	mg/L	Quarterly	250.00		4	84	64.75	45	0	0	ADWG Compliant
Fluoride	mg/L	Quarterly		1.50	4	0.71	0.54	0.37	0	0	ADWG Compliant
Nitrate	mg/L	Quarterly		50.00	4	0.81	N/A	<0.05	0	0	ADWG Compliant
Sulphate	mg/L	Quarterly	250.00	500.00	4	3.3	2.38	1.9	0	0	ADWG Compliant
Iron	mg/L	Quarterly	0.30		4	0.09	N/A	<0.01	0	0	ADWG Compliant
Manganese	mg/L	Quarterly	0.10	0.50	4	0.01	N/A	<0.01	0	0	ADWG Compliant
Zinc	mg/L	Quarterly	3.00		4	<0.01	N/A	<0.01	0	0	ADWG Compliant
Aluminium	mg/L	Quarterly	0.20		4	0.04	N/A	0.04	0	0	ADWG Compliant
Copper	mg/L	Quarterly	1.00	2.00	4	0.012	N/A	0.009	0	0	ADWG Compliant
E. Coli	CFU/100mL	Weekly		0.00	51					0	ADWG Compliant

The above table is representative of treated reticulated water quality. The water quality data included in the table is based on water quality testing from the 2021/2022 financial year. Chlorine monitoring and dosing equipment has been upgraded to ensure a consistent level of free chlorine is maintained in the treated water. THM and Chlorate is to be included in the Quarterly testing for treated Dirranbani Scheme and heavy metals on an annual basis. Depending on the outcome of the investigations of the RMIP, raw water will be tested for standard water analysis if Balonne Shire Council continues usings the existing or a new water treatment plant.

Alternative monitoring sites for the Dirranbandi Raw/Treated/Reticulated Water Quality Data include the above sampled, BSC Works Depot, Café 22 and the Pool.

Table 3.4 Bollon Raw / Treated / Reticulated Water Quality Data

Summary Page	
Scheme	Bollon
Sampling Location	Rayner Place Park
Laboratory Used	Queensland Health Forensic and Scientific Services

Parameter	Units	Frequency of Reporting	ADWG Limit		No. Samples	Summary of Results			No. Exceeding		Comment
			Aesthetic	Health		Maximum Value	Average Value	Minimum Value	Aesthetic	Health	
PH		Quarterly	6.5-8.5		4	8.65	8.59	8.44	**3**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Total Hardness	mg/L	Quarterly	200.00		4	5.2	5.15	5.1	0	0	ADWG Compliant
Alkalinity	mg/L	Quarterly			4	360	352.50	350	0	0	ADWG Compliant
Total Dissolved Ions	mg/L	Quarterly			4	739	733.50	726	0	0	ADWG Compliant
Total Dissolved Solids	mg/L	Quarterly	500.00		4	560	555.00	550	**4**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Colour	PCU	Quarterly	15.00		4	<1	N/A	0	0	0	ADWG Compliant
Turbidity	NTU	Quarterly	5.00		4	<1	N/A	<1	0	0	ADWG Compliant
Sodium	mg/L	Quarterly	180.00		4	220	220.00	220	**4**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Potassium	mg/L	Quarterly			4	1.8	1.73	1.7	0	0	ADWG Compliant
Calcium	mg/L	Quarterly			4	2.1	2.03	2	0	0	ADWG Compliant
Magnesium	mg/L	Quarterly			4	0.03	0.03	0.03	0	0	ADWG Compliant
Chloride	mg/L	Quarterly	250.00		4	89	87.75	87	0	0	ADWG Compliant
Fluoride	mg/L	Quarterly		1.50	4	0.44	0.42	0.41	0	0	ADWG Compliant
Nitrate	mg/L	Quarterly		50.00	4	<0.05	N/A	<0.05	0	0	ADWG Compliant
Sulphate	mg/L	Quarterly	250.00	500.00	4	5.3	5.18	5.1	0	0	ADWG Compliant
Iron	mg/L	Quarterly	0.30		4	0.04	N/A	<0.01	0	0	ADWG Compliant
Manganese	mg/L	Quarterly	0.10	0.50	4	0.12	N/A	<0.01	1	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Zinc	mg/L	Quarterly	3.00		4	<0.01	N/A	<0.01	0	0	ADWG Compliant
Aluminium	mg/L	Quarterly	0.20		4	<0.05	N/A	0	0	0	ADWG Compliant
Copper	mg/L	Quarterly	1.00	2.00	4	0.011	N/A	0.009	0	0	ADWG Compliant
E. Coli	CFU/100mL	Monthly		0.00	12					0	ADWG Compliant

There are no treatment processes conducted for the Bollon water supply. The above table is representative of the raw reticulated water quality. As can be seen in the above table, water sourced from the Bollon Artesian Bore is of consistent quality. Parameters such as Total Dissolved Solids and Sodium consistently exceed the ADWG aesthetic limits. pH values occasionally exceed the ADWG aesthetic limit with the average value is just over the ADWG limit of 8.5. The water quality data included in the table is based on water quality testing from the 2021/2022 financial year. Testing for heavy metals on an annual basis is to be included in the monitoring routine.

Table 3.5 Thallon Raw / Treated / Reticulated Water Quality Data

Summary Page	
Scheme	Thallon
Sampling Location	Thallon Park
Laboratory Used	Queensland Health Forensic and Scientific Services

Parameter	Units	Frequency of Reporting	ADWG Limit		No. Samples	Summary of Results			No. Exceeding		Comment
			Aesthetic	Health		Maximum Value	Average Value	Minimum Value	Aesthetic	Health	
PH		Quarterly	6.5-8.5		4	8.53	8.44	8.39	1	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Total Hardness	mg/L	Quarterly	200.00		4	5.9	5.60	5.1	0	0	ADWG Compliant
Alkalinity	mg/L	Quarterly			4	490	462.50	440	0	0	ADWG Compliant
Total Dissolved Ions	mg/L	Quarterly			4	911	866.50	820	0	0	ADWG Compliant
Total Dissolved Solids	mg/L	Quarterly	500.00		4	650	622.50	590	**4**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Colour	PCU	Quarterly	15.00		4	<1	N/A	0	0	0	ADWG Compliant
Turbidity	NTU	Quarterly	5.00		4	<1	N/A	<1	0	0	ADWG Compliant
Sodium	mg/L	Quarterly	180.00		4	260	247.50	230	**4**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Potassium	mg/L	Quarterly			4	2.5	2.40	2.3	0	0	ADWG Compliant
Calcium	mg/L	Quarterly			4	2.3	2.20	2	0	0	ADWG Compliant
Magnesium	mg/L	Quarterly			4	0.03	0.03	0.03	0	0	ADWG Compliant
Chloride	mg/L	Quarterly	250.00		4	59	54.75	45	0	0	ADWG Compliant
Fluoride	mg/L	Quarterly		1.50	4	0.68	0.64	0.58	0	0	ADWG Compliant
Nitrate	mg/L	Quarterly		50.00	4	<0.05	N/A	<0.05	0	0	ADWG Compliant
Sulphate	mg/L	Quarterly	250.00	500.00	4	2.1	1.75	1.4	0	0	ADWG Compliant
Iron	mg/L	Quarterly	0.30		4	0.11	N/A	<0.01	0	0	ADWG Compliant
Manganese	mg/L	Quarterly	0.10	0.50	4	0.017	N/A	<0.01	0	0	ADWG Compliant
Zinc	mg/L	Quarterly	3.00		4	<0.01	N/A	<0.01	0	0	ADWG Compliant
Aluminium	mg/L	Quarterly	0.20		4	<0.05	N/A	0	0	0	ADWG Compliant
Copper	mg/L	Quarterly	1.00	2.00	4	0.16	N/A	0.009	0	0	ADWG Compliant
E. Coli	CFU/100mL	Monthly		0.00	12					0	ADWG Compliant

There are no treatment processes conducted for the Thallon water supply. The above table is representative of the raw reticulated water quality. As can be seen in the above table, water sourced from the Thallon Artesian Bore is of consistent quality. Parameters such as Total Dissolved Solids and Sodium consistently exceed the ADWG aesthetic limits. pH values occasionally exceed the ADWG aesthetic limit, with all samples within the higher range of the aesthetic limits (greater than 8.3). The water quality data included in the table is based on water quality testing from the 2021/2022 financial year. Testing for heavy metals on an annual basis is to be included in the monitoring routine.

Table 3.6 Hebel Raw / Treated / Reticulated Water Quality Data

Summary Page	
Scheme	Hebel
Sampling Location	Hebel Park
Laboratory Used	Queensland Health Forensic and Scientific Services

Parameter	Units	Frequency of Reporting	ADWG Limit		No. Samples	Summary of Results			No. Exceeding		Comment
			Aesthetic	Health		Maximum Value	Average Value	Minimum Value	Aesthetic	Health	
PH		Quarterly	6.5-8.5		4	8.68	8.65	8.63	**3**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Total Hardness	mg/L	Quarterly	200.00		3	4.9	4.83	4.8	0	0	ADWG Compliant
Alkalinity	mg/L	Quarterly			3	380	380.00	380	0	0	ADWG Compliant
Total Dissolved Ions	mg/L	Quarterly			3	743	737.67	734	0	0	ADWG Compliant
Total Dissolved Solids	mg/L	Quarterly	500.00		3	540	540.00	540	**3**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Colour	PCU	Quarterly	15.00		3	<1	N/A	0	0	0	ADWG Compliant
Turbidity	NTU	Quarterly	5.00		3	<1	N/A	<1	0	0	ADWG Compliant
Sodium	mg/L	Quarterly	180.00		3	220	220.00	220	**3**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Potassium	mg/L	Quarterly			3	1.4	1.37	1.3	0	0	ADWG Compliant
Calcium	mg/L	Quarterly			3	1.9	1.87	1.8	0	0	ADWG Compliant
Magnesium	mg/L	Quarterly			3	0.08	0.05	0.03	0	0	ADWG Compliant
Chloride	mg/L	Quarterly	250.00		3	68	67.67	67	0	0	ADWG Compliant
Fluoride	mg/L	Quarterly		1.50	3	0.48	0.47	0.46	0	0	ADWG Compliant
Nitrate	mg/L	Quarterly		50.00	3	0.1	N/A	<0.05	0	0	ADWG Compliant
Sulphate	mg/L	Quarterly	250.00	500.00	3	0.8	0.73	0.7	0	0	ADWG Compliant
Iron	mg/L	Quarterly	0.30		3	<0.01	N/A	<0.01	0	0	ADWG Compliant
Manganese	mg/L	Quarterly	0.10	0.50	3	0.014	N/A	<0.01	0	0	ADWG Compliant
Zinc	mg/L	Quarterly	3.00		3	<0.01	N/A	<0.01	0	0	ADWG Compliant
Aluminium	mg/L	Quarterly	0.20		3	<0.05	N/A	0	0	0	ADWG Compliant
Copper	mg/L	Quarterly	1.00	2.00	3	0.015	N/A	0.009	0	0	ADWG Compliant
E. Coli	CFU/100mL	Monthly		0.00	12					0	ADWG Compliant

There are no treatment processes conducted for the Hebel water supply. The above table is representative of the raw reticulated water quality. As can be seen in the above table, water sourced from the Hebel Artesian Bore is of consistent quality. Parameters such as pH, Total Dissolved Solids and Sodium consistently exceed the ADWG aesthetic limits. The water quality data included in the table is based on water quality testing from the 2021/2022 financial year. Testing for heavy metals on an annual basis is to be included in the monitoring routine.

Table 3.7 Mungindi Raw Water Quality Data

No historical raw water quality data exists for the Mungindi Water Supply Scheme.

Table 3.8 Mungindi Treated / Reticulated Water Quality Data

Summary Page	
Scheme	Mungindi
Sampling Location	Mungindi - River Park
Laboratory Used	Queensland Health Forensic and Scientific Services

Parameter	Units	Frequency of Reporting	ADWG Limit		No. Samples	Summary of Results			No. Exceeding		Comment
			Aesthetic	Health		Maximum Value	Average Value	Minimum Value	Aesthetic	Health	
PH		Quarterly	6.5-8.5		4	8.4	8.40	8.39	**3**	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Total Hardness	mg/L	Quarterly	200.00		3	44	38.33	33	0	0	ADWG Compliant
Alkalinity	mg/L	Quarterly			3	280	182.67	38	0	0	ADWG Compliant
Total Dissolved Ions	mg/L	Quarterly			3	562	502.67	473	0	0	ADWG Compliant
Total Dissolved Solids	mg/L	Quarterly	500.00		3	410	370.00	350	0	0	ADWG Compliant
Colour	PCU	Quarterly	15.00		3	<1	N/A	0	0	0	ADWG Compliant
Turbidity	NTU	Quarterly	5.00		3	17	N/A	<1	1	0	**Some Non-Compliances - ADWG Aesthetic Limit**
Sodium	mg/L	Quarterly	180.00		3	150	133.33	120	0	0	ADWG Compliant
Potassium	mg/L	Quarterly			3	4	3.67	3.4	0	0	ADWG Compliant
Calcium	mg/L	Quarterly			3	9.2	8.63	7.9	0	0	ADWG Compliant
Magnesium	mg/L	Quarterly			3	5.2	4.10	3.2	0	0	ADWG Compliant
Chloride	mg/L	Quarterly	250.00		3	51	46.67	44	0	0	ADWG Compliant
Fluoride	mg/L	Quarterly		1.50	3	1.1	0.65	0.4	0	0	ADWG Compliant
Nitrate	mg/L	Quarterly		50.00	3	1.3	N/A	<0.05	0	0	ADWG Compliant
Sulphate	mg/L	Quarterly	250.00	500.00	3	6	4.70	3.2	0	0	ADWG Compliant
Iron	mg/L	Quarterly	0.30		3	0.02	N/A	<0.01	0	0	ADWG Compliant
Manganese	mg/L	Quarterly	0.10	0.50	3	0.005	N/A	<0.01	0	0	ADWG Compliant
Zinc	mg/L	Quarterly	3.00		3	<0.01	N/A	<0.01	0	0	ADWG Compliant
Aluminium	mg/L	Quarterly	0.20		3	<0.05	N/A	0	0	0	ADWG Compliant
Copper	mg/L	Quarterly	1.00	2.00	3	0.021	N/A	0.009	0	0	ADWG Compliant
E. Coli	CFU/100mL	Weekly		0.00	51					0	ADWG Compliant

Potable water is supplied by Moree Plains Shire Council to Balonne Shire Council in the township of Mungindi. Water is treated by Moree Plains Shire Council at the Mungindi water treatment plant. Verification water quality monitoring is conducted monthly by Balonne Shire Council and Moree Plains Shire Council. The above data is from the Balonne Shire Council testing for the 2021/2022 financial year. Within the last quarter (quarter 4) of the recording period turbidity was recorded well in excess of the ADWG aesthetic limit. Over the recording period three (3) pH readings were in excess of the ADWG aesthetic limit. pH is controlled at the Mungindi water treatment plant by the addition of soda ash. It is assumed the non-compliance was a result of incorrect pH adjustment at the Mungindi water treatment plant. Moree Plains Shire Council conduct operational monitoring at the Mungindi WTP (NSW) and the Mungindi Hospital (Qld). Parameters tested include pH, turbidity and free chlorine. Records of operational monitoring are kept by Moree Plains Shire Council. Balonne Shire Council is notified by Moree Plains Shire Council when health limits of the ADWG are exceeded. Balonne Shire Council is not notified of exceedances to operational parameters. Testing for heavy metals on an annual basis is to be included in the monitoring routine.

3.1.2. Water quality complaints

The Balonne Shire Council record water quality complaints through the service request process. Very few water complaints are received from schemes supplied by GAB bore water as the water is of a very consistent quality. Complaints in the Dirranbandi and Mungindi water supply schemes sometimes bypass the service request process with customers going directly to the town officer / water treatment plant operator. The town officer/treatment plant operator is required to redirect the customer to lodge the complaint formally or ensure that it is recorded.

3.1.3. Catchment Characteristics

3.1.1.1 Condamine – Balonne Catchment – Dirranbandi Water Source

Raw water for the Dirranbandi water supply scheme is drawn from the Balonne Minor River which is located within the Condamine – Balonne catchment. The Condamine-Balonne region is in southern Queensland, extends about 100 km to the south-west into New South Wales and covers 12.8 percent of the total area of the Murray-Darling Basin (MDB). The region is based around the Condamine and Balonne rivers. The population is 182,000 or 9 percent of the MDB total, concentrated in the centres of Toowoomba, Warwick, Dalby, Chinchilla, Roma and St George. Land use is dominated by cattle and sheep grazing and there are significant areas of grain and cotton crops. Over 112,000 ha of irrigated crops were grown in 2000 and 63 percent of this was cotton. There are several nationally significant wetlands located on the lower Balonne River system. The Ramsar-listed Narran Lake Nature Reserve (which includes Back and Clear lakes) located in New South Wales is part of large terminal wetlands of the Narran River at the end of the Condamine system flowing out of Queensland. The Culgoa River floodplain supports a significant area of remnant Coolibah woodlands.

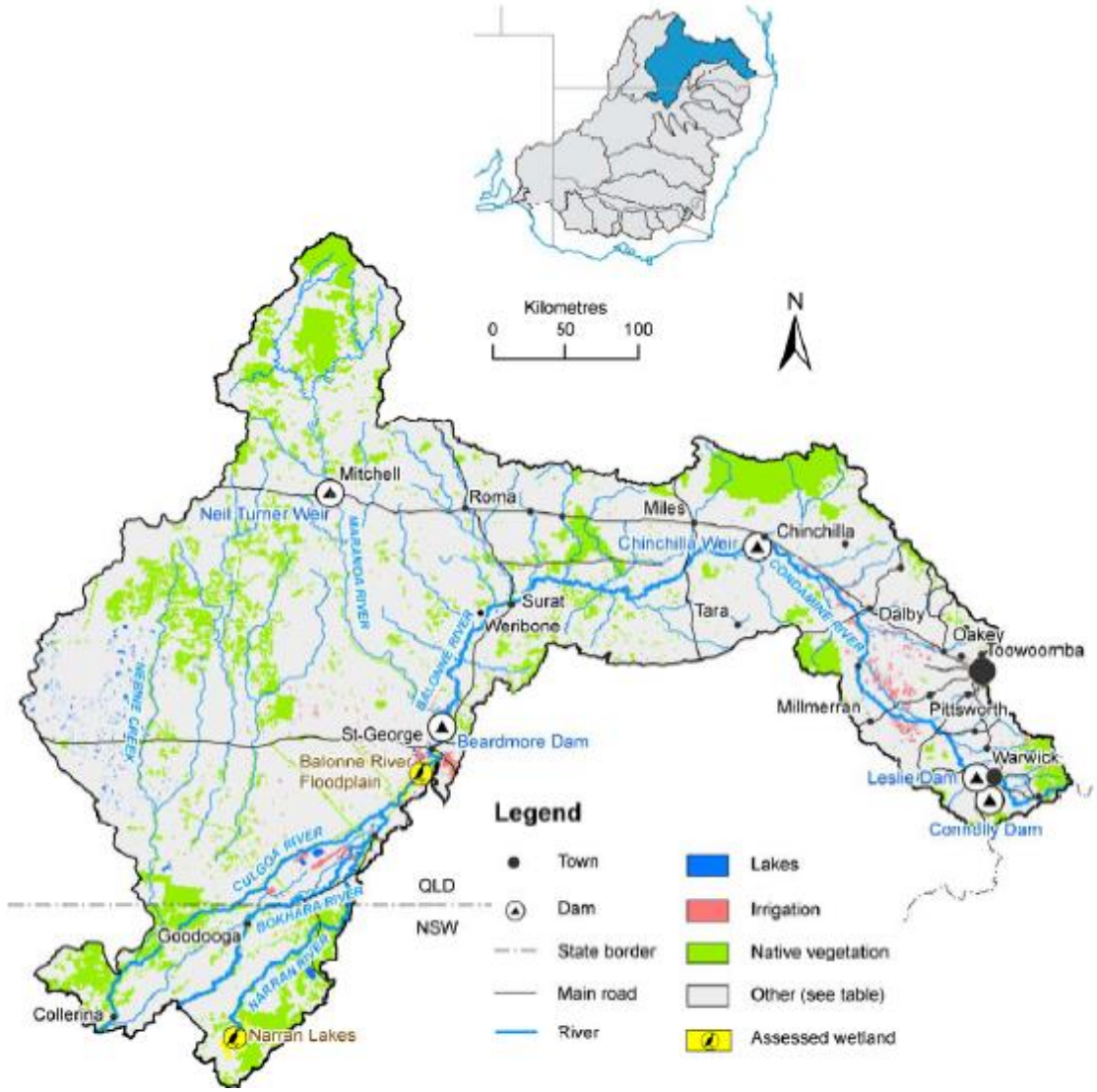

Figure 3.1 Condamine - Balonne Catchment Map

The region uses 3 percent of the surface water diverted for irrigation in the MDB and about 10 percent of the total groundwater used in the MDB. The construction of public storages in the upper Condamine and the Balonne River near St George has resulted in a degree of regulation, particularly of the Balonne River downstream of the Beardmore Dam. The three main irrigation areas are the Upper Condamine Water Supply Scheme, the Chinchilla Weir Water Supply Scheme and the St George Water Supply Scheme. There is also some licensed water harvesting for irrigation via interception and on-farm storage of overland flow. Around 75 percent of the irrigation water used within the region is sourced from surface water diversions.

Land use	Area		
	percent		ha
Dryland crops	6.6%		899,000
Dryland pasture	76.4%		10,419,400
Irrigated crops	0.8%		112,600
Cereals		*15.5%*	*17,400*
Cotton		*63.5%*	*71,500*
Horticulture		*2.8%*	*3,100*
Orchards		*0.8%*	*900*
Pasture and hay		*17.2%*	*19,500*
Vine fruits		*0.2%*	*200*
Native vegetation	15.8%		2,151,900
Plantation forests	<0.1%		2,400
Urban	0.2%		25,000
Water	0.2%		28,500
Total	**100.0%**		**13,638,800**

Source: CSIRO (2008). Water availability in the Condamine-Balonne. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project.

3.1.1.2 Border Rivers Catchment – Mungindi Water Source

Raw water for the Mungindi water supply scheme is drawn from the Barwon River which is located within the Border Rivers catchment. The Border Rivers region is in southern Queensland and north-eastern New South Wales and represents 4 percent of the area of the Murray-Darling Basin (MDB). The region is based around the Macintyre Brook and the Dumaresq River which joins the Macintyre River that ultimately becomes the Barwon River. The population is around 50,000 or 2.5 percent of the MDB total, concentrated in the major centres of Glen Innes, Inverell, Tenterfield, Stanthorpe, Inglewood, Mungindi and Goondiwindi. The dominant land use is broadacre livestock grazing, particularly on the tablelands, with a shift to cropping on the slopes and plains. In the year 2000, there were approximately 75,300 ha of irrigated cropping with cotton accounting for over 75 percent of this area. There is a small amount of commercial plantation forestry and large numbers of farm dams and ring tanks in the region. The nationally significant wetland Morella Watercourse/Boobera Lagoon/Pungbougal Lagoon 6 km south-west of Goondiwindi in New South Wales is considered to be one of the most important Aboriginal places in eastern Australia.

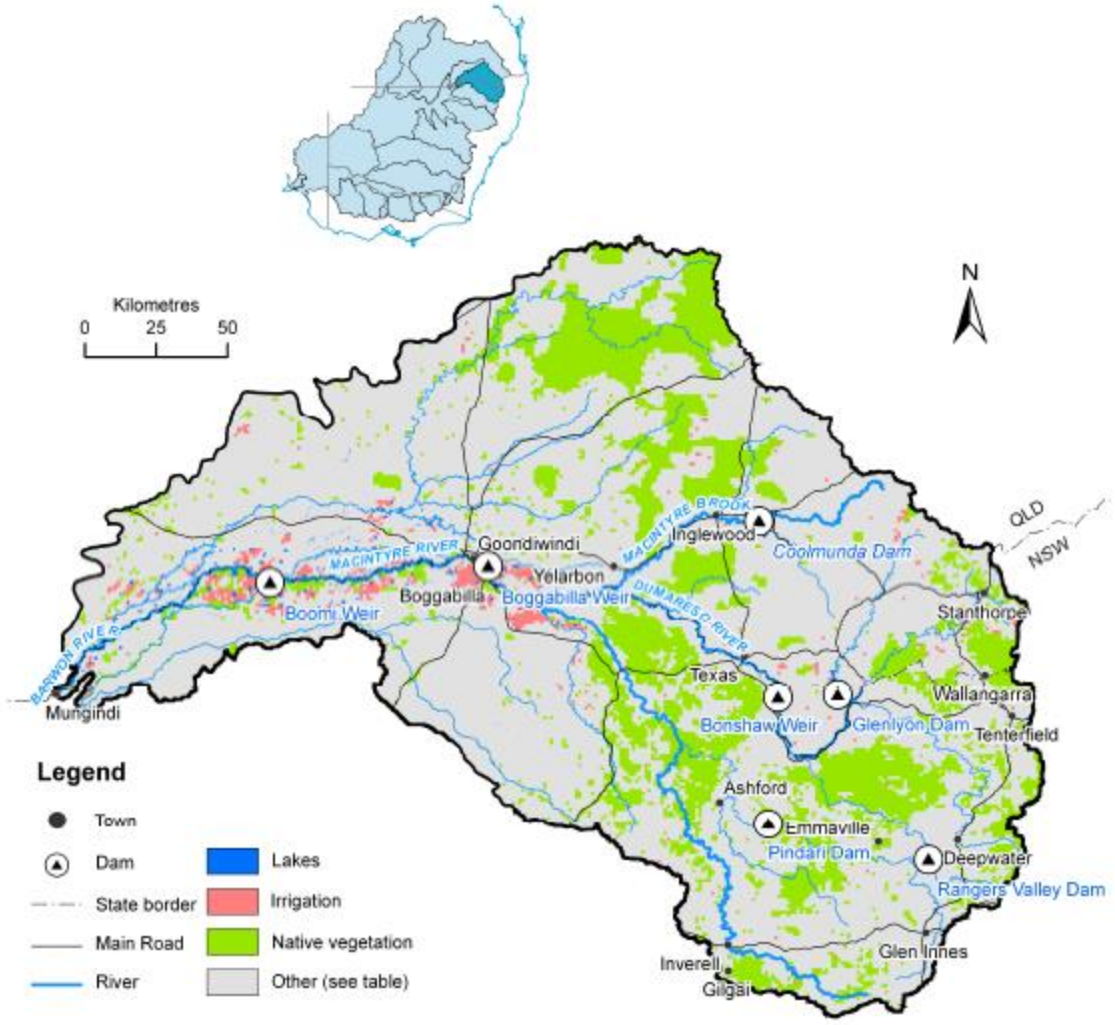

Figure 3.2 Border Rivers Catchment Map

The region uses 4.4 percent of the surface water diverted for irrigation and slightly less than 2 percent of the MDB groundwater resource that is used. A number of major water storages constructed since the late 1960s enable irrigated agriculture on the plains. There are seven groundwater management units (GMUs) in the southern part of the region. Over 90 percent of the water used for irrigation is diverted from surface water resources. However, groundwater use is high, and is a particularly important resource in dry years. The following sections summarise the region's biophysical features including rainfall, topography, land use and the environmental assets of significance. It outlines the institutional arrangements for the region's natural resources and presents key features of the surface and groundwater resources of the region including historical water use.

Land use	Area		
	percent		ha
Dryland crops	13.1%		572,200
Dryland pasture	63.6%		2,774,800
Irrigated crops	1.7%		75,300
Cereals		*7.2%*	*5,400*
Cotton		*76.1%*	*57,300*
Horticulture		*3.9%*	*2,900*
Orchards		*5.6%*	*4,200*
Pasture and hay		*6.4%*	*4,900*
Vine fruits		*0.8%*	*600*
National parks and State forests	21.2%		921,700
Plantation forests	0.1%		3,500
Urban	0.2%		10,200
Water	0.1%		3,100
Total	**100.0%**		**4,360,800**

Source: CSIRO (2007). Water availability in the Border Rivers. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project.

3.1.1.3 Great Artesian Basin (Gubberamunda Sandstone Aquifer) – St George, Dirranbandi, Bollon, Thallon and Hebel Water Source

Raw water for the St George, Dirranbandi, Bollon, Thallon and Hebel water supply schemes is drawn from the Gubbermunda Sandstone Aquifer of the Great Artesian Basin. The water is sourced through deep bores which are fully cased. Land uses and catchment characteristics have almost no effect upon raw water quality and will not be investigated as part of this plan.

4.0 Assessment of Risks

Balonne Shire Council has adopted a risk methodology based on the "Preparing a Drinking Water Quality Management Plan Supporting Information, September 2010" documentation provided by the Queensland Water Supply Regulator. There are some minor differences to the descriptors, and to the levels of uncertainty.

4.1 Methodology

The entire risk assessment process is conducted over three stages. These include:

1) Hazard identification,
2) Unmitigated risk assessment, and
3) Mitigated risk assessment.

Balonne Shire Council identified a list of hazards considering previous drafts of the DWQMP, water quality data, incident history, known water quality issues, and the experience of the hazard identification team.

After a hazard is identified, the likely sources of the hazard to the water source is documented. As the sources are different for the GAB bores compared to surface water, the unmitigated risks are assessed separately. This was also done considering the mode of contamination. For example, the unmitigated risks due to backflow are assessed separately to the risks arising from direct contamination of the source. The hazards that were considered are listed in the first column of the unmitigated risk table.

For each hazard, an unmitigated risk was determined by first determining the consequence of the hazard, and then considering the likelihood that the hazard would result in that consequence. The unmitigated risk assumes that a person consumes the water with the hazard present and no treatment in place. (In some cases, such as overdose of treatment chemicals, the definition is broadened to assume that the hazard is introduced to the water supply with no further control measures after the hazard has been introduced).

Hazards that could result in an acute health risk (for example pathogens) have either a major or catastrophic consequence. On the contrary, parameters with chronic health risks, such as chlorine or trace level pesticides, will have either minor or moderate consequences. Aesthetic risks may have consequences from Insignificant to Moderate depending on how widespread the issue is.

Once the consequence and likelihood were assigned, the Public Health Risk was determined using the matrix in Table 4.1 overleaf. Uncertainty descriptors are included in Table 4.2.

Balonne Shire Council considers that a Public Health Risk of medium or below is acceptable for health related risks. In contrast, high risks can be considered acceptable for aesthetic risks. For example, total dissolved solids in the GAB bore sources are above the level in the ADWG considered as the highest quality water, and this water will be provided to all customers. This is technically a widespread aesthetic exceedance and therefore has a Moderate consequence. The parameter is present at all times, and the likelihood is therefore almost certain resulting in a "High" risk. Balonne Shire Council has no intent to manage TDS in these schemes as the water quality is suitable for consumption, and the community accepts it as it is. As such, high level aesthetic risks such as these are also acceptable.

For the mitigated risk assessments, the relevant hazards and hazardous events are then assessed at the relevant stage of the treatment process. This is done to examine failure modes for individual process elements. Where a hazard is present, the preventive measures that are intended to minimise the risk are identified. Note – where similar hazards are managed by the same measures, they are included in the "other hazards managed by the barrier" column. In GAB bore schemes, this means that the pathogen hazards (protozoa, bacteria and viruses) are grouped in a single assessment line.

The effectiveness of the identified measure is then assessed. An uncertainty is assigned to the mitigated risk. If the mitigated risk is unacceptable, a risk management improvement action is identified.

Table 4.1 Risk Matrix Including Consequence and Likelihood Description

Public Health Risk Matrix	Consequence	Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood		Isolated aesthetic exceedance – little operational disruption	Local aesthetic exceedance, potential isolated breach of chemical health parameter	Widespread aesthetic exceedances, or repeated breaches of chronic health guidelines	Potential acute health impact, no outbreak expected	Potential acute health impact, declared outbreak likely
Almost Certain	Occurs daily to weekly	Medium 6	High 10	High 15	Extreme 20	Extreme 25
Likely	1-4 occurrences per month	Medium 5	Medium 8	High 12	High 15	Extreme 20
Possible	1-11 occurrences per year	Low 3	Medium 6	Medium 9	High 12	High 15
Unlikely	1 occurrence every 1-5 years	Low 2	Low 4	Medium 6	Medium 8	High 10
Rare	<1 occurrence every 5 years	Low 1	Low 2	Low 3	Medium 5	Medium 6

Table 4.2 Uncertainty Descriptors

Uncertainty Level	Description
Certain	The variability of the parameters or processes involved are thoroughly understood.
Reliable	The variability of the parameters or processes involved is understood in context of these schemes
Estimate	The variability of the parameters or processes is inferred based on an understanding of other similar systems.
Unreliable	The variability of the parameters or processes is not well understood.

4.1. Hazard Identification and unmitigated risk assessment

A hazard identification team was assembled in March 2023 to identify the hazards that are present across any or all schemes. Following agreement on the hazards that are present, the unmitigated risks were evaluated.

Table 4.3 Hazard identification team

Participant	Position	Organisation	Years of experience in water industry (Balonne specific)	Risk Assessment Experience
Kimberley Morgan	Senior Environmental Consultant	Proterra Group	14 years in public health	14 years of public health risk assessments
Michael Shellshear	Engineering Manager	Proterra Group (former Balonne Shire Council - Project Engineer Water and Sewerage)	14 years water industry (5 in Balonne Shire)	Multiple DW risk workshops and process assessments
Michael Lynch	Manager Urban Infrastructure	Balonne Shire	35 years in water industry (4 months Balonne)	Multiple DW risk workshops and process assessments
Michael Lawrence	Associate Director	Bligh Tanner	20 years in water industry as risk expert	Extensive DW risk experience

During the workshop, available water quality data, and operational knowledge was used to inform the workshop conclusions. The unmitigated risk assessment is presented below.

Table 4.4 Unmitigated Risk

Primary Hazard	Source of Hazard	Type of hazard	Consequence	Likelihood	Risk
Protozoa - GAB bore	No source of protozoa	Biological	Catastrophic	Rare	Medium 6
Protozoa - bore integrity compromised	Ingress through bore head or cracked casing	Biological	Catastrophic	Unlikely	High 10
Protozoa - surface water	Category 4 open catchment - pathogens expected in river	Biological	Catastrophic	Almost Certain	Extreme 25
Protozoa - ingress into reticulation	mains break	Biological	Catastrophic	Likely	Extreme 20
Protozoa - backflow	backflow from customer	Biological	Catastrophic	Possible	High 15

Primary Hazard	Source of Hazard	Type of hazard	Consequence	Likelihood	Risk
Protozoa - Treated water from MPSC	treatment plant not operated to remove protozoa	Biological	Catastrophic	Likely	Extreme 20
Bacteria and virus - GAB bore	No source of bacteria or viruses	Biological	Catastrophic	Rare	Medium 6
Bacteria and virus - bore integrity compromised	Ingress through bore head or cracked casing	Biological	Catastrophic	Possible	High 15
Bacteria and virus - surface water	Category 4 open catchment - pathogens expected in river	Biological	Catastrophic	Almost Certain	Extreme 25
Bacteria and virus - ingress into reticulation	mains break	Biological	Catastrophic	Likely	Extreme 20
Bacteria and virus - Treated water from MPSC	treatment process not effective (turbidity > 1 NTU)	Biological	Catastrophic	Possible	High 15
Bacteria and virus - backflow	backflow from customer	Biological	Catastrophic	Possible	High 15
Cyanobacteria	Algal bloom in the rivers - more common in drought conditions	Biological	Moderate	Possible	Medium 9
Naegleria - bore schemes	Water temperatures in bore systems regularly above 25 close to bores - summer will always be above	Biological	Major	Unlikely	Medium 8
Naegleria - surface water schemes	Water temperatures in surface water schemes may seasonally exceed 30C, but cool in winter.	Biological	Major	Rare	Medium 5
Cyanotoxins	Toxic algal blooms	Chemical	Moderate	Unlikely	Medium 6
Radiological	Could be in bore or surface water due to local geology	Radiological	Moderate	Rare	Low 3
pH - bores	pH is above 8.5 in most bores (typically no greater than 8.6)	Chemical	Moderate	Almost Certain	High 15
pH - Dirranbandi and Mungindi	pH is often up to 8.6 in Dirranbandi and Mungindi is elevated, often around 8.4	Chemical	Moderate	Likely	High 12
Aluminium	related to local geology for bore schemes. Surface water schemes do not use alum	Chemical	Moderate	Unlikely	Medium 6
Boron	Naturally resent in raw water source	Chemical	Moderate	Rare	Low 3
Barium	Naturally resent in raw water source	Chemical	Moderate	Rare	Low 3
Chlorine	Overdose of chemical	Chemical	Moderate	Likely	High 12
Chlorate	Breakdown of chlorine stocks	Chemical	Moderate	Almost Certain	High 15
Heavy Metals	Related to local geology - not historically an issue	Chemical	Moderate	Rare	Low 3
Hardness / TDS	Hardness and TDS above aesthetic guidelines in bores	Physical	Moderate	Almost Certain	High 15

Primary Hazard	Source of Hazard	Type of hazard	Consequence	Likelihood	Risk
Sodium -bores	Sodium above aesthetic guideline	Chemical	Moderate	Almost Certain	High 15
Taste and Odour	Algal exudates	Chemical	Moderate	Unlikely	Medium 6
Taste and Odour Bores	Sulphur in bore	Chemical	Moderate	Almost Certain	High 15
THMs	Reaction of chlorine with organic precursors not removed from treatment	Chemical	Moderate	Almost Certain	High 15
Fluoride	Component of source water	Chemical	Moderate	Rare	Low 3
Turbidity - GAB schemes	Turbidity in bores are low	Physical	Moderate	Rare	Low 3
Turbidity - surface water schemes	Breakthrough from treatment plant	Physical	Moderate	Possible	Medium 9
Pesticides	chemical use in the catchments	Chemical	Moderate	Rare	Low 3
Operator Error	Untrained or unskilled staff	Whole of System	Catastrophic	Almost Certain	Extreme 25
Cyber Security Issue	cyber hacker interfering in the systems	Cyber security	Moderate	Rare	Low 3
Terrorism	Targeted attack on water supply systems	Whole of System	Moderate	Rare	Low 3
Sabotage	Bored kids in the community	Equipment failure	Moderate	Unlikely	Medium 6
Temperature	Temperature above 50C	Physical	Moderate	Almost Certain	High 15
Surface water	Raw water supply - assessed as protozoa	Biological	Catastrophic	Almost Certain	Extreme 25

The mitigated risk assessment for the GAB bore schemes, Dirranbandi and Mungindi are included in the following tables.

Table 4.5 Mitigated Risk Assessment - GAB Schemes

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
GAB 1	Sourcing	Protozoa - GAB bore		Contamination of GAB aquifer	Medium 6	Nil required	Catastrophic	Rare	Medium 6	Certain			
GAB 2	Sourcing	Bacteria and virus - GAB bore		Contamination of GAB aquifer	Medium 6	Nil required	Catastrophic	Rare	Medium 6	Certain			
GAB 3	Sourcing	pH - bores		pH outside of aesthetic range	High 15	Nil	Moderate	Almost Certain	High 15	Certain	pH is marginally above the upper aesthetic range, and is considered acceptable by council		
GAB 4	Sourcing	Radiological		radiological parameters outside of range	Low 3	Nil required	Moderate	Rare	Low 3	Certain	Not considered a concern after snapshot monitoring. Gubberamunda aquifer does not change.		
GAB 5	Sourcing	Sodium -bores	Hardness /TDS	Sodium / Hardness elevated in bore water	High 15	Nil required	Moderate	Almost Certain	High 15	Reliable	sodium and hardness are marginally above the upper aesthetic range, and is considered acceptable by council		
GAB 6	Reticulation	Taste and Odour Bores		Bore water has sulphide smell	High 15	Nil	Moderate	Almost Certain	High 15	Certain	No complaints from residents about the odour - no need to mitigate this issue.		
GAB 7	Reticulation	Surface water		Cross connection to raw water supply in St George	Extreme 25	separated systems, plumbers are aware of multiple systems, no internal plumbing of raw water systems, follow procedure for 'Commissioning of new assets'	Catastrophic	Possible	High 15	Unreliable	Turbidity of the raw water supply is very high - visually different and cross connection would be immediately obvious.	Undertake an audit of systems such as schools where it is believed there may be an ability to use river water to flush toilets. If identified, this would require to either remove or have RPZs to be installed.	

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
GAB 8	Reticulation	Operator Error		Procedures not followed	Extreme 25	Other than plumbing works (see main break line item), there is no ability to impact the water supply on a daily basis, follow procedures; ‘mains flushing, repair of main breaks, maintenance of valves and hydrants, commissioning of new assets, inspection and maintenance of reservoirs backflow prevention, incident and emergency response’	Catastrophic	Rare	Medium 6	Reliable			
GAB 9	Reticulation	Temperature		elevated temperature above plumbing guidelines	High 15	Maximum at borehead St George is 57, Bollon 60. Follow procedures: ‘water quality analysis water quality sampling, calibrating water quality monitoring and testing equipment’	Moderate	Likely	High 12	Reliable	Temperature at bore head can be above 50C, but the temperature drops with distance. This is only an issue for the first houses closest to the bores under high demand.	Investigations being undertaken to determine whether cooling is appropriate for the other schemes	
GAB 10	Bore head integrity	Protozoa - bore integrity compromised	Bacteria and virus	Bore head not constructed properly allowing ingress of pathogens	High 10	Positive pressure, sealed boreheads, construction to Australian standards. No bore pumps in these schemes. Physical inspection of borehead conducted when operator onsite. Follow procedures: ‘Facility security’	Catastrophic	Rare	Medium 6	Certain	Bore is fully sealed and there are no bore pumps. Not possible to contaminate bores in this way	Borehead checklist in development	
GAB 11	Reticulation	Bacteria and virus - ingress into reticulation	Protozoa	Ingress of pathogens through main break repair	Extreme 20	Operational staff are not licensed plumbers. Internal on the job training. Follow procedures; ‘Mains flushing, Repair of main breaks, spare parts Management for critical equipment, Water quality analysis Water quality sampling’	Catastrophic	Unlikely	High 10	Reliable	Council are currently using licensed plumbers to repair breaks.	Retraining with toolbox talks to create awareness and understanding of the main repair procedure. Main repair procedure to be updated to include disinfection.	

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
GAB 12	Reticulation	Bacteria and virus - backflow	Protozoa - backflow	Backflow from customers resulting in pathogens entering supply	High 15	No heavy industry, hospitals have RPZs, all connections have water meters that meet Australian Standards. Follow procedures; 'backflow prevention'	Catastrophic	Unlikely	High 10	Estimate	No register of RPZs across council, and uncertain that these devices are tested as required.	Investigate process and consider developing appropriate procedures.	Consider developing appropriate procedures if not currently done

Table 4.6 Mitigated Risk Assessment - Dirranbandi

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
Dir 1	Sourcing - raw water	Protozoa - surface water	Bacteria and Viruses - surface water	Operation under normal circumstances with plant functioning correctly	Extreme 25	Conventional treatment with chlorine disinfection. Follow procedures: Commissioning of new assets, Flocculant dosing, Management of sediment sludge, Maintenance of filter media, Management of disinfection process, Chemical management'	Catastrophic	Unlikely	High 10	Certain	Treatment plant is outdated and will require upgrades to ensure appropriate treatment. Bore water is considered safe.	Process review to identify issues with the treatment plant and identify appropriate pathway forward. May become a bore water scheme.	
Dir 2	Flocculation/ sedimentation	Protozoa - surface water		Underdose coagulant	Extreme 25	Single dosing pump, daily site visits, Filtration afterwards. Follow procedures: Flocculant dosing, Management of sediment sludge, Chemical management'	Catastrophic	Possible	High 15	Estimate	Operators have determined an appropriate coagulant dose, and the turbidity in the river does not vary often. No current jar testing.	Process review as per previous item. Purchase jar testing equipment and commence training of operators. Purchase new turbidity meters and standards.	Additional online monitoring if plant is to continue operating, develop procedure for jar testing and determining coagulant dose.
Dir 3	Flocculation/ sedimentation	Turbidity - surface water schemes		Overdose coagulant	Medium 9	Single dosing pump, daily site visits, Filtration afterwards. Follow procedures: Flocculant dosing, Management of sediment sludge, Chemical management'	Moderate	Possible	Medium 9	Estimate		Purchase jar testing equipment and commence training of operators. Purchase new turbidity meters and standards.	
Dir 4	Filtration	Protozoa - surface water		filtered water turbidity above 0.5 NTU	Extreme 25	turbidity meters at plant, but not currently online. Follow procedures: Maintenance of filter media	Catastrophic	Possible	High 15	Estimate	Turbidity meter reads from the balance tank rather than off each filter. Filtered water believed to be up to 1.3 NTU. Online measurement is a blend with bore water.	Purchase jar testing equipment and commence training of operators. Purchase new turbidity meters and standards. Develop appropriate procedures.	
Dir 5	Filtration	Turbidity - surface water schemes		Filtered water turbidity above 5 NTU	Medium 9	turbidity meters at plant, but not currently online. Follow procedures: Maintenance of filter media	Moderate	Rare	Low 3	Reliable		developing procedures	

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
Dir 6	Filtration	Protozoa - surface water		Breakthrough after filter backwash	Extreme 25	Backwash undertaken daily. Follow procedures: Maintenance of filter media	Catastrophic	Unlikely	High 10	Reliable	Plant is shut down when backwashing	Commence daily sampling of filtered water (individual filters).	Consider installing turbidity meter after filters (individual best) if the plant is retained.
Dir 7	Bore head integrity - GAB bore	Protozoa - bore integrity compromised	Bacteria and virus	Bore head not constructed properly allowing ingress	High 10	Positive pressure, sealed boreheads, construction to Australian standards. No bore pumps in these schemes. Follow procedures: 'Facility security'	Catastrophic	Rare	Medium 6	Certain	Bore is fully sealed and there are no bore pumps. Not possible to contaminate bores in this way		
Dir 8	Sourcing - GAB	Protozoa - GAB bore		Contamination of GAB aquifer	Medium 6	Nil required	Catastrophic	Rare	Medium 6	Certain			
Dir 9	Sourcing - GAB	Bacteria and virus - GAB bore		Contamination of GAB aquifer	Medium 6	Nil required	Catastrophic	Rare	Medium 6	Certain			
Dir 10	Sourcing - GAB	pH - bores		pH outside of aesthetic range	High 15	Nil	Moderate	Almost Certain	High 15	Certain	pH is marginally above the upper aesthetic range, and is considered acceptable by council		
Dir 11	Sourcing - GAB	Radiological		radiological parameters outside of range	Low 3	Nil required	Moderate	Rare	Low 3	Certain	Not considered a concern after snapshot monitoring. Gubberamunda aquifer does not change.		
Dir 12	Sourcing - GAB	Sodium -bores	Hardness /TDS	Sodium elevated in bore water	High 15	Nil required	Moderate	Almost Certain	High 15	Reliable	sodium and hardness are marginally above the upper aesthetic range, and is considered acceptable by council		

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
Dir 13	Sourcing - GAB	Temperature		Bypass cooling system	High 15	closed circuit cooling tower can be bypassed - bore temperature is 54. Mixed in clearwater reservoir, controlled of multitrode. Typically 30% bore water, but varies depending on clearwater tank level. Follow procedures: 'water quality analysis water quality sampling, calibrating water quality monitoring and testing equipment, closed circuit cooling tower operation and maintenance'	Moderate	Rare	Low 3	Certain			
Dir 14	Cooling system - Bore	Temperature		Normal operation	High 15	closed circuit cooling tower - brings temperature to 28C, mixed in clearwater reservoir. Follow procedure: 'closed circuit cooling tower operation and maintenance'	Moderate	Rare	Low 3	Certain			
Dir 15	Chlorination	Bacteria and virus - surface water		Underdose/ dosing failure	Extreme 25	single dosing pump, shelf standby, daily testing, online meter, not alarmed. Follow procedures: Management of disinfection process, Chemical management'	Catastrophic	Possible	High 15	Estimate	Plant has ability to send alarms, need to set up chlorine analyser appropriately	Reinstate chlorine alarm	
Dir 16	Chlorination	Bacteria and virus - surface water		bypass bore cooling system - elevated temperature water in clear water tank causing chlorine to volatilise	Extreme 25	heat from bore causes chlorine to evaporate. Follow procedures: Management of disinfection process, Chemical management'	Catastrophic	Possible	High 15	Estimate	Plant has ability to send alarms, need to set up chlorine analyser appropriately	Reinstate chlorine alarm	
Dir 17	Chlorination	Chlorine		Overdose	High 12	single dosing pump, shelf standby, daily testing, online meter, not alarmed. Follow procedures: Management of disinfection process, Chemical management'	Moderate	Unlikely	Medium 6	Estimate	Plant has ability to send alarms, need to set up chlorine analyser appropriately	Reinstate chlorine alarm	

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
Dir 18	Chlorination	Chlorate		Chemical breakdown	High 15	Single chlorine tank 2000L. Typically turned over monthly. Follow procedures: Management of disinfection process, Chemical management'	Moderate	Likely	High 12	Unreliable		Install a second 2000L tank for chemical management, commence quarterly monitoring.	
Dir 19	Reticulation	Taste and Odour Bores		Bore water has sulphide smell	High 15	Nil	Moderate	Almost Certain	High 15	Certain	No complaints from residents about the odour - no need to mitigate this issue.		
Dir 20	Reticulation	THMs		Reaction with organics	High 15	Potential for organic breakthrough of treatment plant and reaction to form THMs. High turnover - reservoirs are undersized. Follow procedures: Management of disinfection process, Chemical management'	Moderate	Possible	Medium 9	Estimate	High turnover in system with reservoirs turning over quickly. Limited reaction time.		
Dir 21	Whole of system	Operator Error		Operator mistake	Extreme 25	Operators have Cert III, or completing Cert III. If need to support from St George, currently no trained operator, but training underway. Insufficient procedures. Follow procedures: Flocculant dosing, Management of sediment sludge, Maintenance of filter media, Management of disinfection process, Chemical management, Closed circuit cooling tower operation and maintenance'	Catastrophic	Unlikely	High 10	Estimate	Training being completed, but long term operator is moving on.	Complete the training that has commenced. Develop further procedures for operating plant. Installation of monitoring and alarms.	
Dir 22	Whole of system	Cyber Security Issue		Plant operated remotely	Low 3	SCADA System is currently monitoring only. No ability to control. Follow procedures: 'Facility security'	Moderate	Rare	Low 3	Certain	Risk will increase as remote monitoring and control is commenced.		

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
Dir 23	Whole of system	sabotage		Targeted vandalism	Medium 6	WTP site is fenced and secure, bore fenced. Follow procedures: 'Facility security'	Moderate	Unlikely	Medium 6	Certain			
Dir 24	Ingress into Reservoir	Bacteria and virus - ingress into reticulation		Ingress into reservoir through hatch	Extreme 20	Domed concrete tank, steel lid, not routinely inspected. Follow procedures: 'Facility security, Inspection and maintenance of reservoirs'	Catastrophic	Possible	High 15	Unreliable		Develop an inspection procedure	Arrange for diving and condition assessment of reservoir
Dir 25	Reticulation	Bacteria and virus - ingress into reticulation	Protozoa	Ingress through main break repair	Extreme 20	Operational staff are not licensed plumbers. Internal on the job training. Follow procedures; 'Mains flushing, Repair of main breaks, Spare parts Management for critical equipment, Water quality analysis Water quality sampling'	Catastrophic	Unlikely	High 10	Reliable	Council are currently using licensed plumbers to repair breaks.	Retraining with toolbox talks to create awareness and understanding of the main repair procedure. Main repair procedure to be updated to include disinfection.	
Dir 26	Reticulation	Bacteria and virus - backflow	Protozoa - backflow	Backflow from customers	High 15	No heavy industry, hospitals have RPZs, all connections have water meters that meet Australian Standards. Follow procedures: Backflow prevention	Catastrophic	Unlikely	High 10	Estimate	No register of RPZs across council, and uncertain that these devices are tested as required.	Investigate process and consider developing appropriate procedures.	consider developing appropriate procedures if not currently done

Table 4.7 Mitigated Risk Assessment - Mungindi

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
Mung 1	Treated water purchased from Moree Plains SC	Protozoa - Treated water from MPSC			Extreme 20	Agreement with MPSC to provide supply of treated water and repair of leaks. Mungindi WTP is a surface water plant.	Catastrophic	Likely	Extreme 20	Unreliable	Moree Plains was invited but did not attend workshop. Understood that the filtered water turbidity CCP is >0.7 NTU. Target is <0.5 NTU. No confidence that the turbidity target is met. However MPSC is required to report to NSW Health if > 0.7 NTU.	Consider need for a boil water alert until routine turbidity monitoring commenced. Daily (weekday) testing to commence as soon as the portable turbidity meter arrives.	Drill the GAB bore and convert to bore scheme or consider online chlorine and turbidity monitoring along with a new treated water tank, treated with UV on the outlet.
Mung 2	Treated water purchased from Moree Plains SC	Bacteria and virus - Treated water from MPSC			High 15	Agreement with MPSC to provide supply of treated water and repair of leaks. Mungindi WTP is a surface water plant.	Catastrophic	Unlikely	High 10	Unreliable	MPSC chlorine target is >1 mg/L with a low chlorine critical limit of <0.5 mg/L. MPSC is required to report to NSW Health if outside this range.	Consider need for a boil water alert. Commence daily (weekday) chlorine testing.	Drill the GAB bore and convert to bore scheme or consider online chlorine and turbidity monitoring along with a new treated water tank, treated with UV on the outlet.
Mung 3	Treated water purchased from Moree Plains SC	Chlorine		Overdose	High 12	High dose into WTP tank, but high chlorine demand	Moderate	Unlikely	Medium 6	Reliable		Commence daily (weekday) chlorine testing.	Online chlorine monitoring if continuing with MPSC supply.
Mung 4	Treated water purchased from Moree Plains SC	Chlorate		Breakdown of hypo solutions	High 15		Moderate	Likely	High 12	Unreliable	Risk not assessed as uncertain what chemical is used. High chlorine dose makes this likely if hypochlorite.	Confirm if the MPSC system has converted to gas. If hypochlorite, commence quarterly monitoring.	
Mung 5	Treated water purchased from Moree Plains SC	THMs		Reaction of organics with high chorine dose	High 15	MPSC doses at between 2 and 3.5 mg/L at WTP tower.	Moderate	Likely	High 12	Estimate		Commence quarterly monitoring of THMs	
Mung 6	Treated water purchased from Moree Plains SC	Radiological		radiological parameters outside of range	Low 3	Nil required	Moderate	Rare	Low 3	Certain	Not considered a concern after snapshot monitoring. Will commence monitoring as per ADWG recommendations.	Commence monitoring as per ADWG for sources	

Risk ID	Treatment Stage	Primary Hazard	Other hazards managed by barrier	Hazardous Event	Unmitigated Risk	Control Measures in place	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk	Uncertainty	Comments	Improvement Action Required - Immediate	Improvement Action Required ~ 2 years
Mung 7	Reticulation	Bacteria and virus - ingress into reticulation	Protozoa	Ingress through main break repair	Extreme 20	Operational staff are not licensed plumbers. Internal on the job training. Follow procedures; 'mains flushing, Repair of main breaks, spare parts management for critical equipment, water quality analysis water quality sampling'	Catastrophic	Unlikely	High 10	Reliable	MPSC are contracted to undertake minor repairs. Council are currently using licensed plumbers to repair breaks.	Retraining with toolbox talks to create awareness and understanding of the main repair procedure. Main repair procedure to be updated to include disinfection. Confirm the level of training of MPSC staff to repair leaks/ breaks.	
Mung 8	Reticulation	Bacteria and virus - backflow	Protozoa - backflow	Backflow from customers	High 15	No heavy industry, hospitals have RPZs, all connections have water meters that meet Australian Standards. Follow procedures; 'backflow prevention'	Catastrophic	Unlikely	High 10	Estimate	No register of RPZs across council, and uncertain that these devices are tested as required.	Investigate process and consider developing appropriate procedures.	consider developing appropriate procedures if not currently done

Note: The Balonne Shire Council has limited control of the water supplied to the Mungindi scheme in terms of Source, Treatment and Reservoirs as these scheme components are managed by Moree Plains Shire Council. Balonne Shire Council can control to some degree water quality through management of the reticulation mains. The supply of water of water by Moree Plains Shire Council to Balonne Shire Council is governed by the "Agreement for the Supply of Services to Mungindi in the State of Queensland". The agreement states that Moree Plains Shire Council does not give any warranty, guarantee or undertaking as to the quality of the water supplied to Balonne Shire Council. The water supplied to Balonne Shire Council shall be consistent to that supplied in the town of Mungindi in the State of New South Wales. It is understood that the State of New South Wales has or will have similar frameworks and regulation (to Queensland) for the management of drinking water quality. A recommendation from the 2017 audit was that Balonne Shire Council develop communication protocols with Moree Plains Shire Council to ensure Balonne Shire Council is informed of any water quality issues. In 2020 Balonne Shire Council implemented water restrictions for Mungindi Qld that align with the those applied by Moree Plains Shire Council to Mungindi NSW. The restriction levels are determined by Moree Plains Shire Council and communicated to Balonne Shire Council.

5.0 Operation and maintenance procedures

The Balonne Shire Council has work procedures for the potable water supply schemes within the Shire. These procedures are reviewed periodically: every three years or following a change to the system/scheme.

5.1. Existing Procedures

The existing procedures are in a review period. The existing procedures are located on the Balonne Shire Council document management system, MAGIQ Documents.

Table 5.1 Existing Procedures & Status

Scheme	Activity	Owner	Status	Comment	Target review date	Review Frequency
All	Mains flushing	Manager Urban Infrastructure	Reviewed Sept. 2022	Procedure includes hygiene practices	31/12/25	3 years; or as required.
All	Repair of main breaks	Manager Urban Infrastructure	Reviewed Sept. 2022	Procedure includes hygiene practices	31/12/25	3 years; or as required.
All	Maintenance of valves and hydrants	Manager Urban Infrastructure	Reviewed Sept. 2022	Program formalised through Asset Management Plan	31/12/25	3 years; or as required.
All	Commissioning of new assets	Manager Urban Infrastructure	Reviewed Sept. 2022	Procedure includes hygiene practices	31/12/25	3 years; or as required.
All	Spare parts management for critical equipment.	Manager Urban Infrastructure	Reviewed Sept. 2022		31/12/25	3 years; or as required.
All	Inspection and maintenance of reservoirs	Manager Urban Infrastructure	Reviewed Sept. 2022	Program formalised through Asset Management Plan	31/12/25	3 years; or as required.
All	Backflow prevention	Manager Urban Infrastructure	Reviewed Sept. 2022		31/12/25	3 years; or as required.
All	Water quality analysis	Manager Urban Infrastructure	Reviewed Sept. 2022	Formalise current practice	31/12/25	3 years; or as required.
All	Water quality sampling	Manager Urban Infrastructure	Reviewed Sept. 2022		31/12/25	3 years; or as required.
All	Calibrating water quality monitoring and testing equipment	Manager Urban Infrastructure	Reviewed Sept. 2022	Includes all water schemes that services the Balonne region	31/12/25	3 years; or as required.
All	Facility security	Manager Urban Infrastructure	Reviewed Sept. 2022		31/12/25	3 years; or as required.
All	Incident and emergency response	Manager Urban Infrastructure	Reviewed Sept. 2022		31/12/25	3 years; or as required.
Dirranbandi WTP	Flocculant dosing	Manager Urban Infrastructure	Reviewed Sept. 2022	Formalise current practice	31/12/25	3 years; or as required.
Dirranbandi WTP	Management of sediment sludge	Manager Urban Infrastructure	Reviewed Sept. 2022	Formalise current practice	31/12/25	3 years; or as required.
Dirranbandi WTP	Maintenance of filter media	Manager Urban Infrastructure	Reviewed Sept. 2022	Formalise current practice	31/12/25	3 years; or as required.
Dirranbandi WTP	pH adjustment	Manager Urban Infrastructure	Reviewed Sept. 2022	Formalise current practice	31/12/25	3 years; or as required.
Dirranbandi WTP	Management of disinfection process	Manager Urban Infrastructure	Reviewed Sept. 2022	Formalise current practice	31/12/25	3 years; or as required.

Dirranbandi WTP	Chemical management	Manager Urban Infrastructure	Reviewed Sept. 2022	Storage, handling, monitoring, and ordering	31/12/25	3 years; or as required.
Dirranbandi WTP	Closed circuit cooling tower operation and maintenance	Manager Urban Infrastructure	Reviewed Sept. 2022	Included in operations manual	31/12/25	3 years; or as required.
All	Records management	Manager Urban Infrastructure	Reviewed Sept. 2022	Includes water quality data, daily records, inspections, maintenance, calibration, and incident records	31/12/25	3 years; or as required.

Procurement of chemical supplies is in accordance with Council's procurement policies. Only approved chemicals are purchased from reputable suppliers. All chemicals are checked on receival for expiry dates, damage to packaging, specifications and certificate of analysis.

5.2. New / Proposed Procedures

The Balonne Shire Council is not currently working on introducing any new procedures for their water supply schemes.

5.3. Management of Incidents and Emergencies

The Balonne Shire Council manages incidents and emergencies in accordance with the tables below.

Incidents in the township of Mungindi are managed using the same framework. The Environmental Health Officer shall notify Moree Plains Shire Council as any incident has been identified.

Table 5.2 Incident / Emergency Levels

Incident / Emergency level	Description of level
Level 5	*Widespread outbreak of waterborne disease / Declared disaster / Supply unable to be maintained / Gross exceedances of ADWG health guideline values for a chemical parameter (e.g. more than five times the ADWG health guideline limit).*
Level 4	*Detection of any pathogens in reticulation / Failure of infrastructure (severe or emergency level supply restrictions required to ensure continuity of supply)*
Level 3	*Detection of E. coli in reticulation / Failure of infrastructure (ability to supply water compromised – short term water restrictions may be required) / Minor exceedances 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 / exceedances of ADWG aesthetic guideline (customer complaints possible)*
Level 1	*Exceedances of operational limit managed through operational and maintenance procedures*

Table 5.3 Management of Incidents and Emergencies

Level	Incident or emergency	Summary of actions to be taken (with documented procedure listed)	Position/s responsible for Action/s
5	Widespread outbreak of waterborne disease Declared disaster Gross exceedances of ADWG (5 times health parameter) Detection of a parameter with no ADWG guideline.	Alert Manager Urban Infrastructure and other senior staff.	Environmental Health Officer
		Determine potentially affected area, isolate if possible. Consider Boil Water alert. Escalate emergency further if situation worsens.	Environmental Health Officer
		Report detection to OWSR by phone (immediately by phone, written incident report – Part 1 incident form – within 24 hours)	Environmental Health Officer
		Resample for waterborne disease or ADWG heath parameter.	Environmental Health Officer
		Undertake comprehensive contamination investigation	Environmental Health Officer
		Undertake necessary corrective actions	Water Treatment Plant Operator
		Upon resolution, provide written report to regulator (Part 2 incident form)	Environmental Health Officer

4	Detection of Pathogen	Alert Manager Urban Infrastructure and other senior staff.	Environmental Health Officer
		Determine potentially affected area, isolate if possible. Consider Boil Water alert. Escalate emergency further if situation worsens.	Environmental Health Officer
		Report detection to OWSR by phone (within 3 hours of receipt of test result, written incident report – Part 1 incident form – within 24 hours)	Environmental Health Officer
		Undertake comprehensive contamination investigation	Environmental Health Officer
		Undertake necessary corrective actions	Water Treatment Plant Operator
		Upon resolution, provide written report to regulator (Part 2 incident form)	Environmental Health Officer
3	Detection of E.coli in reticulation Failure to meet ADWG chemical paremeters Fluoride greater than 1.5mg/L Cyber Security Threat	Alert Manager Urban Infrastructure and other senior staff.	Environmental Health Officer
		Determine potentially affected area, isolate if possible. Consider Boil Water alert. Escalate emergency further if situation worsens.	Environmental Health Officer
		Report detection to OWSR by phone (within 3 hours of receipt of test result, written incident report – Part 1 incident form – within 24 hours)	Environmental Health Officer
		Resample for E. coli and disinfectant residual in potentially affected infrastructure	Environmental Health Officer
		Undertake comprehensive contamination investigation	Environmental Health Officer
		Undertake necessary corrective actions	Water Treatment Plant Operator
		Upon resolution, provide written report to regulator (Part 2 incident form)	Environmental Health Officer
2	Failure of infrastructure or source supply (water quality or supply unlikely to be compromised). Highly unlikely incident level for GAB bore supplied schemes. Cyber security breach / failure	Alert Manager Urban Infrastructure and other senior staff.	Water Treatment Plant Operator
		For incidents in Dirranbandi, consider the need to supply 100% GAB bore water to the scheme until treatment and or source water issues are resolved.	Environmental Health Officer / Water Treatment Plant Operator
		Alert Manager Urban Infrastructure and IT Officer	Water Treatment Plant Operator
		Engage maintenance services under maintenance contract	Manager Urban Infrastructure
		Operate system manually.	Water Treatment Plant Operator
1	Exceedances of operational limit or ADWG aesthetic limit managed through operational and maintenance procedures	Record minor incidents and corrective action taken on monthly reporting sheets.	Water Treatment Plant Operator
		Note exceedances of ADWG aesthetic limits. The vast majority of ADWG aesthetic limit breaches will occur in relation to GAB bore water. Very little can be done to prevent these exceedances without the provision of treatment facilities on previously untreated supplies.	Environmental Health Officer

Table 5.4 Emergency Contact Details and Protocols

Incident / Emergency Type	Business Unit / Organisation	Contact Position	Contact Details
All Emergency Types	Balonne Shire Council	Manager Urban Infrastructure	(07) 4620 8888
All Emergency Types	Balonne Shire Council	Environmental Health Officer	(07) 4620 8841
All Emergency Types	Balonne Shire Council	Dirranbandi WTP Operator	0428 258 386
All Emergency Types	Moree Plains Shire Council	Mungindi WTP Operator	0427 401 519
Incident Level 3 or Above	Water Supply Regulator	Call Centre	1300 596 709
Incident Level 3 or Above	Queensland Health	Manager Environmental Health	0417 791 607
Incident Level 3 or Above	Queensland Health – St George	Hospital Manager	(07) 4620 2222
Incident Level 3 or Above	Queensland Health – Dirranbandi	Hospital Manager	(07) 4625 8222
Incident Level 3 or Above	Queensland Health – Mungindi	Hospital Manager	(02) 6705 6100

Incidents for the Mungindi scheme are controlled by Balonne Shire Council contacting the water treatment plant operator at Mungindi as soon a water quality incident is recorded. Moree Plains Shire Council are responsible for the rectification of water quality issues relating to the source, treatment and storage of water. Balonne Shire Council is responsible for managing the Mungindi reticulation network in emergencies. There are provisions in the service agreement between Balonne Shire Council and Moree Plains Shire Council for Moree Plains Shire Council staff to conduct emergency rectification works on Balonne Shire Council reticulation mains if Balonne Shire Council personnel are unable to respond quickly enough.

5.5. Service Wide Support – Information Management

The following table summarises the information management process for water quality data from the Balonne Shire. All records should be stored in Council's electronic record management system. All water quality records are retained for 15 years in accordance with the Queensland State Archives retention and disposal schedule. All records can be accessed by staff electronically using MAGIQ (records management software), or a hard copy is available by contacting the records officer.

Table 5.5 Summary of Water Quality Management Information

Document	Information Recorded	Format (hardcopy / electronic)	Where stored (at WTP / on electronic system / other)	Position Responsible / Business Unit	Comments
Monthly Water Quality Operator Reports including Water Usage, Changes to Dosing Regime and Chlorine Residuals.	Water Usage Chlorine Dose Chlorine Residual	Hard Copy / Electronic	Hard Copy - CEO Secretary Electronic Copy – (Records Management System)	Water and Sewerage Supervisor Town Officers	- Hard Copy filed in records. - Data entered to spreadsheet by Infrastructure Services Admin. Officer. - Reported to Council monthly. - Used for SWIM data entry.
External Water Quality Test Reporting	E.coli PH Total Hardness Alkalinity Total Dissolved Ions Total Dissolved Solids Colour Turbidity Sodium Potassium Calcium Magnesium Chloride Fluoride Nitrate Sulphate Iron Manganese Zinc Aluminium Copper	Hard Copy / Electronic	Hard Copy – EHO Office Electronic Copy – Balonne Shire Council – Water Quality Spreadsheet (Records Management System)	Environmental Health Officer Project Engineer	- Hard Copy filed in EHO office. - Electronic Copy to Records Management System. - Data entered to spreadsheet by EHO.
Internal Water Quality Test Reporting	E.Coli	Hard Copy / Electronic	Hard Copy – EHO Office Electronic Copy – (Records Management System)	Environmental Health Officer	- Hard Copy filed in EHO office. - Soft Copy entered to spreadsheet by EHO.

6.0 Operational and Verification Monitoring Programs

6.1. Operational Monitoring

Table 6.1 Operational Monitoring for Great Artesian Basin Groundwater Supplies - St Geroge, Dirranbandi, Bollon, Thallon and Hebel

Process Step / Critical Control Point / Location in System	Parameter	Associated Hazard	Sampling				Target limit	Action if target limit exceeded	Critical limit	Action if critical limit exceeded
			Location	Frequency	Method	Analysis				
Water sourced from GAB bores is of very consistent quality. Water quality does not indicate any need for disinfection. The bores are cased to a sufficient depth to exclude infiltration from surface water and shallow aquifers. **No operational water quality monitoring** is conducted on GAB bore water supplied schemes.										

Table 6.2 Operational Monitoring for Surface Water Suppliers - Dirranbandi and Mungindi

Process Step / Critical Control Point / Location in System	Parameter	Associated Hazard	Sampling				Target limit	Action if target limit exceeded	Critical limit	Action if critical limit exceeded
			Location	Frequency	Method	Analysis				
Treatment (Not Applicable for Mungindi)	Chlorine Residual	E.Coli, Pathogens	Dirranbandi WTP Sampling Point	Daily	Water Quality Monitor	Nil. Record results	> 2.5 mg/L	Adjust chlorine dosing equipment at WTP	5 mg/L (ADWG health)	Adjust chlorine dosing equipment at WTP
Treatment (Not Applicable for Mungindi)	Turbidity	Bacteria, Cryptosproidium	Dirranbandi WTP Sampling Point	Daily	Water Quality Monitor	Nil. Record results	< 0.2 NTU	Adjust chemical dosing equipment, check clarifier and filter operation at WTP.	1 NTU	Adjust chemical dosing equipment, check clarifier and filter operation at WTP.
Treatment (Not Applicable for Mungindi)	pH	Nil	Dirranbandi WTP Sampling Point	Daily	Water Quality Monitor	Nil. Record results	6.5-8.5	Adjust bore water mix percentage at WTP to control pH	N/A	N/A
Reticulation	Chlorine Residual	E.Coli, Pathogens	Dirranbandi – Dirranbandi Pool	Dirranbandi – Weekly Mungindi – Every 2nd Day MPSC	In House Test	Nil. Record results	> 0.2 mg/L	Adjust chlorine dosing equipment at WTP	5 mg/L (ADWG health)	Adjust chlorine dosing equipment at WTP

Process Step / Critical Control Point / Location in System	Parameter	Associated Hazard	Sampling				Target limit	Action if target limit exceeded	Critical limit	Action if critical limit exceeded
			Location	Frequency	Method	Analysis				
			Mungindi – Mungindi Hospital					Mungindi – Notify Moree Plains Shire Council		Mungindi – Notify Moree Plains Shire Council
Reticulation	pH	Nil	Dirranbandi – Dirranbandi Pool Mungindi – Mungindi Hospital	Dirranbandi – Weekly Mungindi – Every 2nd Day MPSC	In House Test	Nil. Record results	6.5-8.5	Adjust bore water mix percentage at WTP to control pH. Mungindi – Notify Moree Plains Shire Council	N/A	N/A
Reticulation	Turbidity	Bacteria, Cryptosproidium	Mungindi – Mungindi Hospital	Mungindi – Every 2nd Day MPSC	In House Test	Nil. Record results	< 0.2 NTU	MPSC to adjust chemical dosing equipment, check clarifier and filter operation at WTP.	1 NTU	MPSC to adjust chemical dosing equipment, check clarifier and filter operation at WTP.

The operational monitoring program has been developed using the hazards and risks identified in the risk assessment matrix. The sampling points have been chosen to give a representative water quality of that in the entire scheme. The monitoring program also takes into account the technical, staffing and financial resources available to the Balonne Shire Council.

6.2. Verification Monitoring

Table 6.3 Verification Monitoring for Great Artesian Basin Groundwater Supplies - St Geroge, Dirranbandi, Bollon, Thallon and Hebel

Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Location	Associated Hazard	Frequency		Analysing Authority	Response to Exceedances
					@ Treatment Plant Outlet	In distribution system		
E.coli	Nil detect	Bacteria	Various (refer to section 3.1 - Water quality and catchment characteristics)	Bacteria	N/A	St George – Weekly. Other Areas – Monthly.	Balonne Shire Council – In House	Refer to incident management Plan. Notify OWSR and complete incident reporting forms
E.coli PH Total Hardness Alkalinity Total Dissolved Ions Total Dissolved Solids Colour Turbidity Sodium Potassium Calcium Magnesium Chloride Fluoride Nitrate Sulphate Iron Manganese Zinc Aluminium Copper	Various (refer to section 3.1 - Water quality and catchment characteristics)	All hazards identified by standard chemical analysis	Various (refer to section 3.1 - Water quality and catchment characteristics)	All hazards identified by standard chemical analysis	N/A	Quarterly	QHFSS or Toowoomba Regional Council	Refer to incident management Plan Notify OWSR and complete incident reporting forms

Table 6.4 Verification Monitoring for Surface Water Supplies - Dirranbandi and Mungindi

Parameter	ADWG &/or Regulation Value	Associated Hazard	Sampling Location	Associated Hazard	Frequency		Analysing Authority	Response to Exceedances
					@ Treatment Plant Outlet	In distribution system		
E.coli	Nil detect	Bacteria	Various (refer to section 3.1 - Water quality and catchment characteristics)	Bacteria	N/A	Monthly	Balonne Shire Council – In House	Refer to incident management Plan Notify OWSR and complete incident reporting forms
E.coli PH Total Hardness Alkalinity Total Dissolved Ions Total Dissolved Solids Colour Turbidity Sodium Potassium Calcium Magnesium Chloride Fluoride Nitrate Sulphate Iron Manganese Zinc Aluminium Copper	Various (refer to section 3.1 - Water quality and catchment characteristics)	All hazards identified by standard chemical analysis	Various (refer to section 3.1 - Water quality and catchment characteristics)	All hazards identified by standard chemical analysis	N/A	Quarterly	QHFSS or Toowoomba Regional Council	Refer to incident management Plan Notify OWSR and complete incident reporting forms

E Coli is tested in house at the frequency listed in the above table. The test is conducted using the 18hr Colilert equipment.

The verification monitoring program has been developed using the hazards and risks identified in the risk assessment matrix. The sampling points have been chosen to give a representative water quality of that in the entire scheme. The frequency of the testing is consistent with current OSWR and Queensland Health requirements. The monitoring program also considers the technical, staffing, and financial resources available to the Balonne Shire Council. The 2021 audit recommends the introduction of periodic mock drinking water incident management exercises across the schemes. Considering the limited staffing and resources available to the Balonne Shire Council these exercises are not a suitable verification method.

6.3. Verification Contingency

On the occasion that a verification test cannot take place within the required timeframe, clear reasoning will be appropriately documented by the relevant staff and reporting officer/s. All effort is to be made by the relevant staff and reporting officer/s to ensure that verification testing is undertaken by alternative staff/resources in case of reduction in resources (due to leave, unavailability, etc). Consideration is to be made to providing additional training to these support staff to minimise the risk of delay of all verification testing.

7.0 Appendix – Historical Verification Monitoring

Table 7.1 Historical Verification Monitoring - St George

Chemical Reporting																					
Scheme	St George																				
Sampling Location	BSC Administration Building																				
Laboratory Used	Queensland Health Forensic and Scientific Services																				
Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-15	Dec-15	Mar-16	Jun-16	Sep-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20
PH		8.42	8.39	8.43	8.48	8.42	8.47	8.47	8.46	8.47	8.54	8.38	8.36	8.45	8.38	8.42	8.45	8.37	8.31	8.38	8.43
Total Hardness	mg/L	7.8	7.5	7.8	7.4	7.8	7.6	7.8	7.8	200	8	7.7	8	7.7	7.6	8	7.6	7.9	7.8	7.8	7.8
Alkalinity	mg/L	275	281	287	284	275	282	287	282	262	280	284	279	282	274	278	282	285	281	278	291
Total Dissolved Ions	mg/L	680	691	692	692	680	692	691	685	650	680	689	675	685	673	677	678	689	682	683	700
Total Dissolved Solids	mg/L	549	557	554	557	549	558	555	549	528	548	544	541	550	541	543	543	552	546	550	557
Colour	PCU	<1	1	<1	<1	<1	<1	<1	1	<1	<1	1	1	<1	<1	1	<1	<1	<1	<1	<1
Turbidity	mg/L	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium	mg/L	208	210	210	212	208	210	210	210	200	200	200	200	210	200	200	200	200	200	210	210
Potassium	mg/L	2.1	2.2	2.2	2.3	2.1	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1
Calcium	mg/L	3.1	3	3.1	3	3.1	3	3.1	3.1	3	3.2	3.1	3.2	3.1	3	3.2	3	3.1	3.1	3.1	3.1
Magnesium	mg/L	0	0	0	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.03	<0.03	<0.03
Chloride	mg/L	88	90	86	87	88	89	88	86	85	88	89	87	87	86	88	87	88	88	90	90
Fluoride	mg/L	0.35	0.35	0.29	0.28	0.35	0.36	0.34	0.26	0.28	0.28	0.35	0.35	0.37	0.34	0.36	0.35	0.34	0.35	0.36	0.36
Nitrate	mg/L	<0.5	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<.05	<.5	<0.5	0.6	<0.5	<0.5	<0.5	0.15	<0.05	<0.05
Sulphate	mg/L	49	48	47	47	49	49	46	47	46	47	48	48	48	47	48	48	48	48	48	49
Iron	mg/L	<0.1	<0.01	<0.01	<0.01	<0.1	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<.01	<0.01	<0.01	<0.01	0.02	0.01	<0.01	<0.01	0.01
Manganese	mg/L	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.1	<0.01	<0.01	0.01	<0.01	<.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.009	0.009	0.009
Zinc	mg/L	<0.01	0.01	<0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	0.01	<0.01	<.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06	<0.06	<0.06
Aluminium	mg/L	<0.05	<0.05	<0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.06
Copper	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.015	0.004	<0.003

Chemical Reporting									
Scheme	St George								
Sampling Location	BSC Administration Building								
Laboratory Used	Queensland Health Forensic and Scientific Services								
Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22
PH		8.43	8.44	8.33	8.48	8.54	8.34	8.51	8.47
Total Hardness	mg/L	7.7	7.7	7.8	7.1	7.9	7.3	7.5	7.5
Alkalinity	mg/L	288	284	279	290	280	280	290	280
Total Dissolved Ions	mg/L	692	689	682	686	680	685	686	680
Total Dissolved Solids	mg/L	554	553	547	550	550	550	550	550
Colour	PCU	<7	<7	<8	<8	<8	<8	<8	<8
Turbidity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1
Sodium	mg/L	210	210	210	210	210	210	200	210
Potassium	mg/L	2.2	2.2	2.2	2.3	2.2	2.3	2.2	2.3
Calcium	mg/L	3	3.1	3.1	2.8	3.1	2.9	3	3
Magnesium	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Chloride	mg/L	88	88	88	88	87	87	88	89
Fluoride	mg/L	0.34	0.35	0.35	0.36	0.35	0.35	0.37	0.36
Nitrate	mg/L	<0.05	<0.05	0.87	<0.05	<0.05	0.06	<0.05	<0.05
Sulphate	mg/L	48	48	48	48	47	47	48	48
Iron	mg/L	0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Manganese	mg/L	0.008	0.008	0.009	0.007	0.011	0.007	0.009	0.008
Zinc	mg/L	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Aluminium	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Copper	mg/L	0.006	0.006	0.007	0.01	0.012	0.04	0.009	<0.003

Table 7.2 Historical Verification Monitoring - Dirranbandi

Chemical Reporting	
Scheme	Dirranbandi
Sampling Location	Dirranbandi Works Depot
Laboratory Used	Queensland Health Forensic and Scientific Services

Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-15	Dec-15	Mar-16	Jun-16	Sep-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20
PH		7.78	7.8	8.41	8.41	7.78	8.11	N/A	8.24	8.18	N/A	7.99	8.1	8.12	8.21	7.94	8.38	8.23	8.54	8.48	8.39
Total Hardness	mg/L	30	39	6.1	19	30	26	N/A	25	33	N/A	39	21	22	27	41	19	21	31	30	32
Alkalinity	mg/L	147	167	453	352	147	175	N/A	172	162	N/A	197	153	176	175	86	220	206	201	204	231
Total Dissolved Ions	mg/L	383	463	850	696	383	373	N/A	365	351	N/A	420	320	368	368	206	442	419	412	421	466
Total Dissolved Solids	mg/L	307	381	610	508	307	287	N/A	279	271	N/A	314	245	280	280	172	330	311	308	320	347
Colour	PCU	<1	3	1	<1	<1	<1	N/A	1	<1	N/A	2	2	1	<1	1	<1	<1	<1	<1	1
Turbidity	mg/L	5	31	<1	9	5	5	N/A	2	<1	N/A	4	1	<1	<1	2	2	1	2	<1	<1
Sodium	mg/L	102	124	243	197	102	98	N/A	97	89	N/A	110	83	99	97	42	120	110	110	110	120
Potassium	mg/L	3.8	5.1	2.5	4.1	3.8	4.4	N/A	3.7	4.6	N/A	5.5	3.6	3.7	4.5	6.8	3.7	3.4	5.2	3.6	4
Calcium	mg/L	7.6	9.6	2.4	5.3	7.6	6.8	N/A	6.2	7.9	N/A	9.4	5.3	5.6	6.7	9.5	4.9	5.4	7.8	7.7	8.3
Magnesium	mg/L	2.7	3.8	0	1.4	2.7	2.3	N/A	2.4	3.1	N/A	3.8	2	2	2.5	4.2	1.5	1.8	2.9	2.6	2.7
Chloride	mg/L	38	55	55	61	38	47	N/A	43	46	N/A	53	36	41	42	32	44	42	44	44	48
Fluoride	mg/L	0.38	0.36	0.49	0.43	0.38	0.26	N/A	0.24	0.23	N/A	0.37	0.32	0.29	0.31	0.24	0.37	0.35	0.33	0.34	0.37
Nitrate	mg/L	0.5	<0.5	<05	<0.5	0.5	<0.5	N/A	1.2	<0.5	N/A	<0.5	0.6	<0.5	<0.5	1.3	0.9	0.5	0.2	1	0.5
Sulphate	mg/L	50	62	2.7	4.3	50	3	N/A	4	4	N/A	4	3	4	4	6	3	4	4.3	5.7	5.7
Iron	mg/L	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	N/A	<0.01	<0.01	N/A	0.01	0.01	0.02	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.03
Manganese	mg/L	0.01	<0.01	0.01	0.01	0.01	<0.01	N/A	<0.01	<0.01	N/A	<0.01	<.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.001	0.003	0.006
Zinc	mg/L	<0.01	0.01	0.01	<0.01	<0.01	0.07	N/A	<0.01	<0.01	N/A	<0.01	<.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06	<0.06	<0.06
Aluminium	mg/L	0.06	<0.05	<0.05	0.05	0.06	<0.05	N/A	<0.05	<0.05	N/A	<0.05	<.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.03	<0.03
Copper	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	N/A	<0.03	<0.03	N/A	<0.03	<.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.003	0.004	0.003

Chemical Reporting									
Scheme	Dirranbandi								
Sampling Location	Dirranbandi Works Depot								
Laboratory Used	Queensland Health Forensic and Scientific Services								
Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22
PH		8.4	8.17	8.05	8.23	8.41	8.32	8.53	8.57
Total Hardness	mg/L	9.7	44	18	24	24	15	8.5	8.6
Alkalinity	mg/L	421	216	219	200	210	200	420	420
Total Dissolved Ions	mg/L	808	455	451	419	443	406	842	825
Total Dissolved Solids	mg/L	584	343	337	320	340	310	620	610
Colour	PCU	<7	<7	<8	<8	<8	<8	<8	<8
Turbidity	mg/L	1	1	<1	<1	<1	<1	<1	<1
Sodium	mg/L	230	120	130	110	120	120	240	240
Potassium	mg/L	2.4	5.6	2.7	3.6	3.4	3.4	2.5	2.5
Calcium	mg/L	3.1	1.1	4.8	6	5.9	4.1	3	3
Magnesium	mg/L	0.47	4.1	1.5	2.1	2.2	1.3	0.27	0.26
Chloride	mg/L	67	51	47	47	51	45	84	79
Fluoride	mg/L	0.67	0.36	0.4	0.33	0.37	0.38	0.7	0.71
Nitrate	mg/L	<0.05	0.12	0.7	0.93	0.81	0.26	0.21	0.22
Sulphate	mg/L	1.9	6.2	3.1	2.8	3.3	2.4	1.9	1.9
Iron	mg/L	<0.01	<0.01	0.03	0.02	0.01	0.03	0.07	0.09
Manganese	mg/L	0.013	0.003	0.004	0.004	0.003	0.003	0.01	0.009
Zinc	mg/L	<0.06	<0.063	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Aluminium	mg/L	0.04	0.03	0.04	<0.03	<0.03	0.04	<0.03	<0.03
Copper	mg/L	<0.003	0.004	0.008	0.003	<0.003	0.008	0.006	0.012

Table 7.3 Historical Verification Monitoring - Thallon

Chemical Reporting	
Scheme	Thallon
Sampling Location	Thallon Park
Laboratory Used	Queensland Health Forensic and Scientific Services

Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-15	Dec-15	Mar-16	Jun-16	Sep-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20
PH		8.29	8.37	6.56	8.46	8.29	8.46	8.43	8.5	8.48	8.67	8.32	8.32	8.35	8.42	8.41	8.47	8.37	8.52	8.56	8.37
Total Hardness	mg/L	5.5	5.7	39	6.9	5.5	5.7	6	5.6	5.7	5.9	5.7	5.7	5.9	5.7	5.9	5.8	5.8	6.5	7	6.2
Alkalinity	mg/L	492	477	167	441	492	535	483	493	498	487	487	438	482	487	461	468	478	506	482	475
Total Dissolved Ions	mg/L	930	899	463	836	930	987	905	922	933	900	910	825	901	912	859	867	889	935	904	888
Total Dissolved Solids	mg/L	665	645	381	603	665	699	648	662	670	649	642	593	644	652	615	620	635	665	649	633
Colour	PCU	<1	<1	3	2	<1	<1	1	2	1	<1	3	2	2	<1	3	<1	1	<1	<1	<1
Turbidity	mg/L	<1	<1	31	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium	mg/L	270	259	124	243	270	280	260	270	270	260	260	240	260	260	240	240	250	260	260	250
Potassium	mg/L	2.4	2.5	5.1	2.5	2.4	2.4	2.5	2.4	2.5	2.5	2.5	2.5	2.5	2.4	2.2	2.3	2.4	2.1	2.3	2.3
Calcium	mg/L	2.2	2.2	9.6	2.5	2.2	2.2	2.3	2.2	2.2	2.3	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.5	2.7	2.4
Magnesium	mg/L	0	0	3.8	0.1	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.03	0.04	0.03
Chloride	mg/L	60	59	55	56	60	61	58	58	58	58	59	55	47	59	57	57	58	60	60	58
Fluoride	mg/L	0.72	0.67	0.36	0.47	0.72	0.71	0.65	0.56	0.55	0.55	0.68	0.57	0.68	0.69	0.63	0.62	0.64	0.68	0.63	0.63
Nitrate	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.13	<0.05	<0.05
Sulphate	mg/L	2.2	2.6	62	2.5	2.2	2	2	2	2	2	2	3	2	1	1	1	2	1.5	2.7	1.7
Iron	mg/L	0.06	0.05	<0.01	0.17	0.06	0.05	0.12	0.07	0.08	0.08	0.06	0.08	0.1	0.03	0.02	0.03	0.06	0.02	<0.01	0.04
Manganese	mg/L	0.01	<0.01	<0.01	0.01	0.01	<0.01	0.01	0.01	0.01	<0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.004	0.014	0.016
Zinc	mg/L	<0.01	0.01	0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06	<0.06	<0.06
Aluminium	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	<0.03	<0.03
Copper	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	,0.03	<0.03	<0.03	<0.03	<0.03	<.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.004	<0.003	<0.003

Chemical Reporting									
Scheme	Thallon								
Sampling Location	Thallon Park								
Laboratory Used	Queensland Health Forensic and Scientific Services								
Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22
PH		8.39	8.46	8.39	8.44	8.53	8.4	8.39	8.42
Total Hardness	mg/L	5.6	5.8	6.3	5.7	5.1	5.6	5.9	5.8
Alkalinity	mg/L	487	497	455	460	490	450	440	470
Total Dissolved Ions	mg/L	904	933	849	864	911	845	820	890
Total Dissolved Solids	mg/L	644	668	608	620	650	610	590	640
Colour	PCU	<7	<7	<8	<8	<8	<8	<8	<8
Turbidity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1
Sodium	mg/L	250	270	240	250	260	240	230	260
Potassium	mg/L	2.4	2.5	2.4	2.5	2.3	2.5	2.4	2.4
Calcium	mg/L	2.2	2.3	2.5	2.2	2	2.2	2.3	2.3
Magnesium	mg/L	0.03	0.03	0.03	0.03	<0.03	0.03	<0.03	0.03
Chloride	mg/L	58	6	57	57	59	45	56	59
Fluoride	mg/L	0.65	0.69	0.6	0.62	0.68	0.6	0.58	0.68
Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	1.6	1.5	1.2	1.7	1.4	1.9	2.1	1.6
Iron	mg/L	0.1	<0.01	0.1	0.09	0.02	0.04	0.11	0.05
Manganese	mg/L	0.01	0.001	0.013	0.014	0.008	0.01	0.017	0.011
Zinc	mg/L	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Aluminium	mg/L	<0.03	0.05	<0.03	<0.03	<0..03	<0.03	<0.03	<0.03
Copper	mg/L	<0.003	<0.003	<0.003	<0.003	0.16	<0.003	0.005	<0.003

Table 7.4 Historical Verification Monitoring - Mungindi

Chemical Reporting																					
Scheme	Mungindi																				
Sampling Location	Mungindi - River Park																				
Laboratory Used	Queensland Health Forensic and Scientific Services																				
Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-15	Dec-15	Mar-16	Jun-16	Sep-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20
PH		8.06	8.08	8.03	8.12	8.06	8.08	N/A	7.91	8.13	8.3	7.93	8.2	8.11	8.26	8.16	7.6	8.28	8.47	8.57	8.39
Total Hardness	mg/L	72	82	51	79	72	74	N/A	58	125	75	73	74	85	67	85	68	52	6	27	56
Alkalinity	mg/L	81	107	124	97	81	106	N/A	67	132	126	84	169	177	190	127	76	240	306	312	296
Total Dissolved Ions	mg/L	198	250	267	216	198	242	N/A	173	302	274	192	344	366	386	272	186	484	610	626	609
Total Dissolved Solids	mg/L	161	198	214	170	161	192	N/A	153	234	214	151	256	267	284	208	152	353	445	467	451
Colour	PCU	<1	<1	1	<1	<1	<1	N/A	1	<1	<1	1	1	<1	<1	1	<1	<1	<1	<1	<1
Turbidity	mg/L	<1	<1	45	<1	<1	<1	N/A	<1	1	<1	<1	2	<1	<1	<1	<1	<1	<1	<1	<1
Sodium	mg/L	30	41	58	31	30	41	N/A	30	41	51	26	70	73	87	45	26	120	150	170	150
Potassium	mg/L	3	4.3	3.5	4.1	3	3.2	N/A	3.7	4.3	4.4	4	4.1	4.4	4.5	5.3	4.6	4	4.8	3.7	4.2
Calcium	mg/L	13	15	11	16	13	14	N/A	12	20	14	14	14	16	12	16	13	10	12	7	12
Magnesium	mg/L	9.3	11	5.9	9.8	9.3	9.4	N/A	6.9	18	10	9.6	9.5	11	8.8	11	8.4	6.2	7.5	2.4	6.1
Chloride	mg/L	32	40	34	34	32	38	N/A	33	49	39	32	38	44	41	37	27	43	60	57	61
Fluoride	mg/L	0.96	1.1	0	0.86	0.96	1	N/A	1	0.86	0.91	1	0.28	0.91	0.96	1	1.1	1.1	1	0.99	1
Nitrate	mg/L	1.9	<0.5	<0.5	<0.5	1.9	<0.5	N/A	0.8	2.2	<0.5	<0.5	<.5	<0.5	<0.5	<0.5	2.7	<0.5	0.27	0.57	0.17
Sulphate	mg/L	8.2	8.7	4.4	4	8.2	7	N/A	6	6	4	4	4	3	2	4	11	8	5.7	11	15
Iron	mg/L	<0.01	<0.01	0.01	<0.1	<0.01	<0.01	N/A	<0.01	<0.01	<0.01	<0.01	<.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	N/A	<0.01	<0.01	<0.01	<0.01	<.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.001	0.001	0.001
Zinc	mg/L	0.01	0.03	0.02	0.02	0.01	<0.05	N/A	<0.01	0.02	0.02	0.01	0.01	0.01	0.01	0	0.03	0.01	<0.06	<0.06	<0.06
Aluminium	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	N/A	<0.05	<0.05	<0.05	<0.05	<.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03
Copper	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	N/A	<0.03	<0.03	<0.03	<0.03	<.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.014	0.017	0.004

Chemical Reporting									
Scheme	Mungindi								
Sampling Location	Mungindi - River Park								
Laboratory Used	Queensland Health Forensic and Scientific Services								
Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22
PH		8.39	8.31	8.48	8.37	8.4	Flooding	8.4	8.39
Total Hardness	mg/L	54	60	41	53	44		33	38
Alkalinity	mg/L	248	242	325	220	230		280	38
Total Dissolved Ions	mg/L	514	509	630	478	473		562	473
Total Dissolved Solids	mg/L	380	379	458	370	350		410	350
Colour	PCU	<7	<7	<8	<8	<8		<8	<8
Turbidity	mg/L	<1	<1	<1	<1	<1		<1	17
Sodium	mg/L	130	130	170	120	120		150	130
Potassium	mg/L	3.6	4.2	3.9	4	3.4		4	3.6
Calcium	mg/L	12	13	9	12	9.2		7.9	8.8
Magnesium	mg/L	6.1	7	4.5	6	5.2		3.2	3.9
Chloride	mg/L	51	66	54	52	45		51	44
Fluoride	mg/L	1.1	1.1	1.1	1.2	1.1		0.46	0.4
Nitrate	mg/L	0.15	0.11	0.72	2.1	0.76		1.3	0.87
Sulphate	mg/L	15	10	4	14	6		3.2	4.9
Iron	mg/L	<0.01	<0.01	0.05	<0.01	<0.01		0.01	0.02
Manganese	mg/L	<0.001	<0.001	0.001	<0.001	0.001		0.002	0.005
Zinc	mg/L	<0.06	<0.06	<0.06	<0.06	<0.06		<0.06	<0.06
Aluminium	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	<0.03
Copper	mg/L	0.008	0.013	0.025	0.005	0.007		0.021	0.003

Table 7.5 Historical Verification Monitoring - Hebel

Chemical Reporting																					
Scheme	Hebel																				
Sampling Location	Hebel Park																				
Laboratory Used	Queensland Health Forensic and Scientific Services																				
Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-15	Dec-15	Mar-16	Jun-16	Sep-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20
PH		8.58	8.53	8.59	8.51	8.58	8.71	N/A	8.66	8.49	8.59	8.3	8.48	8.51	8.38	8.62	8.61	8.58	8.71	8.58	8.68
Total Hardness	mg/L	4.5	4.6	4.7	7.7	4.5	4.7	N/A	5.2	5.2	6.8	5.4	4.9	5.2	5.2	5.2	5	4.7	4.6	5.2	4.9
Alkalinity	mg/L	375	378	388	282	375	381	N/A	382	373	377	384	373	379	374	378	382	383	381	357	390
Total Dissolved Ions	mg/L	738	745	755	686	738	747	N/A	736	740	742	752	726	739	738	733	736	745	734	742	760
Total Dissolved Solids	mg/L	541	547	551	552	541	550	N/A	544	543	547	539	527	537	536	534	535	544	538	562	553
Colour	PCU	<1	2	0	<1	<1	<1	N/A	1	<1	<1	1	2	<1	<1	2	1	1	<1	<1	<1
Turbidity	mg/L	<1	<1	<1	<1	<1	<1	N/A	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium	mg/L	219	221	222	210	219	220	N/A	220	220	220	210	210	210	210	210	210	220	210	220	220
Potassium	mg/L	1.3	1.4	1.4	2.2	1.3	1.4	N/A	1.4	1.3	1.4	1.4	1.3	1.4	1.3	1.3	1.4	1.4	1.4	1.7	1.3
Calcium	mg/L	1.8	1.8	1.8	3	1.8	1.9	N/A	2	2	2.6	2.1	1.9	2	2	2	1.8	1.85	1.8	2	1.9
Magnesium	mg/L	0	0	0	0	0	<0.1	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.03	<0.03	0.03
Chloride	mg/L	67	67	65	86	67	68	N/A	65	65	67	67	65	66	67	67	67	67	67	89	69
Fluoride	mg/L	0.46	0.48	0.38	0.29	0.46	0.48	N/A	0.36	0.37	0.37	0.46	0.43	0.47	0.46	0.46	0.46	0.45	0.46	0.42	0.47
Nitrate	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	N/A	<0.5	2.1	2.4	2.2	<0.5	<0.5	2.5	<0.5	<0.5	<0.5	0.08	<0.05	<0.05
Sulphate	mg/L	1.2	1.5	1.1	47	1.2	2	N/A	1	2	6	2	1	<1	1	<1	<1	<1	0.9	5.3	0.9
Iron	mg/L	0.02	0.02	0.03	<0.01	0.02	0.01	N/A	<0.01	<0.01	<0.01	<0.01	<.01	<0.01	<0.01	0.01	0.04	0.03	0.01	<0.01	0.01
Manganese	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	N/A	0.01	0.01	0.03	0.01	0.02	0.01	0.01	0.01	<0.01	0.01	0.008	0.01	0.02
Zinc	mg/L	<0.01	0.01	<0.01	<0.01	<0.01	0.11	N/A	<0.01	<0.01	0.03	0.02	0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.06	<0.06	<0.06
Aluminium	mg/L	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	N/A	<0.05	<0.05	<0.05	<0.05	<.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03
Copper	mg/L	<0.03	<0.03	<0.05	<0.03	<0.03	<0.03	N/A	<0.03	<0.03	0.03	0.1	<.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.022	<0.003	<0.003

Chemical Reporting									
Scheme	Hebel								
Sampling Location	Hebel Park								
Laboratory Used	Queensland Health Forensic and Scientific Services								
Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22
PH		8.52	8.63	8.61	8.69	8.68	Flooding	8.65	8.63
Total Hardness	mg/L	4.9	5	4.9	4.9	4.8		4.9	4.8
Alkalinity	mg/L	387	384	380	380	380		380	380
Total Dissolved Ions	mg/L	749	748	737	742	734		743	736
Total Dissolved Solids	mg/L	545	548	538	540	540		540	540
Colour	PCU	<7	<7	<8	<8	<8		<8	<8
Turbidity	mg/L	<1	<1	<1	<1	<1		<1	<1
Sodium	mg/L	220	220	210	220	220		220	220
Potassium	mg/L	1.4	1.4	1.3	1.4	1.4		1.3	1.4
Calcium	mg/L	1.9	2	1.9	1.9	1.8		1.9	1.9
Magnesium	mg/L	0.03	0.03	0.03	0.03	0.08		0.03	0.03
Chloride	mg/L	67	67	67	67	68		67	68
Fluoride	mg/L	0.45	0.46	0.46	0.46	0.46		0.48	0.47
Nitrate	mg/L	0.92	<0.05	<0.05	<0.05	0.07		0.1	0.06
Sulphate	mg/L	0.9	0.9	0.7	0.6	0.8		0.7	0.7
Iron	mg/L	<0.01	0.02	<0.01	<0.01	<0.01		<0.01	<0.01
Manganese	mg/L	0.011	0.008	0.01	0.012	0.009		0.009	0.014
Zinc	mg/L	<0.06	<0.06	<0.06	<0.06	<0.06		<0.06	<0.06
Aluminium	mg/L	<0.03	<0.03	<0.03	<0.03	<0..03		<0.03	<0.03
Copper	mg/L	<0.003	<0.003	<0.003	<0.003	0.015		0.003	<0.003

Table 7.6 Historical Verification Monitoring - Bollon

Chemical Reporting	
Scheme	Bollon
Sampling Location	Rayner Place Park
Laboratory Used	Queensland Health Forensic and Scientific Services

Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-15	Dec-15	Mar-16	Jun-16	Sep-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20
PH		8.49	8.45	8.5	8.54	8.49	8.57	8.55	8.55	8.49	8.59	8.3	8.48	8.49	8.5	8.56	8.54	8.43	8.58	8.58	8.51
Total Hardness	mg/L	5.2	5.1	5.2	4.9	5.2	5.2	5.2	5	5.2	6.8	5.4	4.9	5.3	5.1	5.2	5.2	5.2	5.2	5.2	5.2
Alkalinity	mg/L	355	361	371	386	355	358	359	355	373	377	384	373	355	349	351	356	356	355	357	365
Total Dissolved Ions	mg/L	746	758	766	793	746	753	752	743	740	742	752	726	740	730	730	735	742	738	742	757
Total Dissolved Solids	mg/L	565	574	577	595	565	573	570	563	543	547	539	527	558	552	552	553	559	558	562	568
Colour	PCU	<1	1	1	1	<1	<1	1	2	<1	<1	1	2	<1	<1	1	<1	<1	<1	<1	<1
Turbidity	mg/L	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium	mg/L	224	226	228	238	224	230	230	220	220	220	210	210	220	220	210	210	220	220	220	220
Potassium	mg/L	1.7	1.8	1.7	1.8	1.7	1.7	1.8	1.7	1.3	1.4	1.4	1.3	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Calcium	mg/L	2	2	2.1	1.9	2	2.1	2	2	2	2.6	2.1	1.9	2.1	2	2	2	2	2	2	2
Magnesium	mg/L	0	0	0	0	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.06	<0.03	<0.03
Chloride	mg/L	87	90	85	85	87	89	87	85	65	67	67	65	86	87	87	87	87	88	89	89
Fluoride	mg/L	0.44	0.44	0.34	0.37	0.44	0.43	0.44	0.32	0.37	0.37	0.46	0.43	0.4	0.42	0.43	0.41	0.41	0.41	0.42	0.44
Nitrate	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.1	2.4	2.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05
Sulphate	mg/L	5.7	6.4	5.6	5.4	5.7	6	5	6	2	6	2	1	5	5	5	5	5	5.4	5.3	5.4
Iron	mg/L	<0.01	0.01	<0.01	0.02	<0.01	0.01	0.04	0.03	<0.01	<0.01	<0.01	<.01	<0.01	<0.01	0.02	0.03	0.01	0.02	<0.01	0.01
Manganese	mg/L	<0.01	<0.01	0.01	0.01	<0.01	0.01	0.01	<0.01	0.01	0.03	0.01	0.02	<0.01	<0.01	0.01	0.01	0.01	0.009	0.01	0.011
Zinc	mg/L	<0.01	0.01	<0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	0.03	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.006	<0.06	<0.06
Aluminium	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03
Copper	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.1	<.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.003	<0.003	<0.003

Chemical Reporting									
Scheme	Bollon								
Sampling Location	Rayner Place Park								
Laboratory Used	Queensland Health Forensic and Scientific Services								
Parameter	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22
PH		8.53	8.54	8.55	8.58	8.65	8.44	8.62	8.65
Total Hardness	mg/L	5	5.3	5.1	5.1	5.2	5.2	5.1	5.1
Alkalinity	mg/L	359	359	358	360	350	350	360	350
Total Dissolved Ions	mg/L	744	747	741	742	726	732	737	739
Total Dissolved Solids	mg/L	562	565	560	560	550	550	560	560
Colour	PCU	<7	<7	<8	<8	<8	<8	<8	<8
Turbidity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1
Sodium	mg/L	220	220	220	220	220	220	220	220
Potassium	mg/L	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.8
Calcium	mg/L	2	2.1	2	2	2	2.1	2	2
Magnesium	mg/L	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03
Chloride	mg/L	87	88	87	87	87	87	88	89
Fluoride	mg/L	0.41	0.41	0.42	0.43	0.41	0.41	0.43	0.44
Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.058	<0.05	<0.05
Sulphate	mg/L	5.2	5.2	4.7	5.1	5.3	5.1	5.1	5.2
Iron	mg/L	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.04
Manganese	mg/L	0.008	0.009	0.014	0.012	0.01	0.009	0.011	0.12
Zinc	mg/L	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Aluminium	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06
Copper	mg/L	<0.003	0.003	<0.003	<0.003	<0.003	0.011	<0.003	<0.003