



QUILPIE DRINKING WATER QUALITY MANAGEMENT PLAN

Service Provider ID 108

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1 REGISTERED SERVICE DETAILS

Quilpie Shire Council (QSC) is located in South Western Queensland and comprises the towns of Quilpie, Eromanga, Adavale and Cheepie covering an area of 67,482 km².

Figure 1.1 shows the location of the town of Quilpie relative to Brisbane, Rockhampton, Townsville and Mt. Isa.

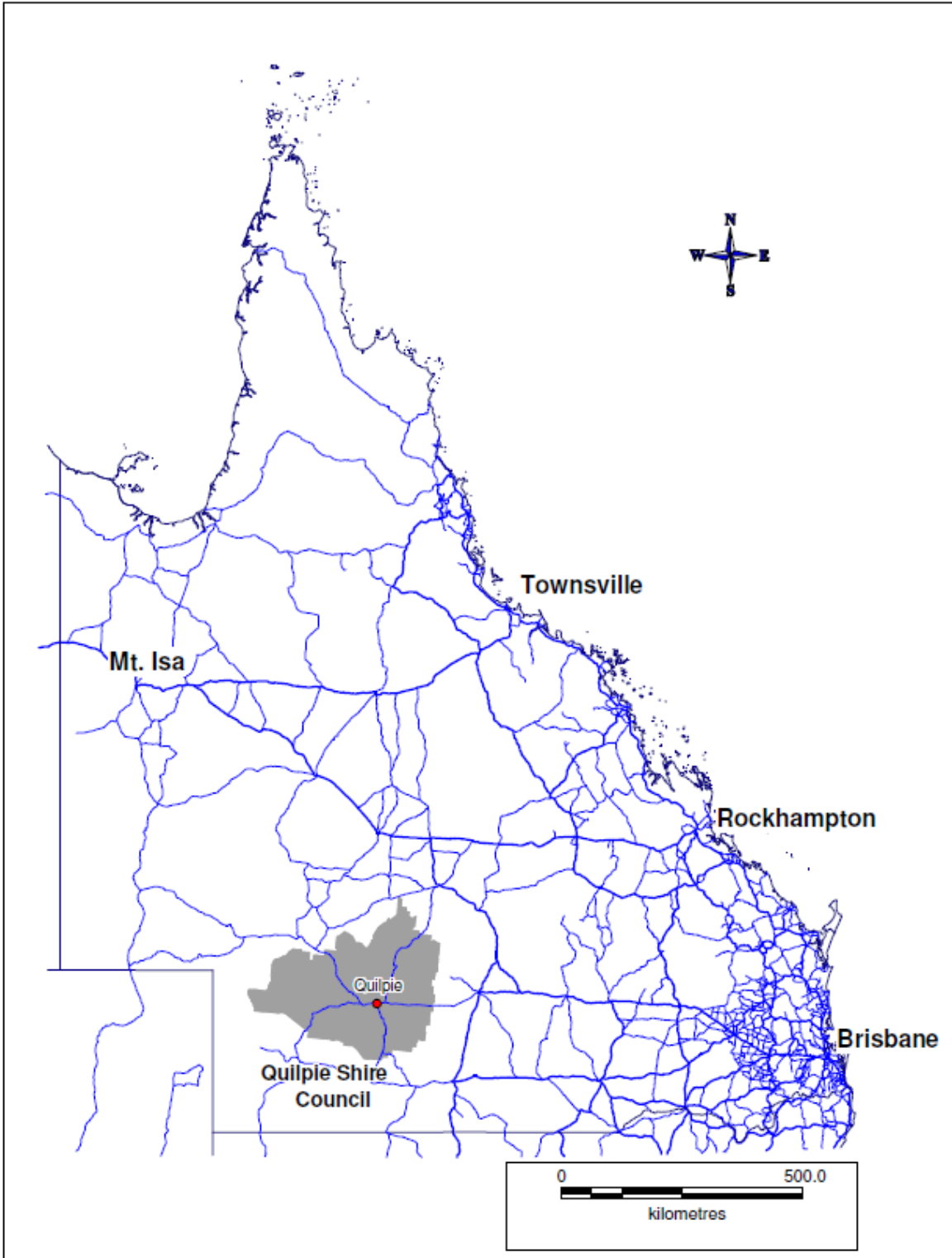


Figure 1.1 Quilpie Location Map

QSC is the drinking water service provider (SPID 108) for the following water supply schemes in the region; (refer to Figure 1.2).

- **Quilpie Water Supply Scheme**

Quilpie is located approximately 217km west of Charleville and 1000km west of Brisbane.

- **Eromanga Water Supply Scheme**

Eromanga is located 100km west of Quilpie.

QSC also provide a non-potable water supply to the Adavale Water supply scheme;

- **Adavale Raw Water Supply Scheme (Non-potable)**

Adavale is located 103km north of Quilpie.

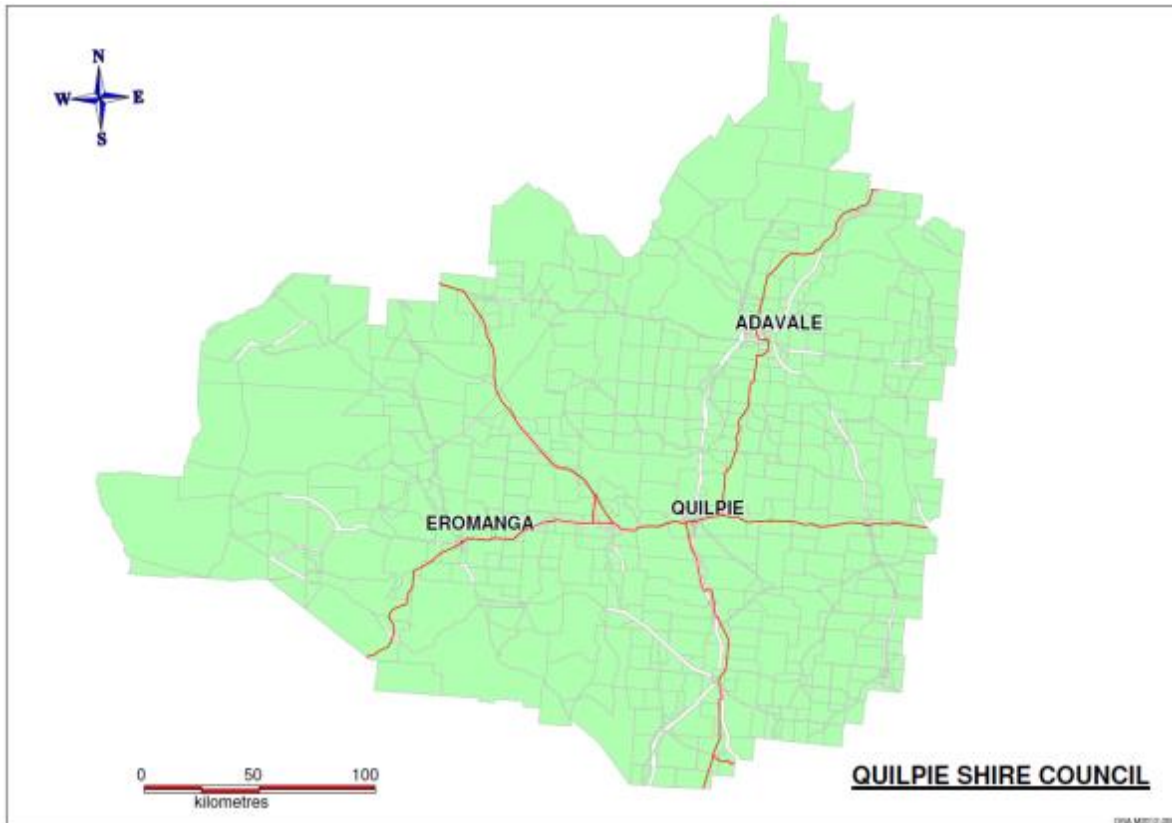


Figure 1.2 Quilpie Shire Council

QSC is a small Drinking Water Service Provider (DWSP) as defined in the Water Supply (Safety and Reliability) Act 2008 and provides drinking water for an approximate population of 665 with a total demand of approximately 1.344 ML/d. QSC may be referred to as the DWSP throughout this document.

Refer to Appendix A Drinking Water Quality Management Plan Approval Application

1.1 Further Information Required

Table 1-1 Listing of Water Supply Schemes below lists the drinking water schemes, identifies the operational responsibilities for each scheme and details the current and future population and demand for each scheme.

Table 1-1 Listing of Water Supply Schemes

Scheme Name	Operator (organisation)	Communities Served	Current (2016)			Future (2026)[1]		
			Population Served	Connections	Demand kL/d	Population Served	Connections	Demand kL/d
Quilpie	Shire Council	Quilpie	595	427	1200	515	369	1038
Eromanga		Eromanga	45	43	104	39	39	90
Adavale		Adavale	15	19	40	13	13	35
<i>Total</i>				<i>655</i>	<i>489</i>	<i>1344</i>	<i>567</i>	<i>421</i>

1.2 Legislative Requirements

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

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

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

The operation of a water service or a drinking water service will also be covered under other State and Commonwealth Legislation. It should be noted the requirements of Water Supply (Safety and Reliability) Act 2008 do not negate the requirements of other legislation unless where expressly stated. The provider is also responsible for obtaining any necessary approvals under the other Acts to ensure the continued operation of the service. State and Commonwealth legislation relating to the operations of a water service are detailed in table 1.2 below:

Table1-2 Regulatory and Formal Requirements

Requirement	Council obligations and how they relate to the DWQMP
Water Supply (Safety and Reliability) Act 2008 Water Supply (Safety and Reliability) Regulation 2011	Council registered as a service provider, given powers to do certain things (e.g. disconnect customers, restrictions). Required to have an approved DWQMP and comply with the DWQMP. Required to report and respond to drinking water incidents.
Public Health Act 2005 Public Health Regulation 2005	Sets minimum sampling frequencies for E. coli as a provider. Council must not provide unsafe water.
Disaster Management Act 2003	Council is required to have a disaster management plan. This plan links to the Emergency Plan in this document.
Work Health and Safety Act 2011	Council must ensure safe work practices, including in the provision of drinking water.

Requirement	Council obligations and how they relate to the DWQMP
Plumbing and Drainage Act (2002)	Council must ensure that water infrastructure work is at a particular standard.
Qld Plumbing and Wastewater Code (QPW code)	The code defines how drinking water infrastructure can be constructed.

1.2.1 First Point of Contact

In accordance with section 95(3) (b) of the Act it is a requirement, the first point of contact relating to the drinking water enquiries is the CEO of Quilpie Shire Council. The contact details for the CEO are as follows:

Table 1-3 First Point of Contact

First Point of Contact: Contact Details	
Name	Tim Rose
Position	Acting Chief Executive Officer
Phone number	(07) 4656 0500
Email	ceo@quilpie.qld.gov.au

2 DETAILS OF INFRASTRUCTURE FOR PROVIDING THE SERVICE

QSC is the DWSP for two drinking water supply schemes. The infrastructure for providing the service is detailed in the sections outlined below:

- 2.1 Quilpie Water Supply Scheme
- 2.2 Eromanga Water Supply Scheme

For the Quilpie water supply scheme, water is untreated from an artesian water source, where the water is reticulated directly to the community's distribution systems, there is no water storage reservoir in Quilpie. Eromanga water supply was upgraded in 2014 with the commissioning of a reverse osmosis treatment plant and water storage facilities. Prior to the commissioning of the treatment plant, Eromanga's water supply was considered to be non-potable, this scheme now provides good quality potable drinking water.

2.1 Quilpie Water Supply Scheme

Quilpie water supply scheme is sourced from two sealed artesian bores; Town Bore 1 and Town Bore 2, the bore water is sourced from 900m and 966m respectfully, the supply scheme relies on the bore pressure from the artesian supply to deliver water to customers without the use of reservoirs. Due to the high pressure of these bores pressure valves are installed at each bore to reduce pressure before being supplied into reticulation. Due to the sealed nature of these bores and the depth that the water is sourced from, the likelihood of pathogenic contamination is greatly reduced compared to a surface water supply scheme.

Bore 2 is the primary water source for Quilpie's water supply scheme supplying the majority of the town. Bore 1's primary function is as a backup water supply in case of bore 2 failure. Bore 1 however is utilised on an ongoing basis to provide water to a small section of the reticulation system on the NW side of Quilpie, providing water to Quilpie Airport and the new council depot. The supply is restricted by a sluice valve running adjacent to bore 1 directing water to the new depot and airport.

2.1.1 Schematic

Figure 2.1 shows a schematic of the Quilpie's Water Supply Scheme. Refer to Appendix B for water supply layouts superimposed on aerial photos.

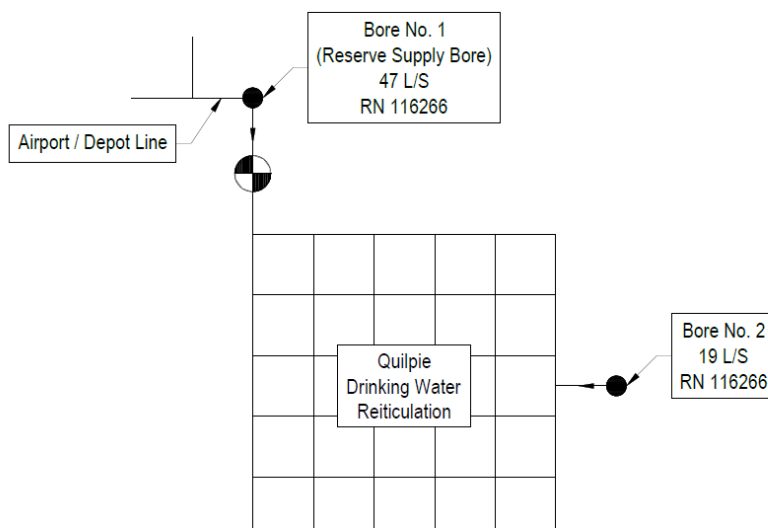


Figure 2.1 Quilpie Service Schematic Layout Source, Treatment and Distribution Details

2.1.2 Source, Treatment and Distribution Details

Table 2-1 provides the following information for Quilpie’s infrastructure:

- Source details;
- Distribution and reticulation.

Table 2-1 Quilpie Infrastructure Details

Component		Quilpie Water Supply Scheme
Sources	Name	Quilpie Town Bore No. 2
	Type	Deep Artesian Bore (RN116266)
	% of supply	100%
	Reliability	Does not run dry
	Water quality issues	Drinking water does not fully comply with the Australian Drinking Water Guidelines. Refer to 3.1.1 Physical and Chemical Water Quality Information
	Name	Quilpie Town Bore No. 1
	Type	Deep Artesian Bore (RN 390)
	% of supply	10% (back-up bore)
	Reliability	Does not run dry
	Water quality issues	Drinking water does not fully comply with the Australian Drinking Water Guidelines. Refer to 3.1.1 Physical and Chemical Water Quality Information
Sourcing Infrastructure	Type	Deep Artesian Bore
	Description	Town Bore No. 1 is located on the corner of Chipu and Brolga Street. Town Bore No.2 is located on the corner of Gyrica and Winchu street. Town Bore No.1 and Town Bore No. 2 are 900m and 966m deep respectively. Town Bore No. 1 is predominantly used as a back-up bore, it provides water to a small part of the reticulation system, including, the new council depot and the airport on the NW side of town. Bore No 1 has the capacity to yield 47 l/s if required. Town Bore No.2 currently yields 19l/s. Both bores are free flowing and deliver enough pressure to distribute water directly into the reticulation without pumping. Refer to APPENDIX D BORE CASING AND STRATA DETAILS for bore construction details.
Are there any sources that do not undergo treatment prior to supply?	Yes	Quilpie Town Bore No.1 and Quilpie Town Bore No. 2
Are there any sources that do not undergo disinfection prior to supply?	Yes	Quilpie Town Bore No.1 and Quilpie Town Bore No. 2.

Component		Quilpie Water Supply Scheme
Distribution and Reticulation System	Pipe material	AC
	Age range	28 - 57
	Approx. % of total length	60%
	Approx. length	8.3km
	Pipe material	DICL
	Age range	28 - 57
Distribution and Reticulation System	Approx. % of total length	24%
	Approx. length	3.7km
	Pipe material	HDPE
	Age range	0 - 34
	Approx. % of total length	13.2%
	Approx. length	1.83km
Distribution and Reticulation System	Areas where potential long detention periods could be expected	None
	Areas where low water pressure (e.g. < 12 m) could be expected during peak or other demand periods)	None
Water quality responsibility changes	Entire water supply scheme	Quilpie Shire Council

2.2 Eromanga Water Supply Scheme

Eromanga water supply scheme has undergone a significant upgrade in recent times. In 2014 a new supply scheme was developed sourcing water from four shallow sub artesian bores in the township of Eromanga. Each bore has an electric submersible pump which supplies water on demand to a common raw water tank as determined by an automated level control system. Level switches in each bore determine the availability of water in each bore. Bore locations are:

- Bore 1 : Town hall
- Bore 2 : Town hall
- Bore 3 : School oval
- Bore 4 : House opposite council depot

A reverse osmosis and chlorine dosing system brings the raw water to a potable standard and transfers the treated water to the clean water tank as required to maintain the set level in the tank. The treatment plant can run automatically performing all necessary back flushing to ensure continuous water output.

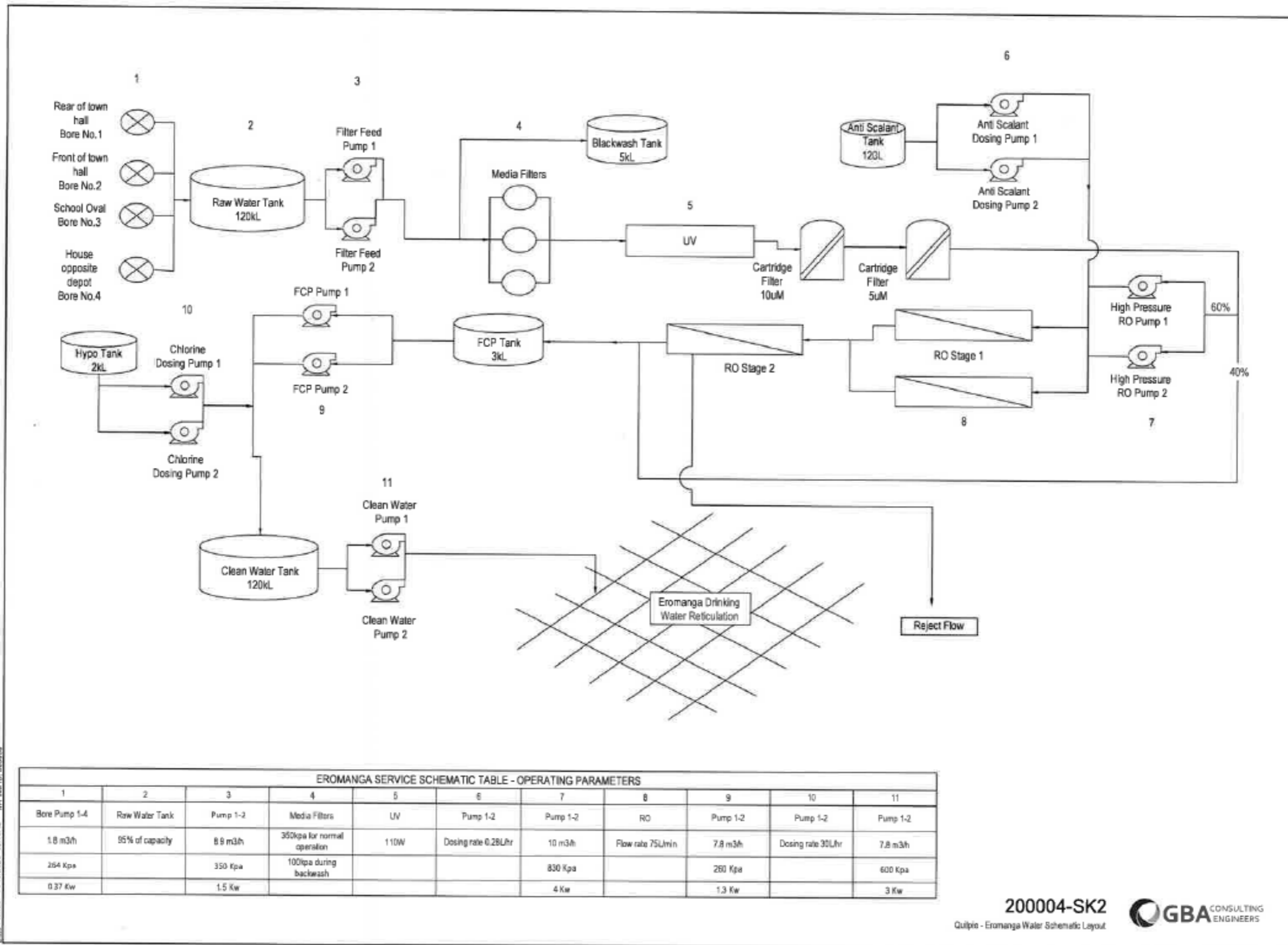
Treated water is drawn from the clean water tank and pressure is maintained by the two clean water pumps and fed to the town supply on demand.

The complete system is controlled and monitored by a PLC (programmable logic controller) with an HMI (Human Machine Interface) panel in the main control building. Radio links between each

of the four bores and the main control provide run signals to pumps and fault indications back to the PLC and HMI touchscreen.

2.2.1 Schematic

Figure 2.2 shows a schematic of the Eromanga water supply scheme. Refer to appendix B for water supply layouts superimposed on aerial photos.



EROMANGA SERVICE SCHEMATIC TABLE - OPERATING PARAMETERS										
1	2	3	4	5	6	7	8	9	10	11
Bore Pump 1-4	Raw Water Tank	Pump 1-2	Media Filters	UV	Pump 1-2	Pump 1-2	RO	Pump 1-2	Pump 1-2	Pump 1-2
1.8 m3/h	95% of capacity	8.9 m3/h	350kpa for normal operation	110W	Dosing rate 0.28L/hr	10 m3/h	Flow rate 75L/min	7.8 m3/h	Dosing rate 35L/hr	7.8 m3/h
264 Kpa		350 Kpa	100tpa during backwash			830 Kpa		260 Kpa		600 Kpa
0.37 Kw		1.5 Kw				4 Kw		1.3 Kw		3 Kw

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 Gulpin - Eromanga Water Schematic Layout

Figure 2.2 Eromanga Service Schematic Layout

2.2.2 Source, Treatment and Distribution Details

Table 2.2 and Table 2.3 provide the following information for Eromanga’s infrastructure:

- Source details;
- Distribution and reticulation.
- Plant component and descriptions (Table 2.3)

Table 2-2 Eromanga Infrastructure supply and Reticulation Details

Component		Eromanga Water Supply (Potable)
Source	Name Type % of supply Reliability Water Quality Issues	Eromanga Hall Bore (front) Sub Artesian Bore 25% Refer to 3.2.1 Water Quality Information
Sourcing Infrastructure	Type Description	Sub Artesian Bore Eromanga Hall Bore (front) is located at the Western side of town on Deacon St. The bore is 29.6m deep, yields 1.63l/s with an electric submersible pump located at top of screen at 23.60m.
Source	Name Type % of supply Reliability Water Quality Issues	Eromanga Hall Bore (Rear) Sub Artesian Bore 25% Refer to 3.2.1 Water Quality Information
Sourcing infrastructure	Type Description	Sub Artesian Bore Eromanga Hall Bore (Rear) is located on the Western side of town on Deacon St. The bore is 42m deep, yields 3.1l/s with an electric submersible pump located at top of screen at 22.5m.
Source	Name Type % of supply Reliability Water Quality Issues	Eromanga House Bore Sub Artesian Bore 25% Permanent Refer to 3.2.1 Water Quality Information
Sourcing Infrastructure	Type Description	Sub Artesian Bore Eromanga House Bore is located on the northern side of town at Lot 6 on Neal St. The bore is 29.8m deep. The bore currently yields 1.09 l/s with an electric submersible pump located at top of screen at 23.80m.
Source	Name Type % of supply Reliability Water Quality Issues	Eromanga School Bore Sub Artesian Bore 25% Permanent Refer to 3.2.1 Water Quality Information

Component		Eromanga Water Supply (Potable)
Sourcing Infrastructure	Type Description	Sub Artesian Bore Eromanga School Bore is located on southern side of town within the school grounds on Donald St next to the swimming pool. The bore is 25m deep. The bore currently yields 2 l/s with an electric submersible pump located at top of screen at 19m.
Are there any sources that do not undergo treatment prior to supply	No	
Are there any sources that do not undergo disinfection prior to supply	Yes Eromanga deep Artesian bore. Potentially used as an alternate water source during plant failure if water cannot be transported from Quilpie. The bore operates currently on a continual basis to supply water for animals on the town common and for wash down water at the IOR oil refinery. The bore can be connected quickly if water needs to be supplied.	
Distribution and Reticulation System	Pipe material	AC
	Age range	33-35
	Approx. % of total length	27.5%
	Approx. length	.413km
Distribution and Reticulation System	Pipe Material	DICL
	Age range	30+
	Approx. % of total length	70%
	Approx. length	1.048km
Distribution and Reticulation System	Pipe material	Poly
	Age range	0-8
	Approx. % of total length	.25%
	Approx. length	.4
Distribution and Reticulation System	Areas where potential long detention periods could be expected	Areas of potential long detention periods may include municipal areas that are not used on a daily basis such as the town hall, other areas may include accommodation in off peak season where utilisation rates are low.
	Areas where low water pressure (e.g. <12m) could be expected during peak or other demand periods.	Treated water delivery consists of two modern delivery pumps with dedicated pressure sensors for each pump, the two pumps are set-up in a lead/lag configuration to maintain a discharge at approximately 28psi. Low water pressure in the system may occur due to mains breakages or other malfunctions.
Water quality responsibility changes	Entire water supply scheme	Quilpie Shire Council

Table 2-3 Eromanga Water Treatment Plant Component Description

Component	Component Description
Raw Water Tank	<p>There are four shallow sub-artesian bores in the township of Eromanga, each have an electric submersible pump which supplies water on demand to a common Raw Water tank as determined by an automated level control system. The Raw Water tank is fitted with a pressure sensor to determine the water level; this is fed back to the Programmable Logic Controller (PLC) which communicates with the bore systems via a radio network. The four bore pumps operate simultaneously and the flow rates are monitored and recorded on the Human Machine Interface (HMI). The Raw Water tank level low set point starts the bore pumps and the Raw Water tank level high set point stops the pumps. There is also a pressure set point that triggers a high pressure fault and shuts the pump down.</p> <p>The common Raw Water tank and the Clean Water tank were constructed with the same specifications. The grounded Clean Water tank is constructed from reinforced concrete and capped with a pitched galvanised steel roof, to protect from vermin and direct stormwater run-off. The Clean Water tank was constructed with a height of 2.4, diameter of 8.6m and capacity of 120kL.</p>
Media Filter Pumps	<p>The Raw Water tank provides flooded suction to two pumps at the head of the water treatment plant. The two pumps provide water to the media filter pre-treatment skid and feed the entire water treatment system. They are configured as duty/standby to ensure that the water supply maintained even in the event of a fault with one of the pumps. The pumps are controlled with individual VSDs (variable speed drives) to maintain a set discharge pressure as measured by a pressure sensor at the filter inlet. The pressure sensor also provides low pressure set points which shutdown the pumps. The pumps have a rotating duty cycle to ensure that the run hours are kept approximately equal for each pump. The pumps are integrated with the entire plant and will operate in auto with the following circumstances:</p> <ul style="list-style-type: none"> • Raw water tank level above Low set point. • RO plant is running or backwash cycle is running
Media Filter Pre-treatment	<p>The pre-treatment component consists of three pressurized media filters in parallel, designed and installed to prevent fouling of the RO system. The arrangement of media is intended to remove the largest particles at the top of the media bed, while smaller particles are retained deeper and deeper in the media. This allows the entire bed to act as a filter allowing much longer filter run times between backwash and more efficient particulate removal. Each media filter has two motorised valves associated with it: a normally open valve for inlet stream going into the top of the filter, and a normally closed valve for the backwash waste stream coming out the top of the filter. Filtration is the default mode in which the raw water passes through the three filters (from top to bottom) and to the RO. In this mode all filter inlet valves are open and all backwash valves are closed. The duty feed pump runs to maintain filter inlet pressure at a set-point. A filter backwash cycle is triggered intermittently to remove any solids and impurities that have accumulated on the surface of the filter media. The cycle uses the filtered water from two of the filters to pass through the third filter in the reverse direction at a high velocity.</p>
Ultra Violet Light Disinfection System	<p>Prior to the RO plant a UV module is installed to inactivate biological organisms from the filtered water to minimize the chance of fouling the RO membranes. The UV will also prevent biological growth from occurring in the water during periods of inactivity. The UV remains on all the time and will raise an alarm if there is a lamp or power failure.</p>
Reverse Osmosis Process	<p>The RO plant treats 60% of the filtered water from the media filters to reduce the salinity of the water to achieve Australian Drinking Water Guidelines (ADWG) requirements by passing it at a high pressure through eight semi-</p>

Component	Component Description
	<p>permeable membranes. The remaining 40% of the filtered water bypasses the RO and is blended with the pure RO water (permeate). The stream that bypasses the RO equipment from the media filters and blends with the RO permeate is controlled by a modulating valve. The valve is modulated to meet a set conductivity based upon the conductivity reading on the blended water.</p> <p>The RO feed pressure sensor also prevents the pumps from dry running (i.e. low suction pressure) by raising an alarm and stopping the pumps. The high pressure pumps will try to restart three times automatically after a low inlet pressure fault, if it continues to get the fault after the third try the pump will stop until the operator resets the fault.</p> <p>The RO has pre-membrane and post membrane pressure sensors which provide pressure indication to the HMI. Alarms are provided for high pressure readings with high differential pressure inhibitors installed to protect equipment. The output of the RO plant is regulated by the speed of the high pressure pumps and by throttling the brine water flow and recycling water flow via manual globe valves.</p> <p>There are two duty/standby anti-scalant dosing pumps that operate at a fixed dose rate while the RO is operating. These pumps dose an anti-scalant chemical solution into the feed water to prevent the build-up of scale.</p>
FCP Pumps	<p>There are two duty/standby FCP pumps that transfer blended permeate water from the FCP tank to the Clean Water tank. The pumps are started and stopped based on high and low FCP tank level set points. The tank level is measured by a pressure sensor mounted on the bottom of the tank. The pumps are started Direct-On-Line (DOL) and run at a fixed flow. A magnetic flow meter measures the discharge flow to the Clean Water tank and inhibits the pumps in the event of a no flow alarm. This no flow alarm is triggered if a pump is running and there is no flow through the flow meter.</p>
Chlorine Dosing	<p>The chlorine dosing treatment occurs during the transfer of blended permeate water from the FCP tank to the Clean Water tank.</p> <p>There are two duty/standby chlorine dosing pumps that inject Sodium Hypochlorite into the FCP pump discharge line at a rate dependant of water usage and target residual levels, with a maximum performance of 30L/hr. The required chlorine dosage is set via the dosing pump speed and is not regulated automatically. These pumps draw from the 2kL Sodium Hypochlorite tank located in the bulk storage area.</p> <p>The duty dosing pump can be run in auto or manual modes as selected through HMI. The switch on the control cabinet bypasses the PLC to allow the pumps to run in the event of a PLC malfunction.</p> <p>The chlorine storage tank has low level protection for the dosing pumps. If a low level alarm is activated the system will stop until the tank is refilled. A chlorine tank low level alarm will also inhibit the entire system from operating (excluding the bore pumps) as the chlorination process is a critical component.</p> <p>The Chlorine Dosing pumps are intended to operate only when the FCP Pumps are delivering water to the Clean Water tank; therefore the dosing pumps are inhibited whenever the FCP pumps are NOT running in auto.</p>
Clean Water Tank	<p>A reverse osmosis and chlorine dosing system brings the raw water to a potable standard, the treated water is then transferred to the Clean Water tank as required to maintain the set level in the tank. Treated water is drawn from the Clean Water tank and pressure is maintained by the two Clean Water pumps and fed to the town supply on demand. The Clean Water tank level and high/low set-point values are monitored along with the Clean Water pump operating status. As part of the monitoring, a high alarm is generated when the tank level exceeds 99% and a low alarm is generated when the tank level</p>

Component	Component Description
	is below 15%, the low level alarm will inhibit the operation of the Clean Water supply pumps until the level is raised. For Clean Water tank specifications refer to Raw Water tank entry.
Clean Water Pumps	The Clean Water pump set is a stand-alone E-Boost pressure system consisting of two delivery pumps with dedicated variable speed drives and pressure sensors for each pump. Although the Clean Water pumps act as a standalone system, they are interlocked with the Clean Water tank level and will be inhibited if the Clean Water tank lo-lo level alarm is activated. The pumps are set-up in a lead/lag configuration to maintain the discharge pressure at approximately 28 psi. The control system interfaces with the pumps system for monitoring and also provides low tank level protection.

Table 2-4 Eromanga Water Treatment Plant Chemical Additive Description

Chemical	Product	Function
Sodium Hypochlorite	Focus Pool Liquid Chlorine	Disinfection of treated water dosed into the transfer line to clean water tank
Polycarboxylic acid	Flocon antiscalant	Anti-scaling solution to prevent membrane scaling dosed prior to RO filtration at a fixed rate while FCP pumps are running.

2.3 Key Stakeholders

Table 2-5 below outlines the relevant stakeholders for QSC water supply schemes in Quilpie, Eromanga and Adavale.

Table 2-7 below identifies Quilpie Shire Council Staff members responsible for the implementation of the DWQMP mentioned in this Plan.

Table 2-5 Quilpie Shire Council Stakeholders

Organisation	Contact Name and Details	Relevance to management of drinking water quality	How the stakeholder is engaged in the DWQMP
Quilpie Shire Council	Tim Rose Acting Chief Executive Officer P: (07) 4656 0500 E: ceo@quilpie.qld.gov.au	Small Drinking Water Service Provider	Small Drinking Water Service Provider
Queensland Health Forensic & Scientific Services	P: (07) 3274 9070	Water Analysis Authority	Chemical Analysis and Reporting on Water Quality
George Bourne & Associates	P: (07) 4651 5177	Consultancy Services	Preparation of DWQMP, Engineering services water supply

Organisati on	Contact Name and Details	Relevance to management of drinking water quality	How the stakeholder is engaged in the DWQMP
Quilpie Shire Community	Quilpie Shire Council 50 Brolga Street PO Box 57 Quilpie Qld 4480 Phone (07) 4656 0500 Fax (07) 4656 1441 Email: admin@quilpie.qld.gov.au	Residents, businesses and travellers	Consumption of water
Queensland Health Public Health Unit	Darling Downs Public Health Unit Queensland Health Building Cnr Tor and Hogg Streets, Toowoomba Qld 4350 P:46998240	Public Health	Public Health
Department of Natural Resources Mines and Energy (DNRME)	Drinking Water Supply Regulator (DNRME) PO Box 2454 Brisbane Q 4001 drinkingwater.reporting@dnrme.qld.gov.au (Phone - Water 1300596709)	Regulatory Body	Regulatory Body

***Note – QSC is in the process of procuring a contractor for the routine maintenance of the Eromanga water treatment plant.**

Table 2-6 Quilpie Shire Council Staff: DWQMP Implementation Group

Role	General description of Responsibilities
CEO	High level management, Capital expenditure, Incident management and response
Engineer	Capital expenditure, project planning and implementation, asset management, incident management and response. Administration of DWQMP, Data management, incident reporting, data analysis, document control, risk assessment.
Water Officer	Implementation of DWQMP, operational monitoring, water sampling, system maintenance

3 IDENTIFY HAZARDS AND HAZARDOUS EVENTS

3.1 Quilpie Water Quality and Catchment Characteristics

Quilpie water supply is composed of two deep artesian bores which are not treated prior to reticulation.

3.1.1 Physical and Chemical Water Quality Information

Water quality information for Quilpie includes the following:

- (a) Summary
- (b) Interpretation

3.1.1 (a) Summary

Table 3-1 below summarises the available reticulated water quality for the Quilpie water supply scheme.

Figure 3.1.1 to Figure 3.1.16 below shows trends of the main characteristics contained in Table 3-1.

Analysis of Quilpie's water quality shows exceedances of ADWG Guidelines for pH, Sodium and Fluoride. Continued monitoring of Quilpie's water supply have revealed naturally occurring Fluoride in concentrations that exceed ADWG health guideline limits, with an average value of 1.75mg/l. Ongoing exposure to high fluoride levels in drinking water have the potential to cause adverse health impacts. The effects of fluoride concentrations found in Quilpie's Drinking water supply include dental fluorosis which has the potential to stain developing teeth in infants. A more serious impact on health caused by high Fluoride levels includes skeletal fluorosis which only occurs in very high levels of fluoride in drinking water, above those levels experienced in Quilpie. Ongoing monitoring of Fluoride in Quilpie's drinking water supply will be undertaken relating to allow the detection of increased health risk in the future. Information on the management of elevated fluoride levels are discussed further in section 5 Risk Management.

The concentrations of sodium in Quilpie's Drinking water supply are consistently above ADWG aesthetic thresholds, the presence of sodium in water supplies is common in ground water due to the high solubility of sodium salts and the abundance of mineral deposits. The concentrations of sodium in Quilpie's drinking water supply do not pose a great risk to human health however may be of concern to people suffering from severe hypertension. The concentrations present in the water supply may have an effect on the taste of the water where ADWG advise that taste becomes appreciable at 180mg/l.

Slightly high pH readings are typical for Quilpie's water supply with an average value of 8.5, issues surrounding increased pH values may include increased scaling in water pipes and fittings. Elevated pH ranges are not uncommon in artesian water supplies in Western Queensland and are associated with hydrogeological processes within the artesian basin.

The responsibility for obtaining the water samples rests with the DWSP and samples are collected by the Water Officer on a quarterly basis. Samples are sent to Queensland Health Scientific Services for analysis.

Table 3-1 Quilpie Reticulated Water

Quilpie Water Supply		Start Date	25/03/20 09	End Date: 14/05 /2019							
Characteristic	Units	No. of Samples	Summary of Results					Guideline Value			
			Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile	Health	Exceedances	Aesthetic	Exceedances
Conductivity	uS/cm	29	975.0	907.31	854.00	38.32	972.00				
pH		35	9.3	8.49	8.30	0.16	8.60			≥6.5 & ≤ 8.5	15
Total Hardness	mg/L as CaCO ₃	29	10.0	6.39	4.20	1.48	9.60				
Temporary Hardness	mg/L as CaCO ₃	29	10.0	6.39	4.20	1.48	9.60			200	0
Alkalinity	mg/L CaCO ₃	29	369.0	329.17	307.00	19.04	368.20				
Residual Alkalinity	meq/L	29	7.2	6.44	6.00	0.37	7.16				
Silica	mg/L	29	44.0	42.83	41.00	0.79	44.00			80	0
Total Dissolved Ions	mg/L	58	778.0	698.79	662.00	35.36	769.40				
Total Dissolved Solids	mg/L	29	600.0	545.28	520.00	24.15	592.20			600	0
True Colour	Hazen	18	5.0	1.50	1.00	1.12	4.15			15	0
Turbidity	NTU	32	1.0	0.30	0.25	0.18	0.59			5	0
Sodium	mg/L	29	230.0	207.48	195.00	10.14	230.00			180	29
Potassium	mg/L	29	2.7	2.34	2.20	0.10	2.50				
Calcium	mg/L	29	4.1	2.51	1.70	0.59	3.78				
Magnesium	mg/L	18	0.3	0.03	0.00	0.07	0.13				
Hydrogen	mg/L	29	0.0	0.00	0.00	0.00	0.00				
Bicarbonate	mg/L	29	435.0	386.10	356.00	22.76	431.00				
Carbonate	mg/L	29	13.0	7.46	4.30	2.26	12.00				
Hydroxide	mg/L	29	0.1	0.05	0.00	0.05	0.10				
Chloride	mg/L	29	95.0	83.97	80.00	3.59	89.60			250	0
Fluoride	mg/L	35	1.9	1.70	1.50	0.09	1.80	1.5	33		
Nitrate	mg/L	16	0.5	0.50	0.50	0.00	0.50	50	0		
Sulphate	mg/L	33	9.0	7.89	6.00	0.90	9.00	500	0	250	0
Iron	mg/L	32	0.03	0.01	0.01	0.01	0.03			0.3	0
Manganese	mg/L	16	0.01	0.009	0.000	0.002	0.010	0.5	0	0.1	0
Zinc	mg/L	22	0.53	0.055	0.003	0.141	0.448			3	0
Aluminium	mg/L	29	0.09	0.051	0.039	0.009	0.062			0.2	0
Boron	mg/L	37	0.63	0.485	0.060	0.087	0.602	4	0		
Copper	mg/L	20	0.49	0.072	0.009	0.125	0.405	2	0	1	0

Aesthetic Guideline Exceedance
Health Guideline Exceedance

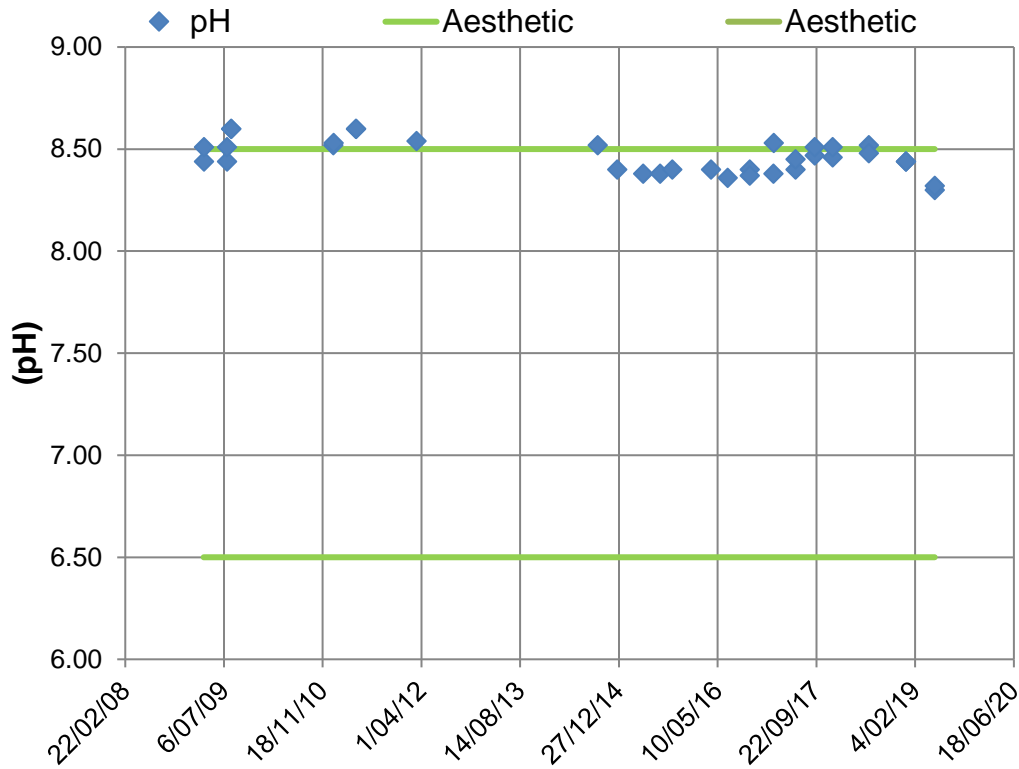


Figure 3.1 Quilpie - pH at 23°C

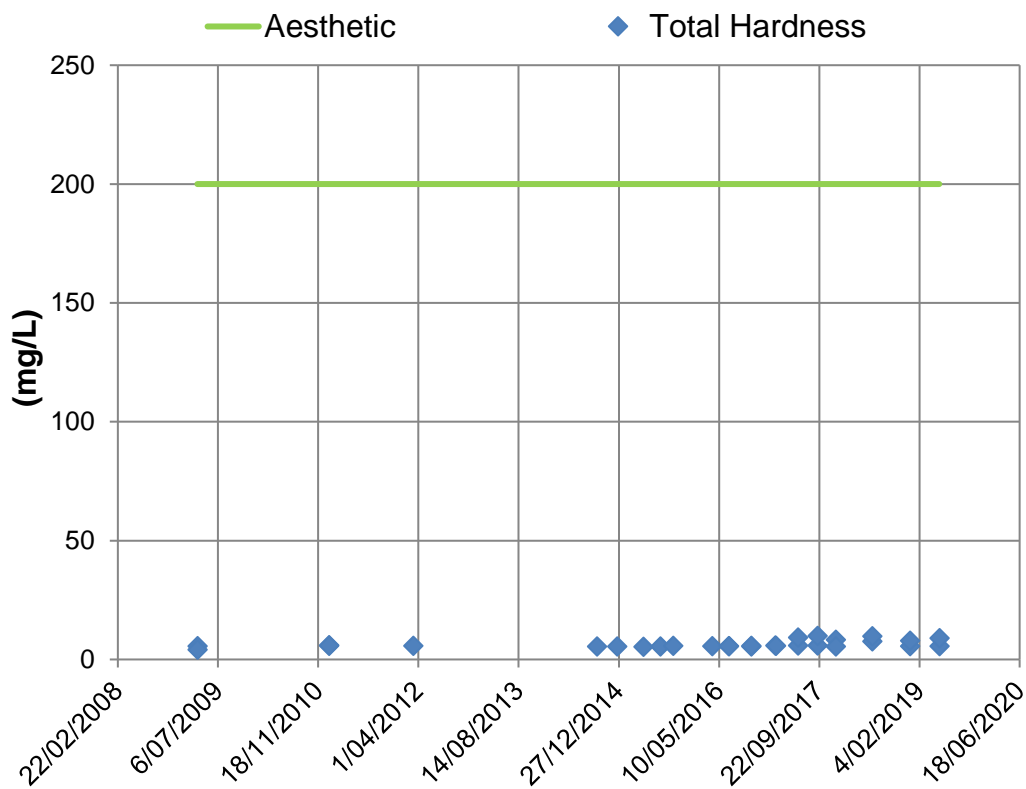


Figure 3.2 Quilpie - Total Hardness

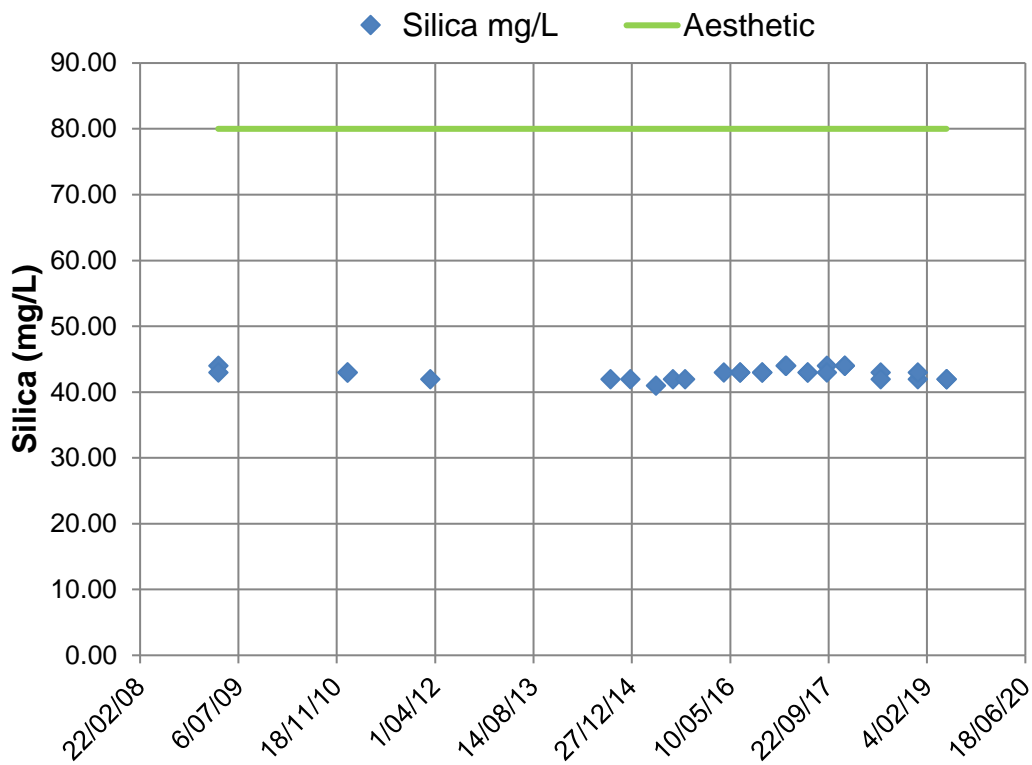


Figure 3.3 Quilpie - Silica

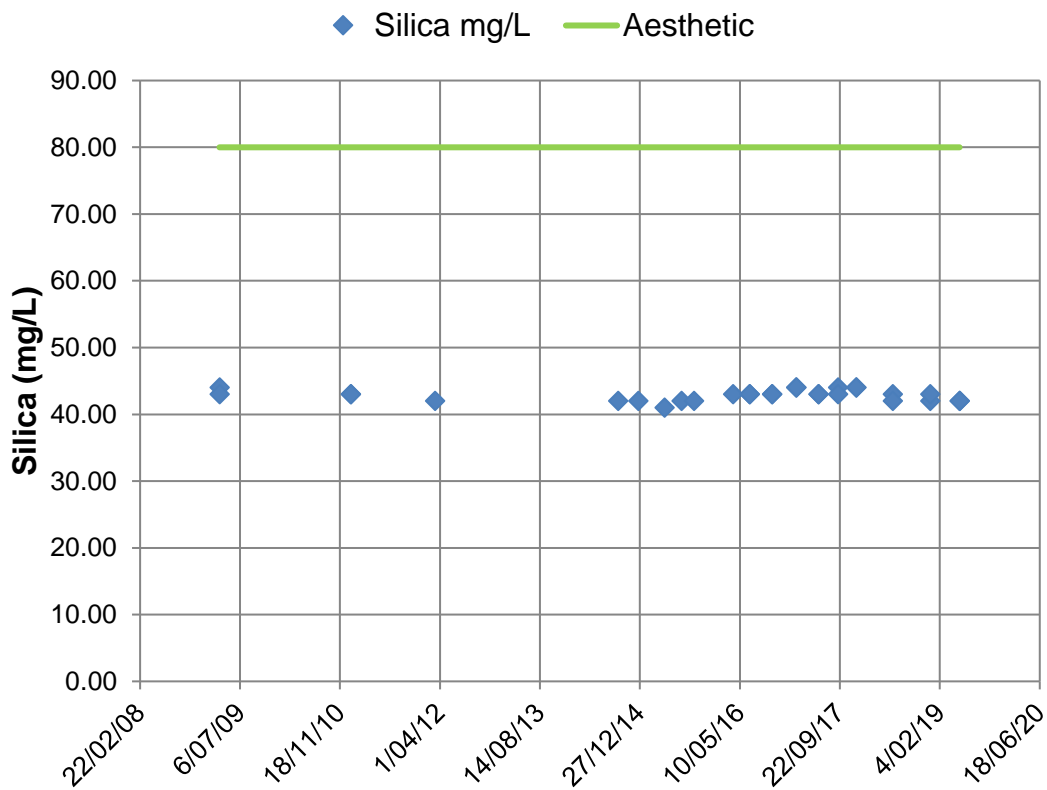


Figure 3.4 Quilpie - Total Dissolved Solids

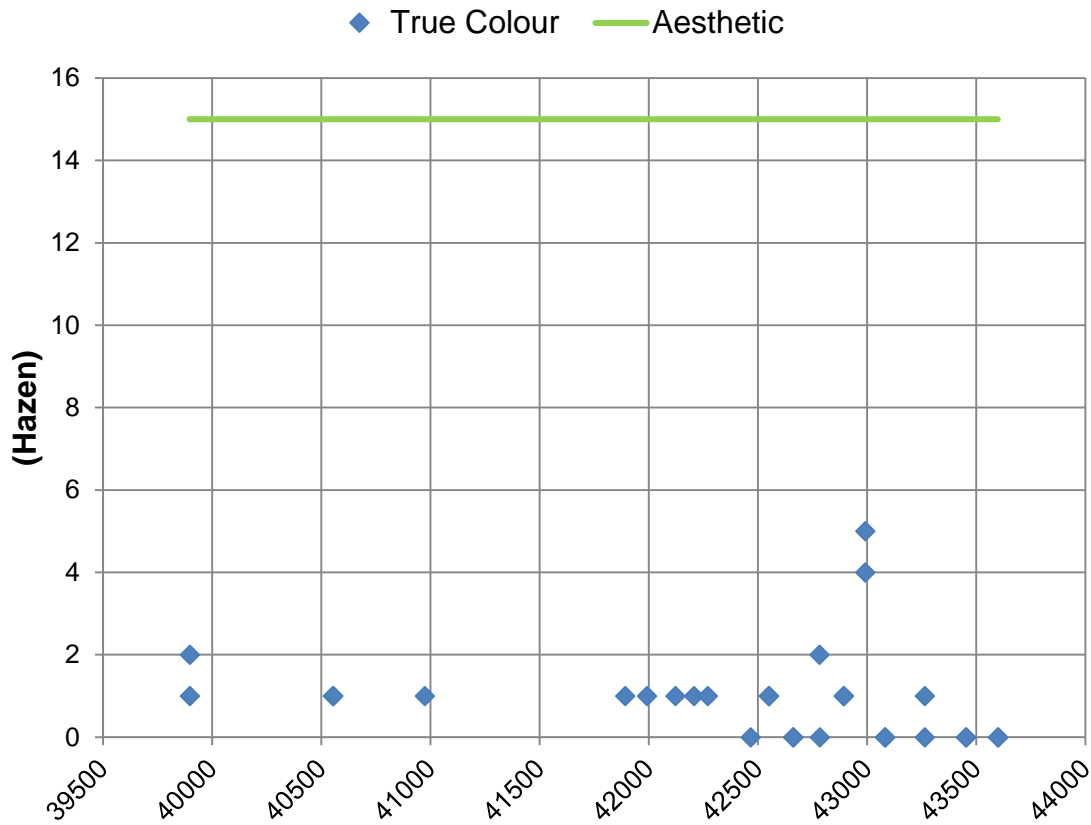


Figure 3.5 Quilpie – True Colour

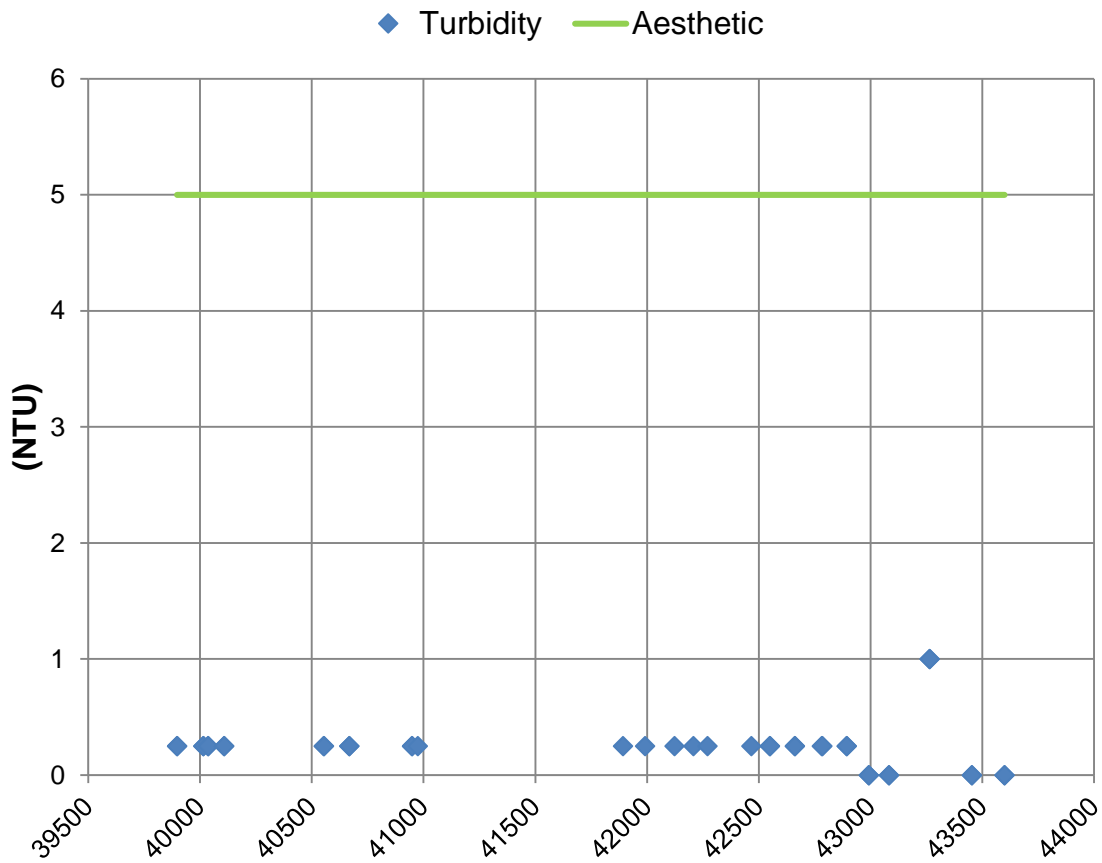


Figure 3.6 Quilpie - Turbidity

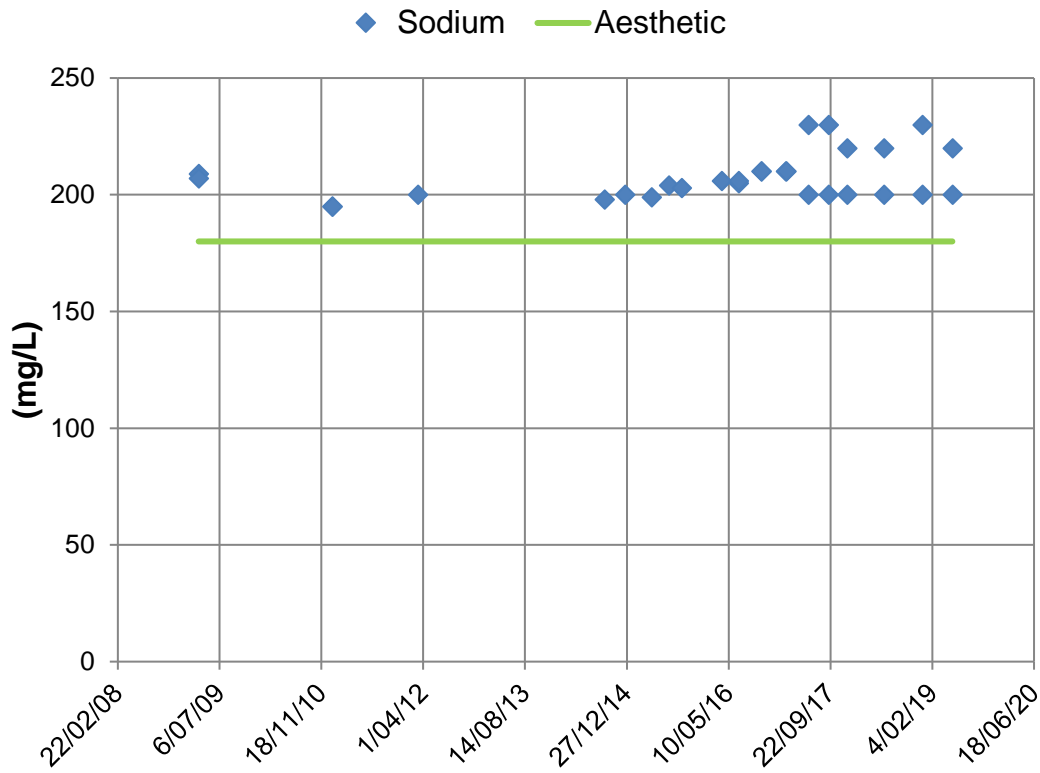


Figure 3.7 Quilpie - Sodium

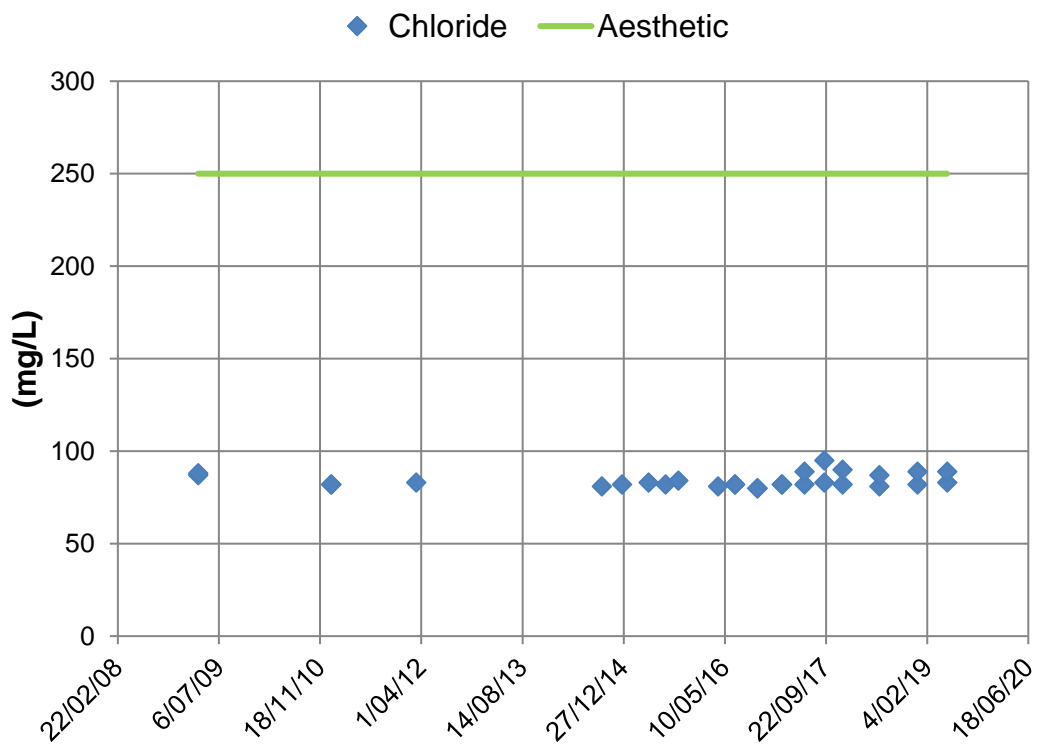


Figure 3.8 Quilpie - Chloride

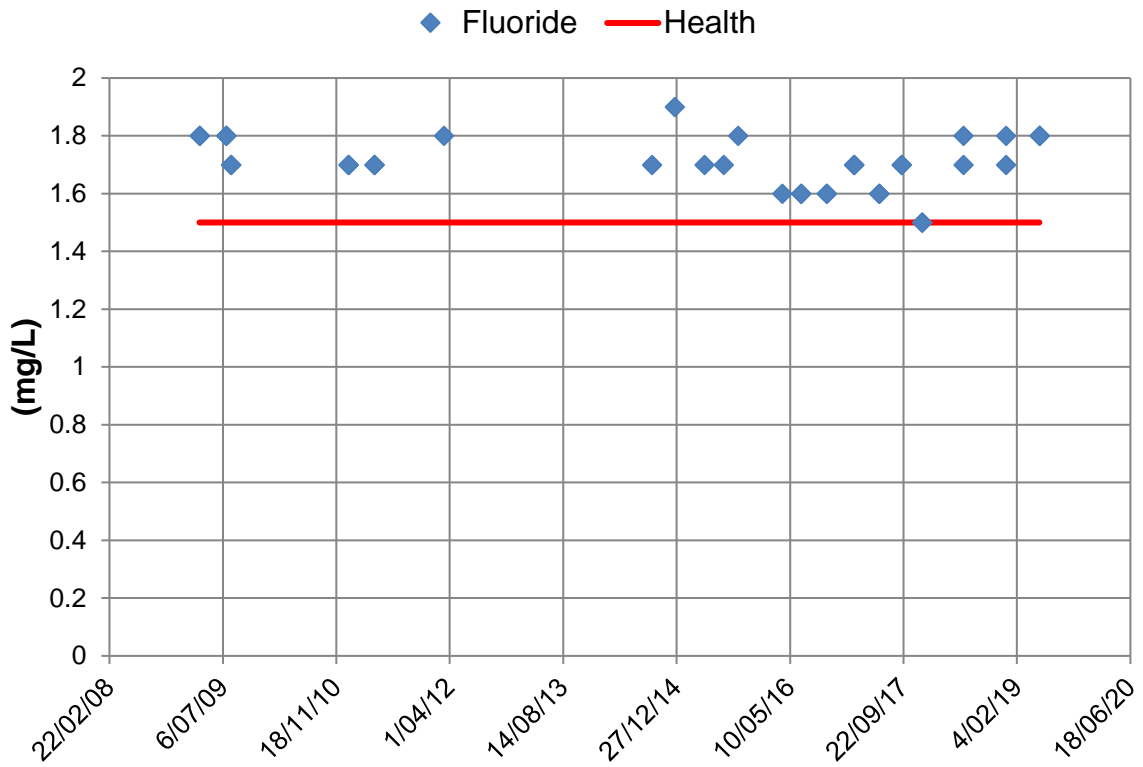


Figure 3.9 Quilpie - Fluoride

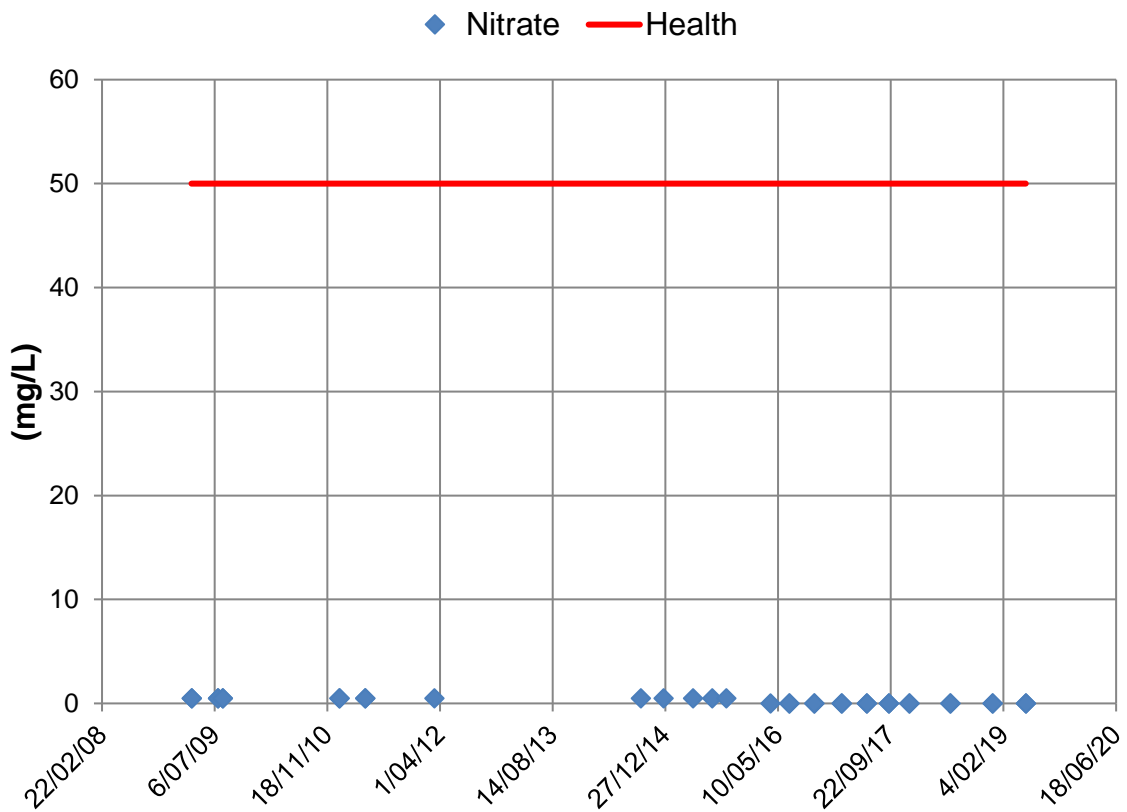


Figure 3.10 Quilpie - Nitrate

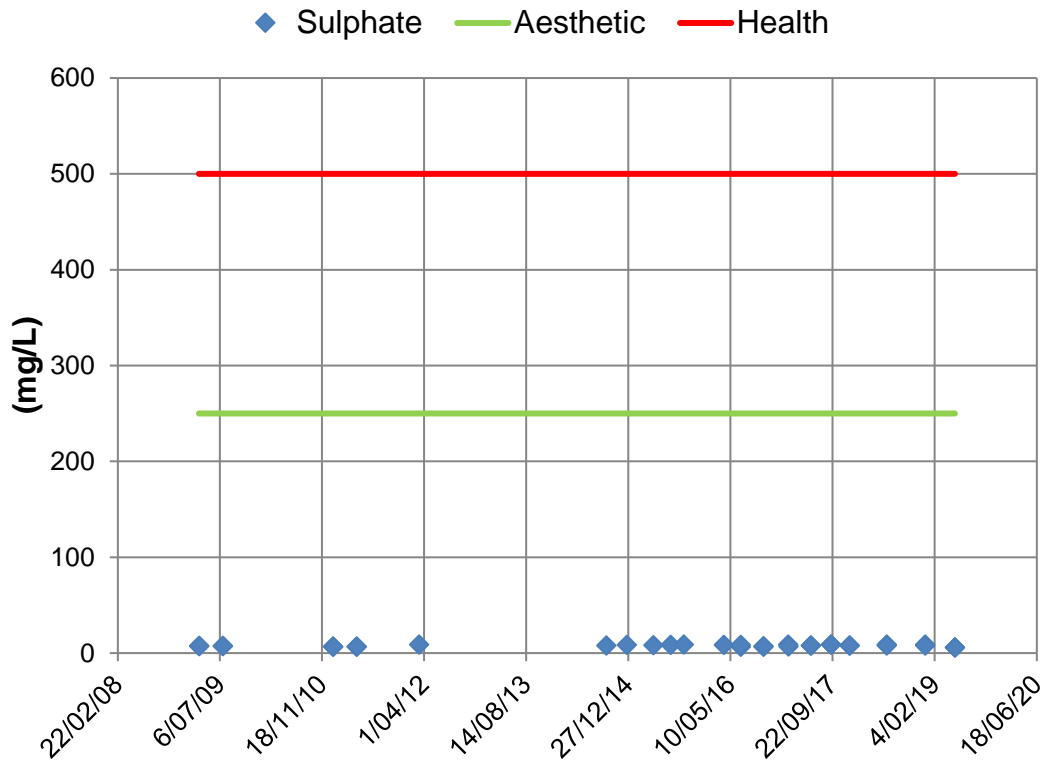


Figure 3.11 Quilpie - Sulphate

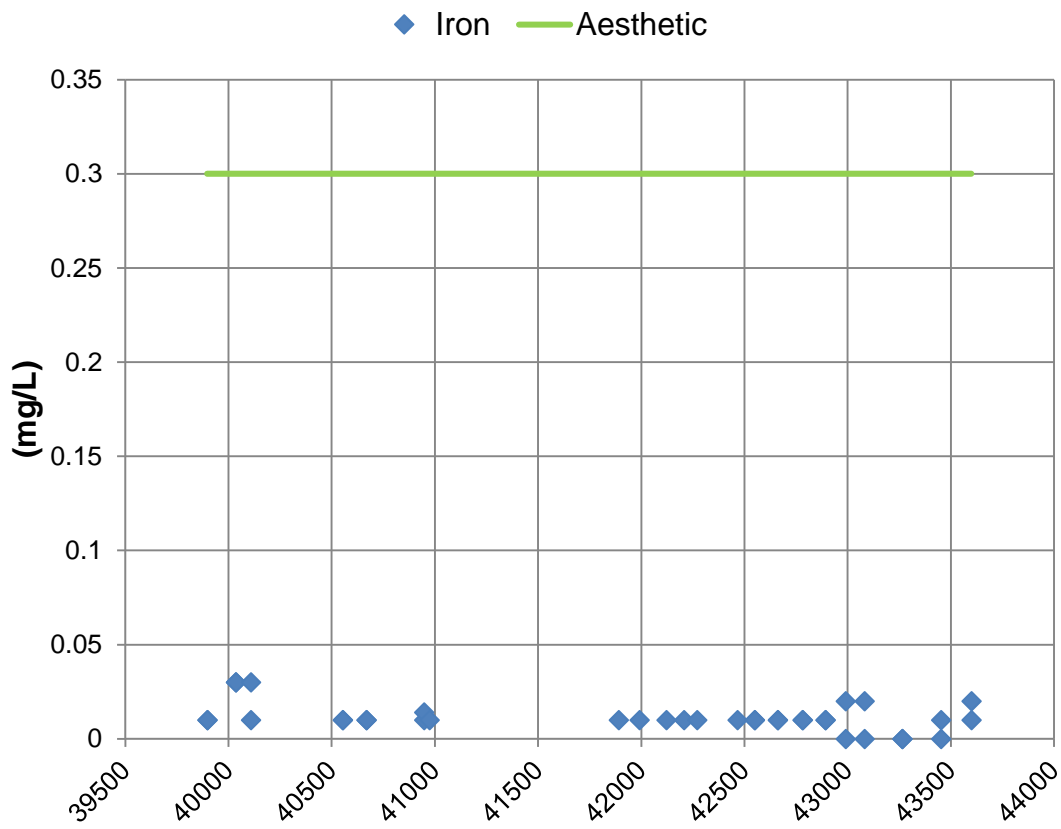


Figure 3.12 Quilpie - Iron

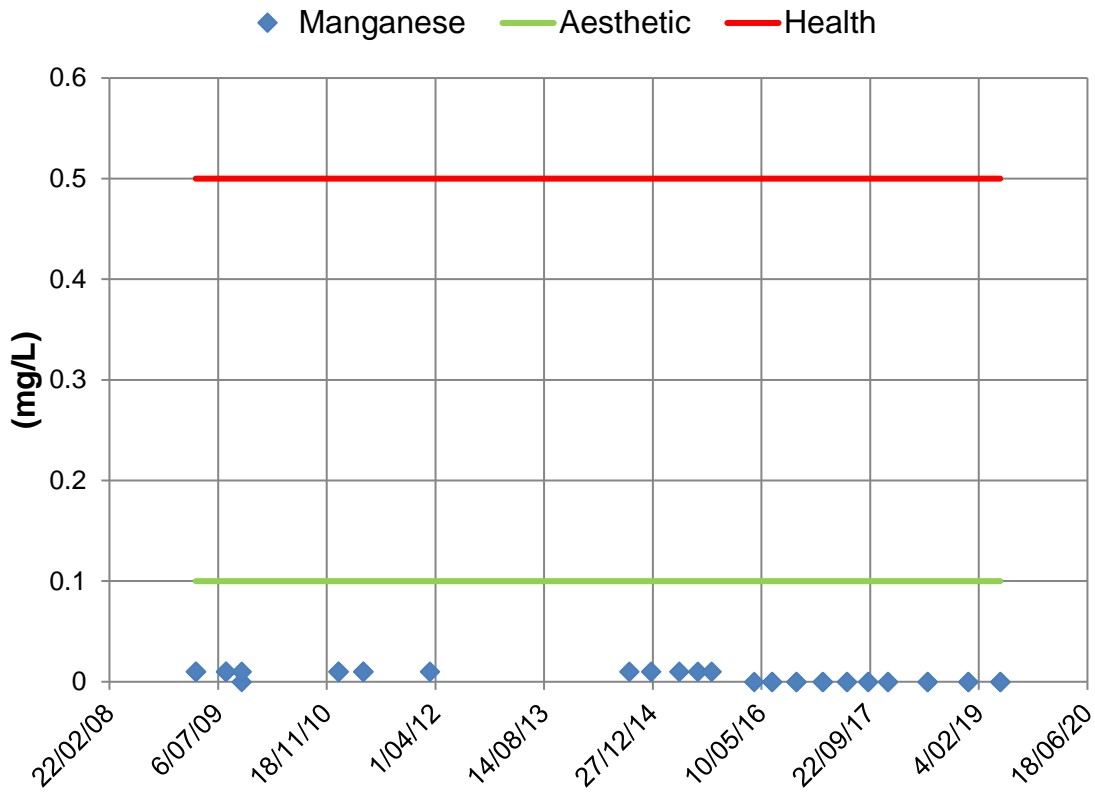


Figure 3.13 Quilpie - Manganese

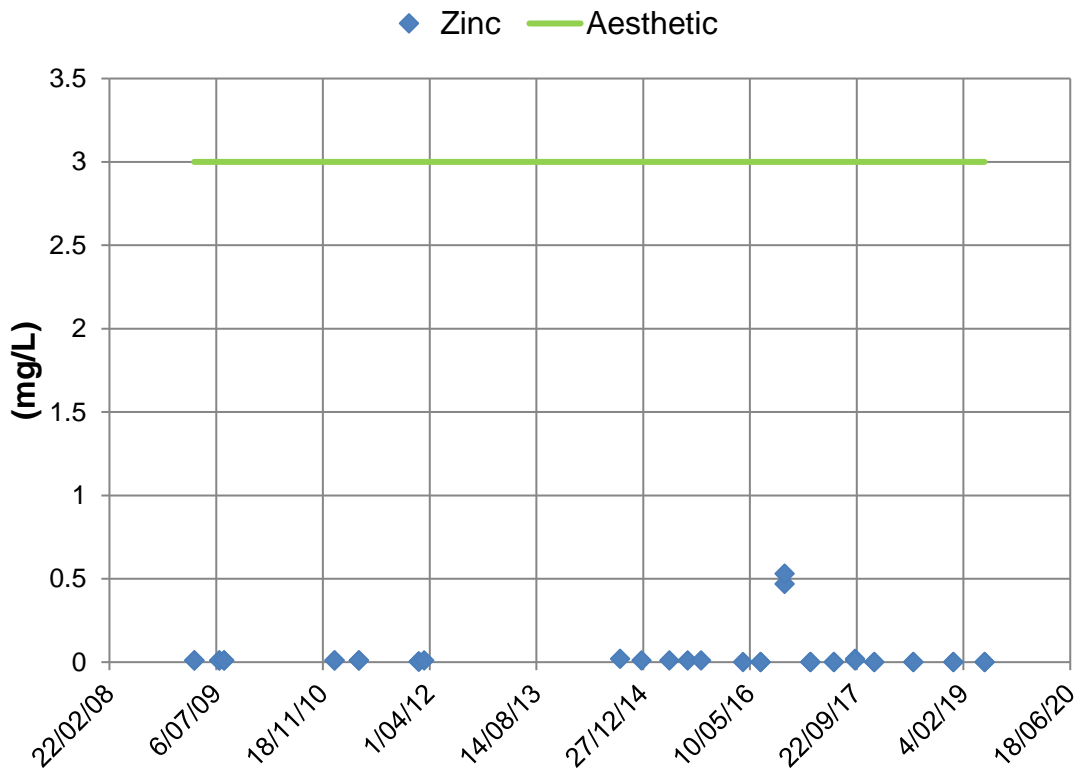


Figure 3.14 Quilpie - Zinc

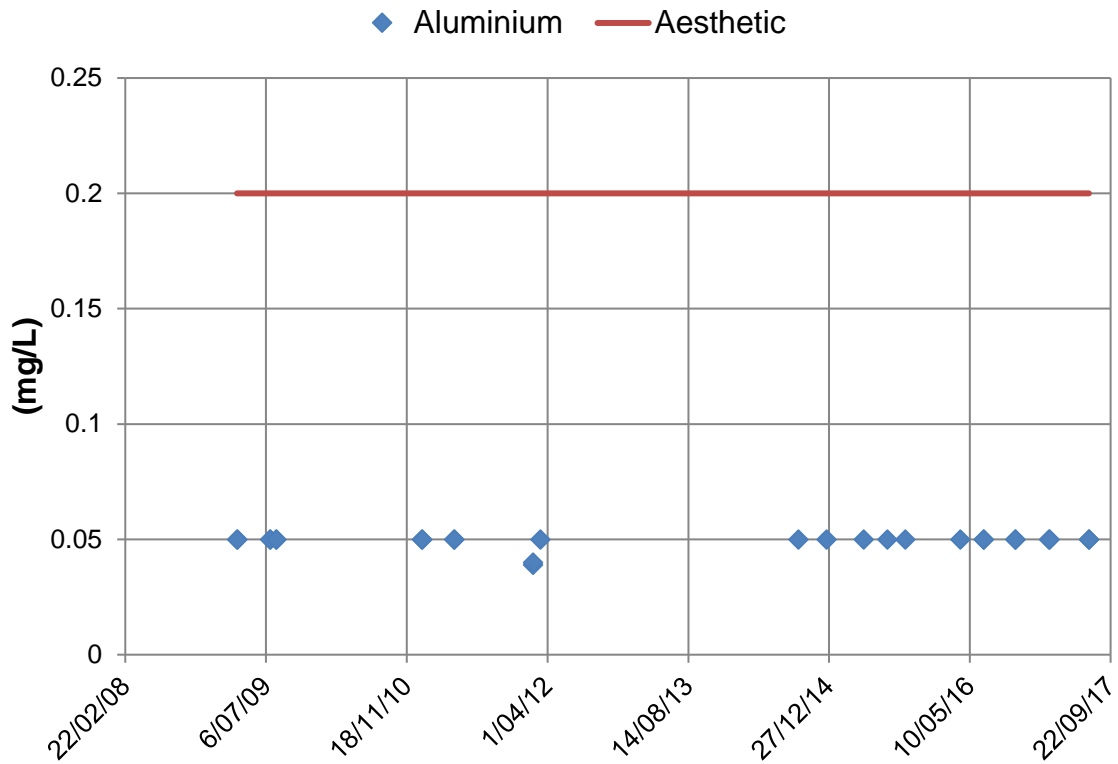


Figure 3.15 Quilpie – Aluminium

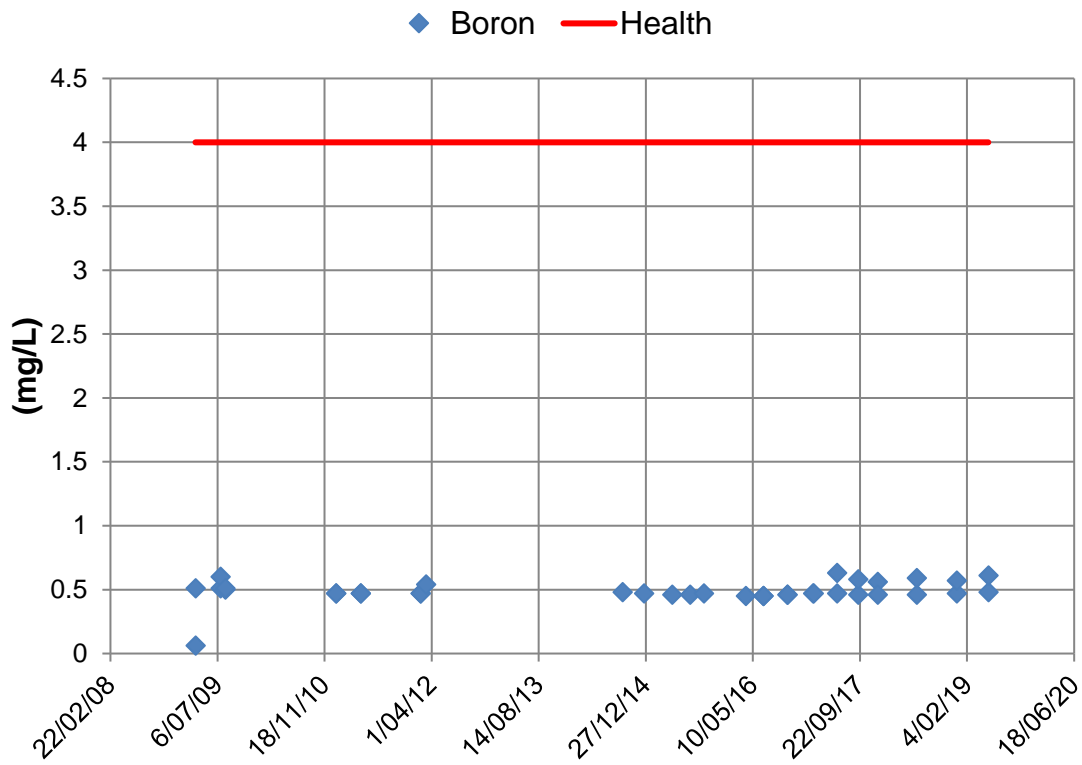


Figure 3.16 Quilpie - Boron

3.1.1 (b) Interpretation

Table 3-1 above shows aesthetic guideline value exceedances¹ for pH and Sodium, and health guideline value exceedances for Fluoride in the reticulated water.

The following aesthetic characteristics were detected (highlighted show exceedances):

- **pH**
- Silica
- Total Dissolved Solids
- Total Hardness
- Colour
- Turbidity
- **Sodium**
- Chloride
- Aluminium

The following health characteristics were detected (highlighted shows exceedances):

- **Fluoride**
- Nitrate
- Boron

Figure 3.1 provides a trend for the analysis of pH; there are fifteen exceedances. A maximum value of 9.3, average value of 8.5 and a 95th percentile value of 8.6 have been determined. The aesthetic guideline value is ≥ 6.5 & ≤ 8.5 . For pH no health based guideline value is considered necessary.

Figure 3.7 provides a trend for the analysis of Sodium; there are twenty nine exceedances from 29 monitoring events. The aesthetic guideline value is 180 mg/l. For Sodium no health based guideline is considered necessary. A maximum value of 230 mg/l, average value of 207 mg/l and a 95th percentile of 230 mg/l have been determined. Sodium values >180 mg/l cause taste issues.

Figure 3.9 provides a trend for the analysis of Fluoride; there are thirty three exceedances from thirty five monitoring events. The health guideline value is 1.5 mg/l. A maximum value of 1.80 mg/l, average value of 1.7 mg/l and a 95th percentile of 1.9 mg/l have been determined. Fluoride values > 1.5 mg/l can cause dental fluorosis. All samples analysed measured > 1.5 mg/l.

Of all samples analysed for E. coli there have been zero E. coli colonies detected.

3.1.2 Catchment Characteristics

Quilpie is located in the Channel Country of South West Queensland and the local government area covers approximately 67,482 square kilometres. The main ranges in the Quilpie Shire are the Grey, McGregor and Willies Ranges. The Willies range forms the catchment boundary of the Quilpie and Paroo Rivers. The Grey Range separates the Cooper Creek catchment from the Bulloo River. The Bulloo River is the major drainage system in the shire, where the head of the catchment is in the Gowan Ranges north of Adavale. The Bulloo River also has a well-developed flood plain.

The average annual rainfall for Quilpie is 349.2mm with the majority of the rain falling between late November and late March. The mean maximum temperature is 29.2°C although temperatures have exceeded the 45°C mark during the summer months. Quilpie has a current

¹ As per the Australian Drinking Water Guidelines

population of 600 permanent residents and has a current demand of 1.20 MI/day. Due to its geographical location the town of Quilpie does not flood.

Quilpie Shire economy is based on the grazing and mining industries. The region consists of one of the largest opal boulder deposits in the world along with extensive gas and oil deposits. Road infrastructure construction and maintenance also contribute significantly to provide a stable employment base for the area.

The Great Artesian Basin (GAB) covers approximately one-fifth of the Australian continent and contains 8.7×10^6 GL of groundwater in the Jurassic sandstone aquifers. It comprises the Eromanga, Surat and Carpentaria sedimentary basins and parts of the Bowen and Galilee Basins. The GAB is the largest groundwater and artesian basin in the world. The basin is located under mostly arid and semi-arid landscapes to the west of the Great Dividing Range. The GAB supports a wide array of activities such as pastoral, agriculture and mining as well as the rural communities, cultural and tourism activities. The GAB is recharged by rainfall and stream flow infiltrating into the exposed sandstone on the edges of the basin.

The Eromanga basin consists of a conformable, almost horizontal bedded sequence of Early Jurassic to Late Cretaceous sedimentary rocks. The sequence comprises continental quartz-rich sandstone, siltstone and mudstone units formed within a shallow marine setting during the Early Cretaceous. These rocks conformably overlie sandstone-dominated formations deposited in lacustrine and fluvial environments of the Late Cretaceous (Habermehl, 1980).

The most significant groundwater systems in the GAB occur in the Late Jurassic to Early Cretaceous aquifer sequence, collectively termed the Cadna-owie–Hooray Aquifer. The Cadna-owie–Hooray Aquifer extends across the entire GAB, although its thickness and hydraulic properties may vary. This important groundwater-bearing unit is a composite of several aquifers that hydraulically interconnect over basement highs, and merge in the western Eromanga Basin (Radke et al., 2000).

Currently there are two bores in Quilpie which both tap the Hooray Sandstone Aquifer, town Bore No 1 (RN 390) and Town Bore No 2 (RN 116266). Figure 3.17 shows the recharge, discharge and flow of the GAB. Town Bore No. 1 (back-up bore) is located on Chipu Street and Town Bore No. 2 is located on Gyrica Street. Bores 1 and 2 are 900m and 966m deep respectively. The bores currently yield 47 l/s and 19 l/s respectively. Both bores are free flowing with high pressures being adjusted by clay pressure valves. Bore 1 was drilled in 1933 and Bore No. 2 was drilled in 2009. All bore headworks are sealed against the possibility of deliberate contamination. Appendix B Figure GBA-2012-081 shows the bore locations and water reticulation layout on an aerial photo of the town. Appendix C contains a copy of the bore card reports obtained from Department of Natural Resources Mines and Energy.

Quilpie sewerage collection scheme is comprised of a sewage treatment plant consisting of an Imhoff tank, baffle type clarifier, three sludge drying beds and two oxidation lagoons. Effluent is discharged to Pinkilla Creek. The sewerage reticulation system has a total pipeline length of 9,555m. New sub-divisions constructed during the last ten years have PVC mains that are in good condition.

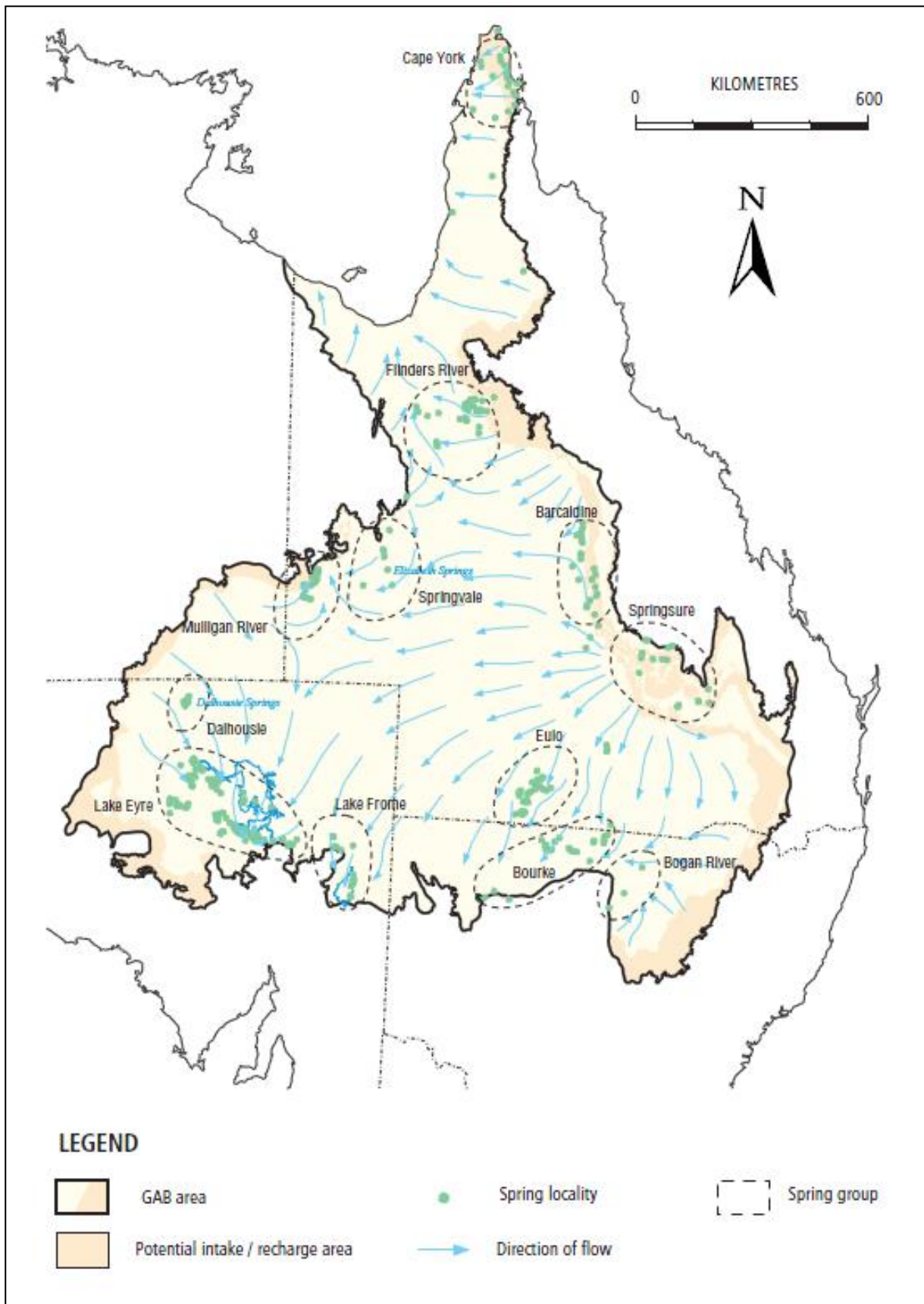


Figure 3.17 GAB Recharge, Discharge and Flow

3.1.3 **Hazard Identification**

The hazards and hazardous events and their sources that adversely affect water quality are documented in Table 3-2 below and include those affecting:

- Catchment
- Sourcing infrastructure
- Distribution system

3.1.4 **Identifying and Documenting Hazards and Hazardous Events**

The hazards and hazardous events were identified using data contained in the plan, a recent independent specialist review of the supply schemes and a risk assessment workshop which was conducted on the 7th of April 2020 with members of Council from the engineering, operations and administration departments along with GBA consultants. The following sections of the plan were critical in assessing the risks associated with the water supply schemes;

- Section 2.1 Quilpie Water Supply Scheme
- Section 3.1.1 Physical and Chemical Water Quality Information
- Section 3.1.2 Catchment Characteristics

Table 3-2 Quilpie Hazard Identification, Risk Assessment and Uncertainty

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum risk			Existing Preventive Measures / Barriers.	Residual risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Catchment	Sewage system discharges, agricultural run-off	Biological	Catastrophic	Rare	Medium 6	O & M Procedure Operational and verification monitoring Confined aquifer	Moderate	Rare	Low 3	Reliable	Acceptable Risk
	Hazard that arises from the natural geological processes in the aquifer.	Chemical	Moderate	Almost Certain	High 15	Fluoride Risk Facts Sheet	Moderate	Unlikely	Medium 6	Estimate	Fluoride awareness program in place informing community of potential health risks.
Sourcing Infrastructure	Bore Failure	Physical	Moderate	Unlikely	Medium 6	O & M Procedure/Regular Inspections Backup bore	Moderate	Rare	Low 3	Reliable	Q1. Construct new water supply bore
	Maintenance and repair of water main	Biological	Catastrophic	Possible	High 15	O & M Procedures	Catastrophic	Unlikely	High 10	Uncertain	Q2. Update O & M procedures to include safe practices for maintenance and repair of water mains Q3. Establish a temperature monitoring program for the reticulation system
	Accidental or intentional contamination	Chemical/Biological	Catastrophic	Rare	Medium 6	Chain-link fencing and locked gates around bores O & M Procedures	Moderate	Rare	Low 3	Reliable	Acceptable Risk
	Flood Event	Physical	Catastrophic	Rare	Medium 6	Town does not flood. Sealed bore headworks O & M Procedures	Moderate	Rare	Low 3	Uncertain	
Treatment Plant	Reticulated Water Untreated										
Disinfection Process	Reticulated Water Not Disinfected (Sealed artesian hot water system)										
Distribution System	Accidental or intentional contamination	Biological/ Chemical	Catastrophic	Possible	High 15	O&M Procedures	Catastrophic	Rare	Medium 6	Confident	Q3. Establish a temperature monitoring program for the reticulation system Q4. Reduce contamination risks at standpipe locations. Install backflow prevention protection and improved hose storage system.

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum risk			Existing Preventive Measures / Barriers.	Residual risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
	Reticulation maintenance and repair	biological	Catastrophic	Possible	High 15	O & M Procedures	Catastrophic	Unlikely	High 10	Confident	Q2. Update O & M procedures to include safe practices for maintenance and repair of water mains
Whole of System	Flights carrying water samples to be analysed are delayed/cancelled	Chemical/Biological	Minor	Possible	Medium 6	Collect new samples and schedule testing for next available flight O & M Procedures	Minor	Rare	Low 2	Confident	Acceptable Risk
	Poor information management	Chemical/Biological	Catastrophic	Possible	High 15	Water quality data analysis and management, routine operations and maintenance of scheme	Moderate	Unlikely	Medium 6	Uncertain	Q2. Procedures to be developed and reviewed. Q5. Monitoring data and documentation consolidated and managed centrally
	Contamination of water samples	Chemical/Biological	Major	Possible	High 12	O & M procedures	Major	Unlikely	Medium 8	Reliable	Q6. Upgrade water testing facilities. Provide dedicated testing facility to ensure hygienic conditions for water testing
	Lack of human resources	Chemical/Biological/Physical	Major	Likely	High 16	O & M procedures Knowledge succession	Major	Possible	High 12	Uncertain	Q2. Update O & M procedures to include safe practices for maintenance and repair of water mains
	Bush Fire	Physical	Major	Possible	High 12	Infrastructure management – fuel reduction Emergency services response unit Council disaster management preparedness	Major	Rare	Medium 5	Confident	Acceptable Risk
	Cyber security breach	Physical	Moderate	Possible	Medium 9	High grade security protection User authentication Restricted administration privileges Malware protection Anti-virus protection Sonic wall protection	Moderate	Rare	Low 3	Reliable	Acceptable Risk

3.1.5 Hazard Identification (and Risk Assessment) Team

The personnel responsible for the hazard identification and risk assessment process, their roles and responsibilities are detailed in Table 3-3 below.

Table 3-3 Hazard Identification and Risk Assessment Team

Typical Job Title for Key Personnel	What Role Did Each Person Play on The Team?	What Expertise and System Knowledge Did The Person Bring?
Engineer	Management of DWQMP Process, Risk Assessment Procedure & Chairing Risk Assessment Workshop	High level knowledge of supply schemes, risk assessment and general engineering experience in the management of the systems Knowledge of Regulatory requirement and responsibilities under the Act
Water Officer	Risk Assessment Workshop	Detailed knowledge of individual schemes, risk assessment
Environmental Scientist (Consultant)	Risk Assessment Workshop	Knowledge of Regulatory requirement and responsibilities under the Act

3.2 Eromanga Water Quality and Catchment Characteristics

In 2014 Eromanga’s water supply system underwent significant changes, including the implementation of an alternate water source and the installation of a reverse osmosis water treatment plant. Eromanga’s water supply source was converted from artesian water supply to four shallow sub-artesian bores this decision was made due to the overall superior water quality of the sub artesian water. A water treatment plant was implemented and water storage tanks were also installed as part of the water supply upgrade, the treatment system installed included a reverse osmosis filtration system with a capacity of 2l/second, an automated chlorine dosing system, raw water and treated water storage tanks and a pump systems to distribute clean water throughout the distribution system.

3.2.1 Physical and Chemical Water Quality Information

Water quality information for Eromanga includes the following:

- a) Summary
- b) Interpretation

3.2.1 (a) Summary

Recent water testing, since the commissioning of the water treatment plant of the Eromanga water supply have indicated that the water quality of the distribution system is generally of a high standard.

Table 3.5 and 3.6 below summarises the available water quality for reticulated and raw water respectfully, post system upgrade. Aesthetic guideline exceedances are highlighted amber and health guideline value exceedances are highlighted red.

Table 3-4 Eromanga Reticulated Water

Eromanga Water Supply		Start Date 09/09/2014		End Date: 21/08/2019							
Characteristic	Units	No. of Samples	Summary of Results					Guideline Value			
			Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile	Health	Exceedances	Aesthetic	Exceedance
Conductivity	uS/cm	27	2230.00	650.19	318.00	491.00	1842.90				
pH		27	7.93	7.36	6.66	0.33	7.85			≥6.5 & ≤ 8.5	
Total Hardness	mg/L as CaCO₃	27	340.00	73.15	20.00	78.86	266.70			200	
Temporary Hardness	mg/L as CaCO ₃	27	137.00	44.85	20.00	27.88	112.30			200	
Alkalinity	mg/L CaCO ₃	27	137.00	45.78	21.00	27.52	112.30				
Residual Alkalinity	meq/L	27	0.10	0.02	0.00	0.04	0.10				
Silica	mg/L	27	78.00	26.59	11.00	16.26	65.00			80	
Total Dissolved Ions	mg/L	27	1320.00	362.48	176.00	290.47	1073.30				
Total Dissolved Solids	mg/L	27	1310.00	361.04	174.00	290.31	1073.60			600	
True Colour	Hazen	27	4.00	0.94	0.50	0.90	3.10			15	
Turbidity	NTU	27	30.00	2.26	0.50	5.59	5.80			5	
Sodium Absorption Ratio		27	7.90	5.08	2.90	1.28	7.35				
Sodium	mg/L	27	330.00	97.78	22.00	74.03	276.00			180	
Potassium	mg/L	27	4.60	1.40	0.60	0.99	3.75				
Calcium	mg/L	27	78.00	17.85	4.90	17.27	59.00				
Magnesium	mg/L	27	37.00	6.99	1.50	8.91	28.80				
Hydrogen	mg/L	27	0.00	0.00	0.00	0.00	0.00				
Bicarbonate	mg/L	27	166.00	55.63	25.00	33.36	136.20				
Carbonate	mg/L	27	0.90	0.14	0.00	0.21	0.58				
Hydroxide	mg/L	27	0.00	0.00	0.00	0.00	0.00				
Chloride	mg/L	27	480.00	140.11	59.00	110.70	405.00			250	
Fluoride	mg/L	27	0.36	0.12	0.03	0.08	0.30	1.5	0		
Nitrate	mg/L	27	16.00	7.50	3.80	3.24	14.50	50	0		
Sulphate	mg/L	27	210.00	33.38	4.00	51.03	159.60	500	0	250	
Iron	mg/L	26	0.070	0.019	0.010	0.014	0.038			0.3	
Manganese	mg/L	26	0.020	0.010	0.010	0.002	0.010	0.5	0	0.1	
Zinc	mg/L	27	1.500	0.107	0.010	0.302	0.521			3	
Aluminium	mg/L	27	0.05	0.05	0.05	0.00	0.05			0.2	
Boron	mg/L	27	0.25	0.21	0.18	0.02	0.24	4	0		
Copper	mg/L	26	0.25	0.04	0.03	0.04	0.04	2	0	1	
Aesthetic Guideline Exceedance	Health Guideline Exceedance										

Table 3-5 Eromanga Raw Water

Eromanga Raw Water Supply		Start Date	15/03/2017		End Date:	14/05/2019					
Characteristic	Units	No. of Samples	Summary of Results					Guideline Value			
			Maximum Value	Average Value	Minimum Value	Std Dev	95 th Percentile	Health	Exceedances	Aesthetic	Exceedances
Conductivity	uS/cm	12	5160.00	2475.83	1260.00	960.55	3977.50				
pH		12	7.58	7.45	7.26	0.10	7.57			≥6.5 & ≤ 8.5	0
Total Hardness	mg/L as CaCO ₃	12	1100.00	416.08	138.00	227.48	751.85			200	11
Temporary Hardness	mg/L as CaCO ₃	12	141.00	114.00	59.00	24.13	136.60			200	0
Alkalinity	mg/L CaCO ₃	12	141.00	114.00	59.00	24.13	136.60				
Residual Alkalinity	meq/L	12	0.00	0.00	0.00	0.00	0.00				
Silica	mg/L	12	88.00	76.83	71.00	5.81	86.90			80	3
Total Dissolved Ions	mg/L	12	2950.00	1453.42	745.00	544.73	2306.50				
Total Dissolved Solids	mg/L	12	2970.00	1459.50	792.00	543.92	2315.50			600	12
True Colour	Hazen	12	4.00	0.49	0.05	1.08	2.08			15	0
Turbidity	NTU	12	2.00	0.29	0.05	0.58	1.45			5	0
Sodium Absorption Ratio		12	9.10	7.60	6.20	1.03	9.10				
Sodium	mg/L	12	640.00	350.83	200.00	118.07	535.50			180	12
Potassium	mg/L	12	9.20	4.87	0.20	1.99	7.55				
Calcium	mg/L	12	230.00	89.50	32.00	46.96	158.50				
Magnesium	mg/L	12	130.00	46.92	14.00	27.39	87.10				
Hydrogen	mg/L	12	0.00	0.00	0.00	0.00	0.00				
Bicarbonate	mg/L	12	171.00	138.67	72.00	29.36	166.05				
Carbonate	mg/L	12	0.50	0.32	0.10	0.13	0.50				
Hydroxide	mg/L	12	0.00	0.00	0.00	0.00	0.00				
Chloride	mg/L	12	1300.00	558.33	180.00	274.25	981.00			250	11
Fluoride	mg/L	11	0.46	0.36	0.25	0.05	0.44	1.5	0		
Nitrate	mg/L	12	24.00	16.75	6.40	5.62	23.45	50	0		
Sulphate	mg/L	12	520.00	247.50	180.00	89.17	393.50	500	1	250	4
Iron	mg/L	12	0.010	0.010	0.010	0.000	0.010			0.3	0
Manganese	mg/L	12	0.100	0.018	0.010	0.025	0.056	0.5	0	0.1	0
Zinc	mg/L	12	0.900	0.091	0.010	0.244	0.438			3	0
Aluminium	mg/L	12	0.050	0.050	0.050	0.000	0.050			0.2	0
Boron	mg/L	12	0.280	0.251	0.200	0.028	0.280	4	0		
Copper	mg/L	12	0.040	0.031	0.030	0.003	0.035	2	0	1	0

Aesthetic Guideline Exceedance

Health Guideline Exceedance

Figure 3.18 to Figure 3.31 below shows trends for the water characteristics contained in Table 3.5 and 3.6

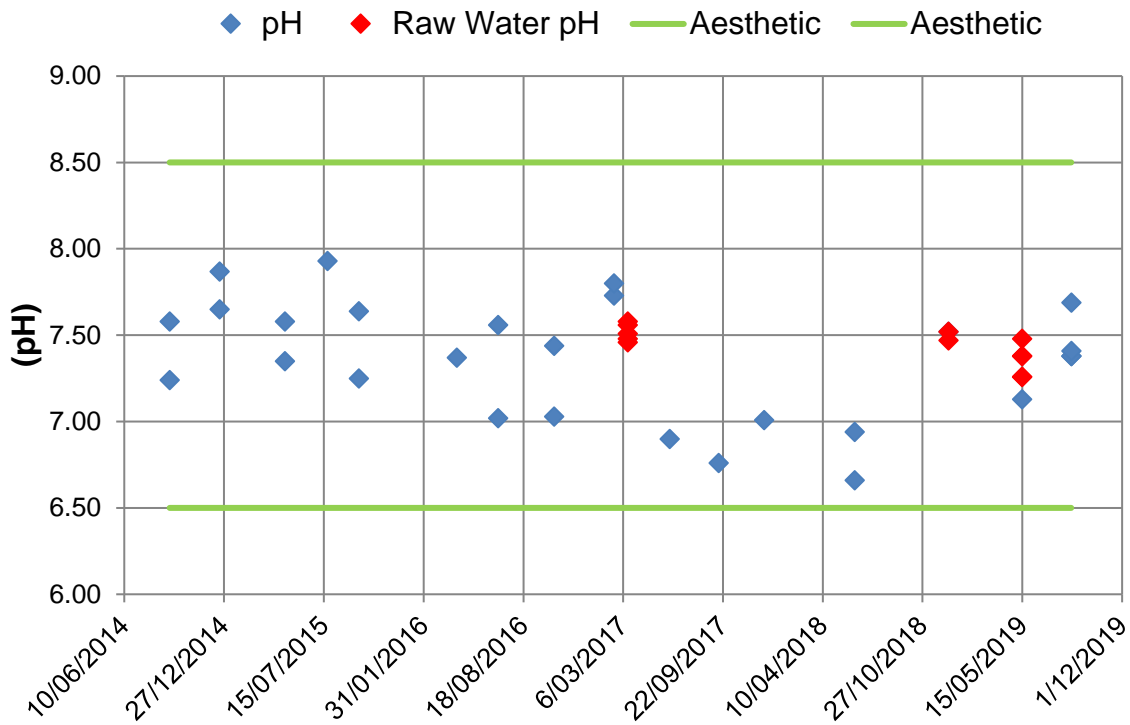


Figure 3.18 Eromanga pH at 23°C

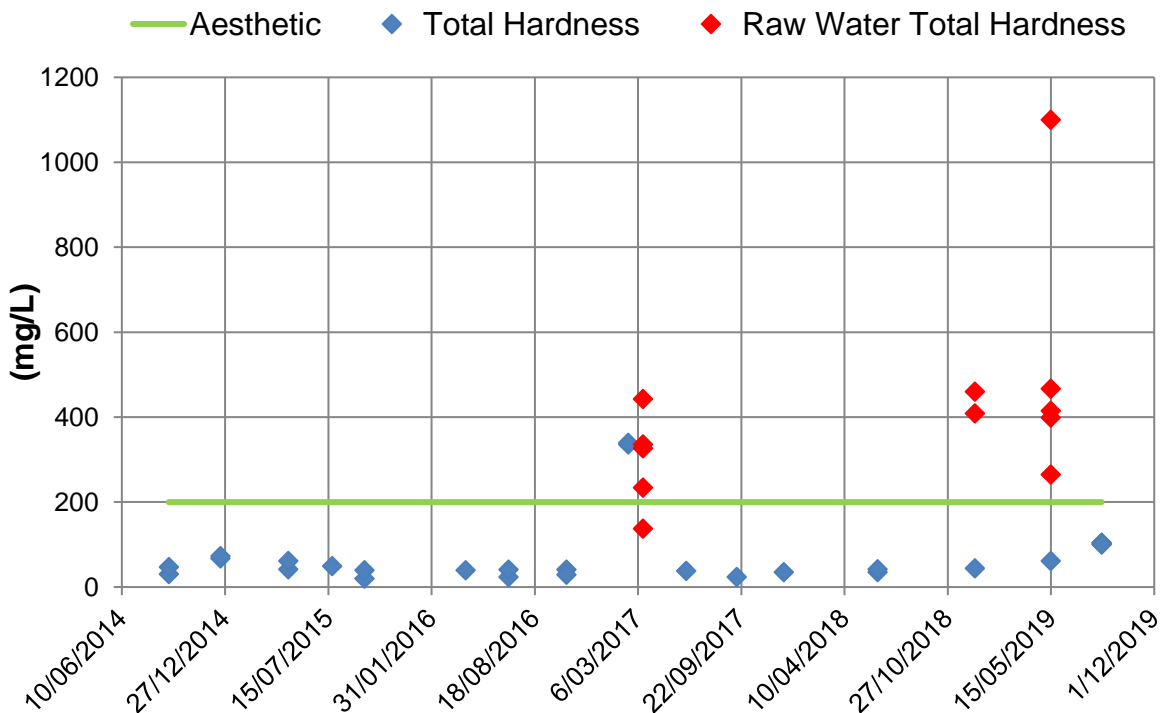


Figure 3.19 Eromanga Total Hardness

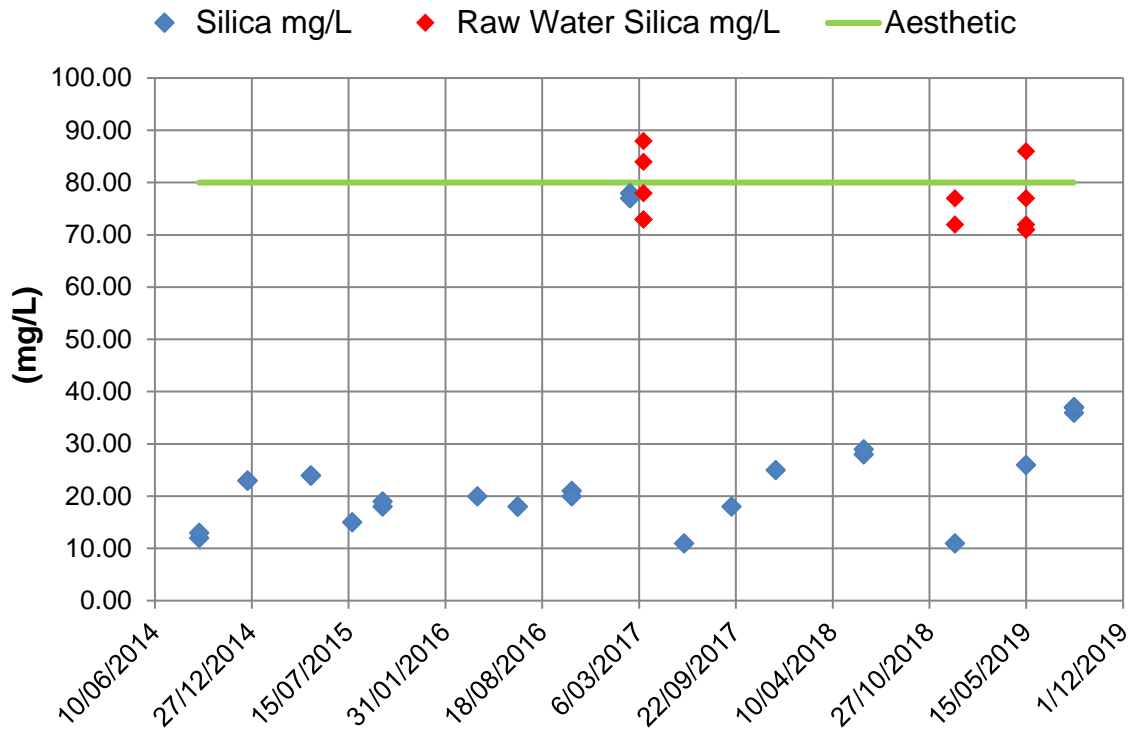


Figure 3.20 Eromanga Silica

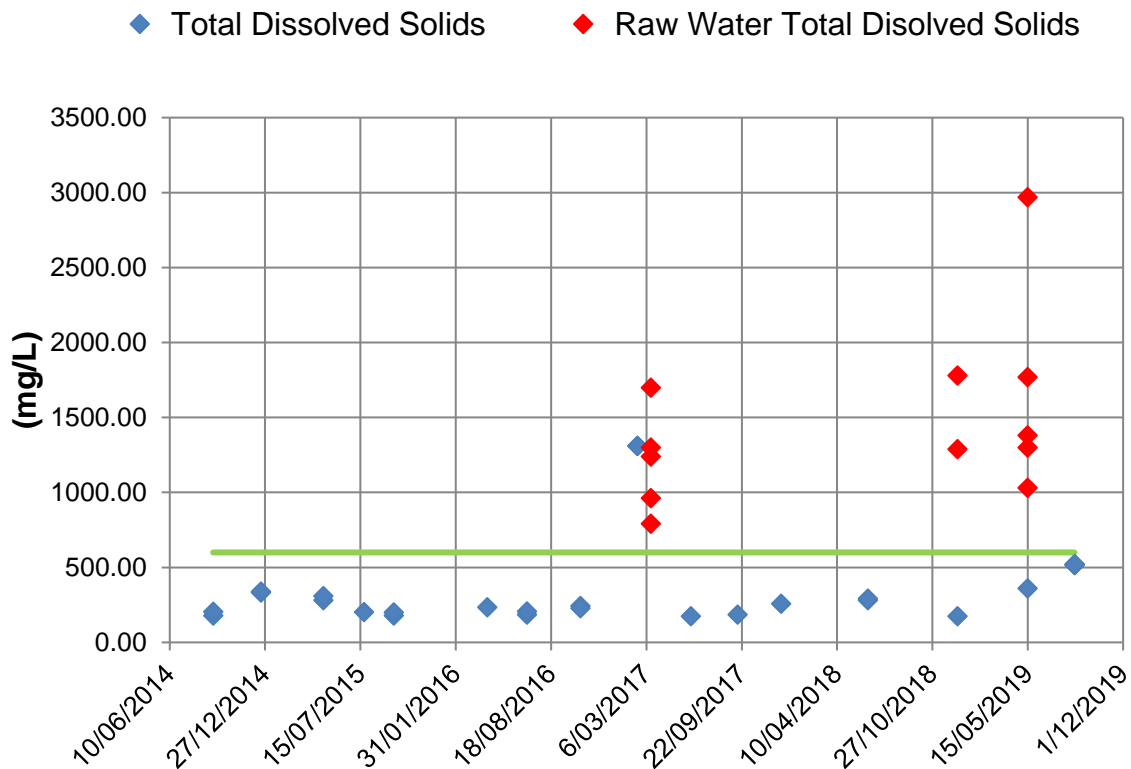


Figure 3.21 Eromanga Total Dissolved Solids

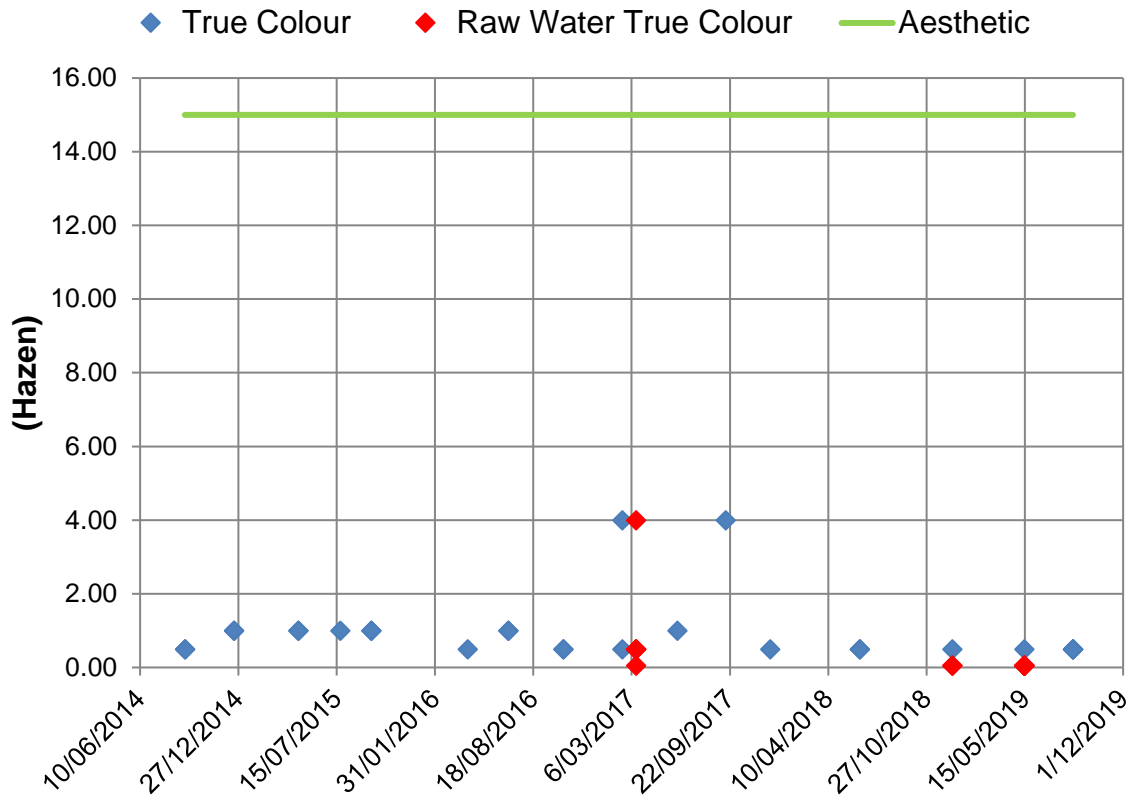


Figure 3.22 Eromanga True Colour

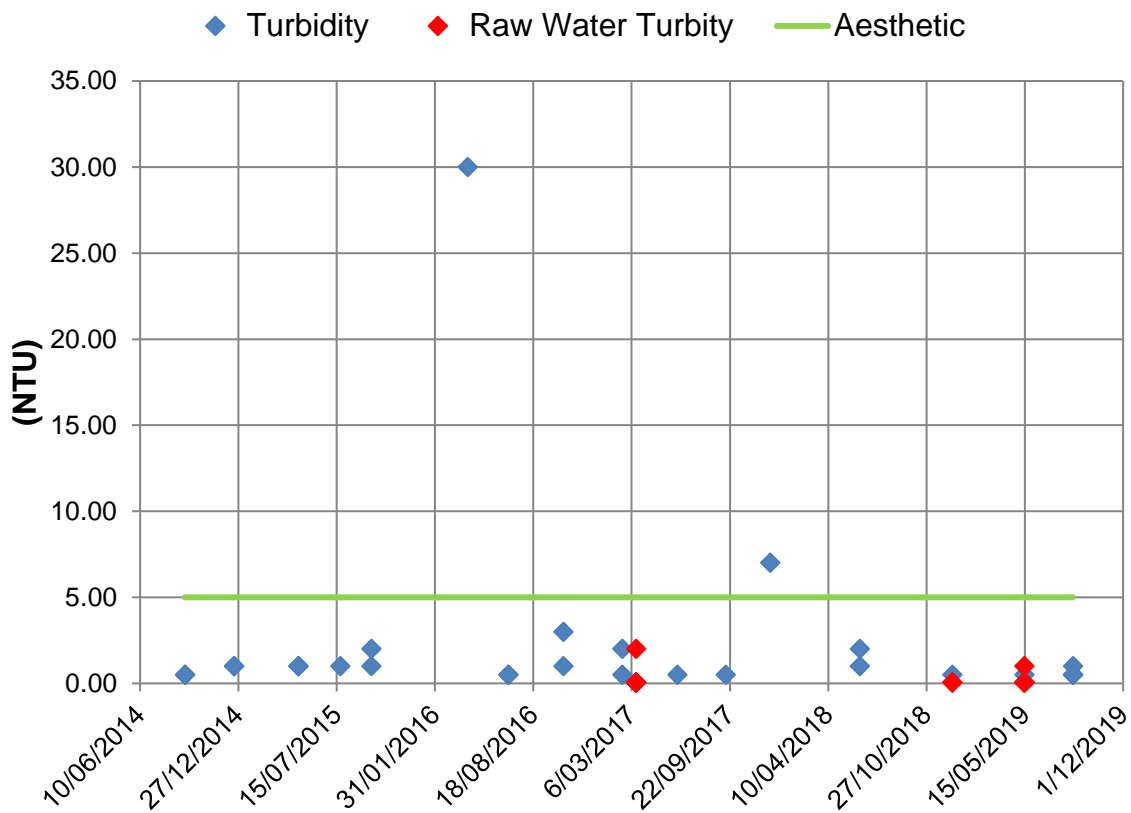


Figure 3.23 Eromanga Turbidity

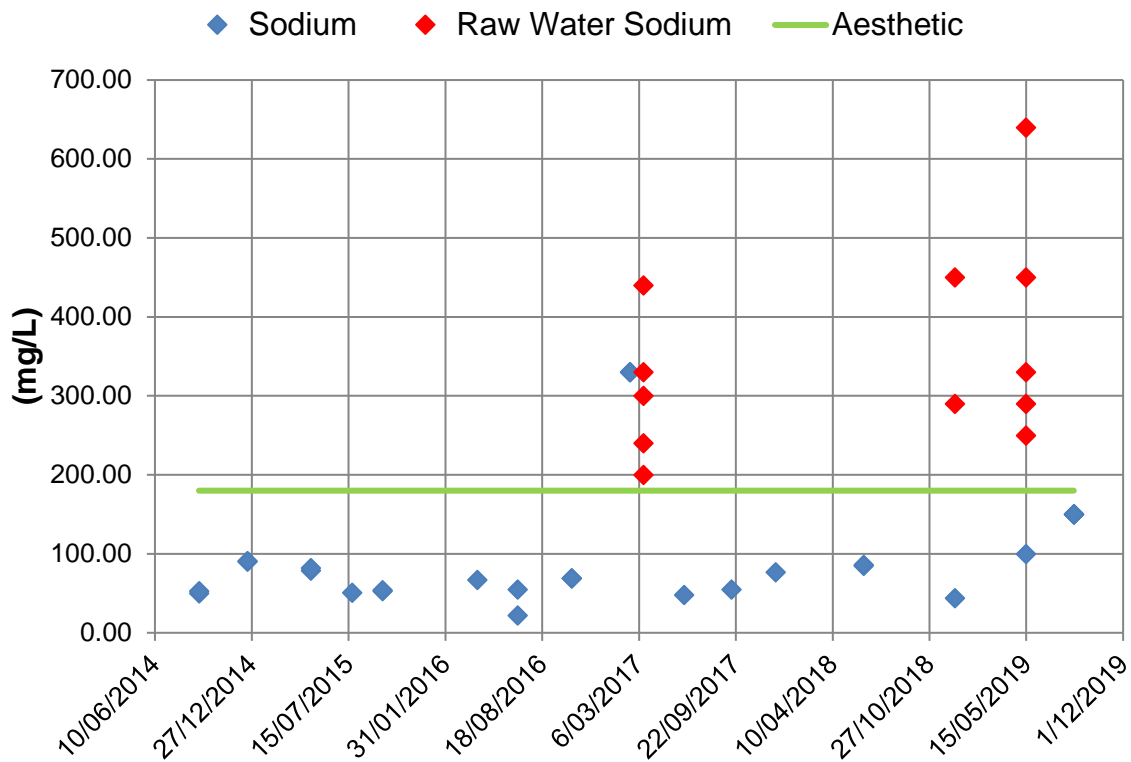


Figure 3.24 Eromanga Sodium

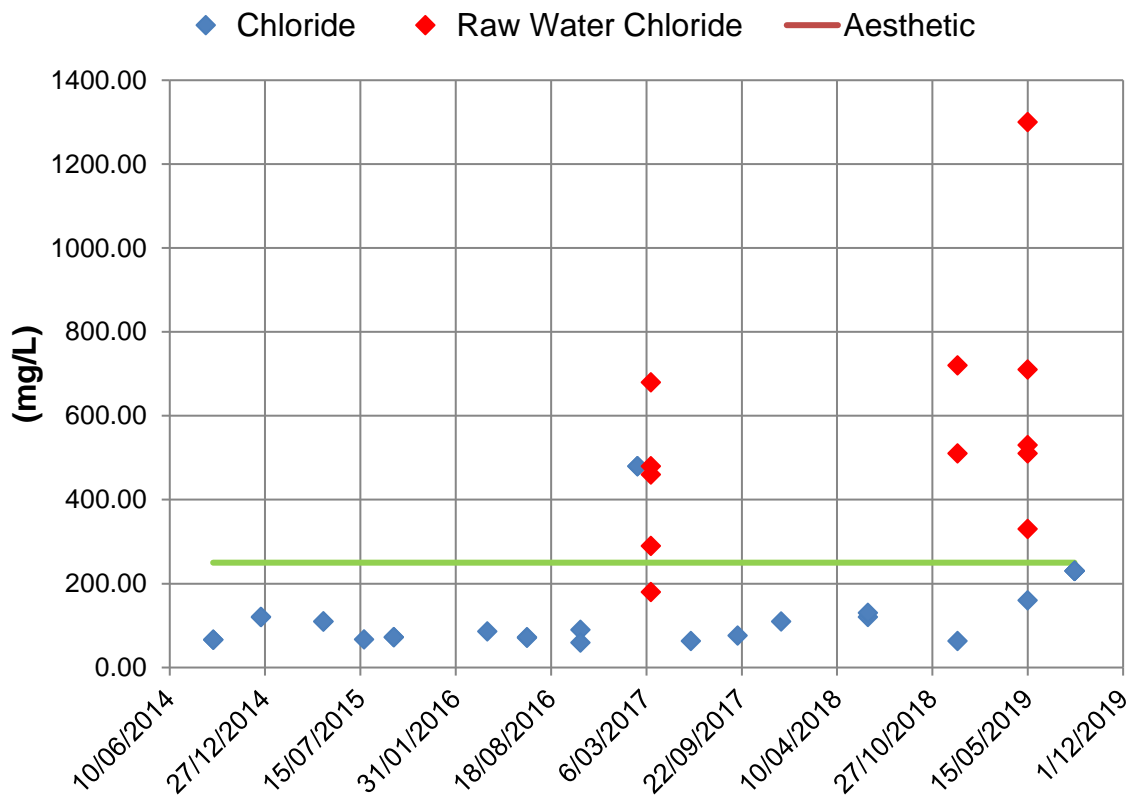


Figure 3.25 Eromanga Chloride

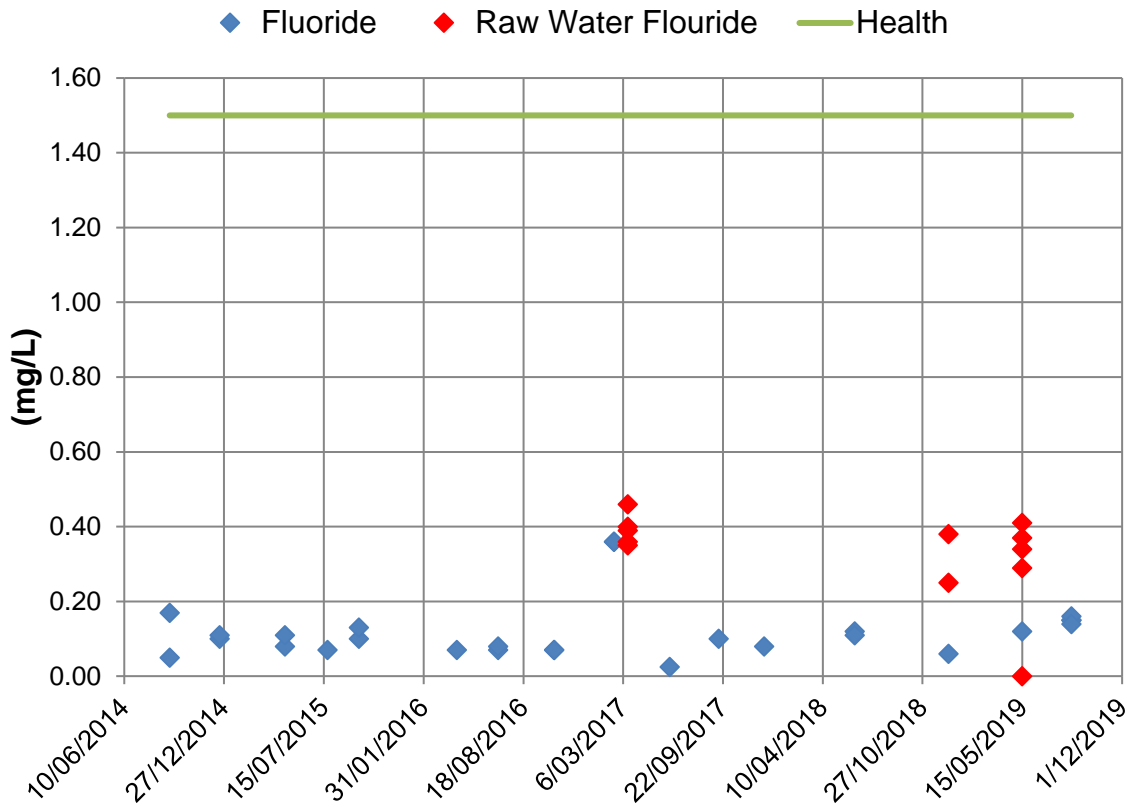


Figure 3.26 Eromanga Fluoride

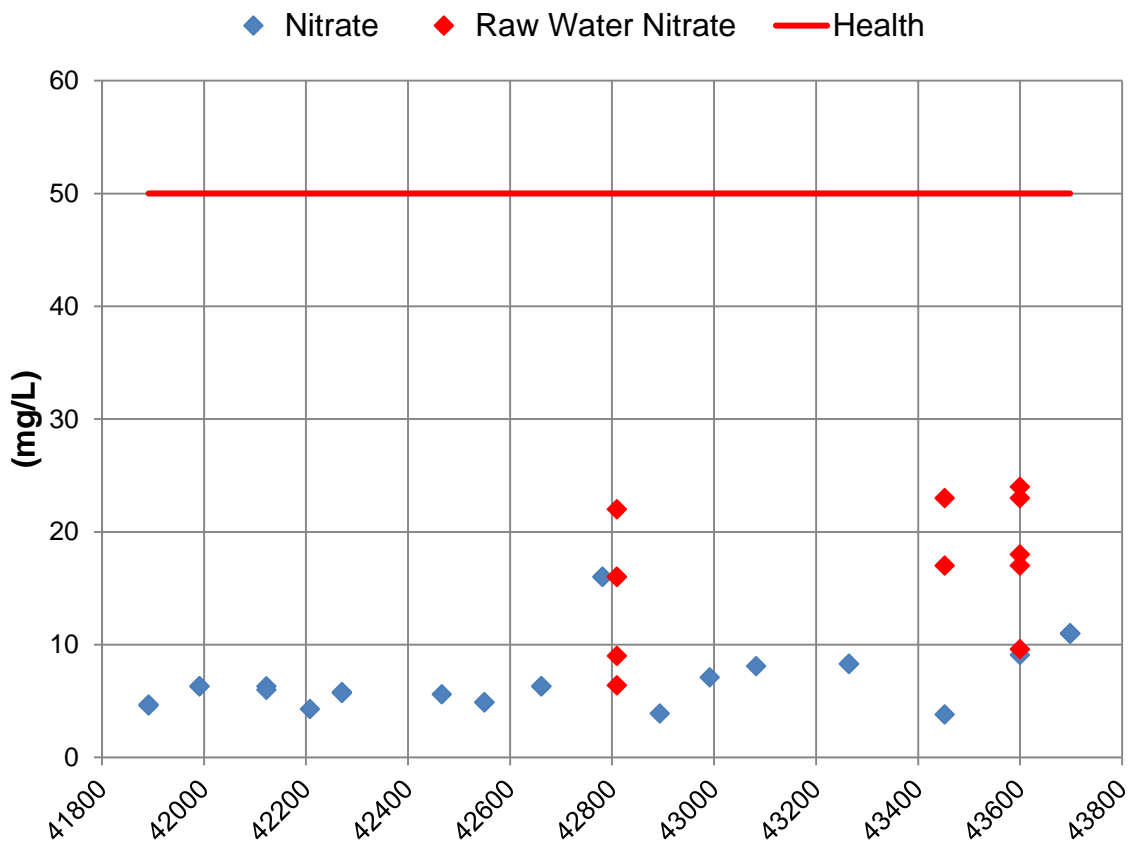


Figure 3.27 Eromanga Nitrate

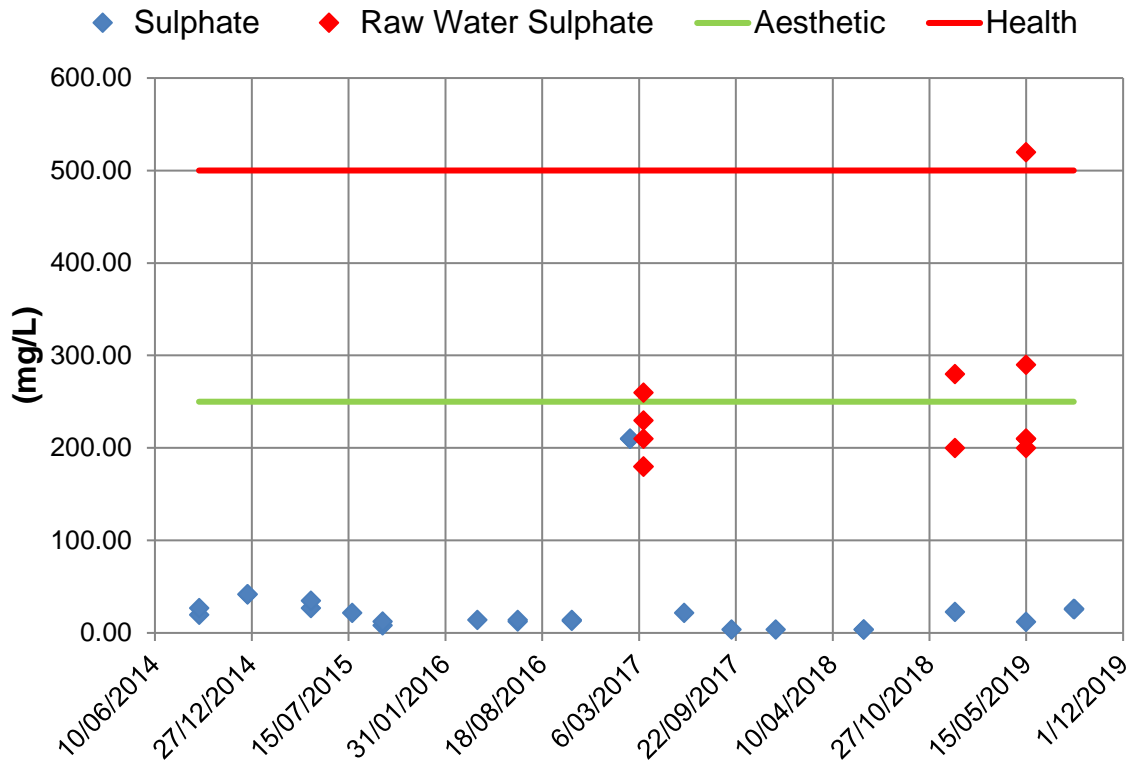


Figure 3.28 Eromanga Sulphate

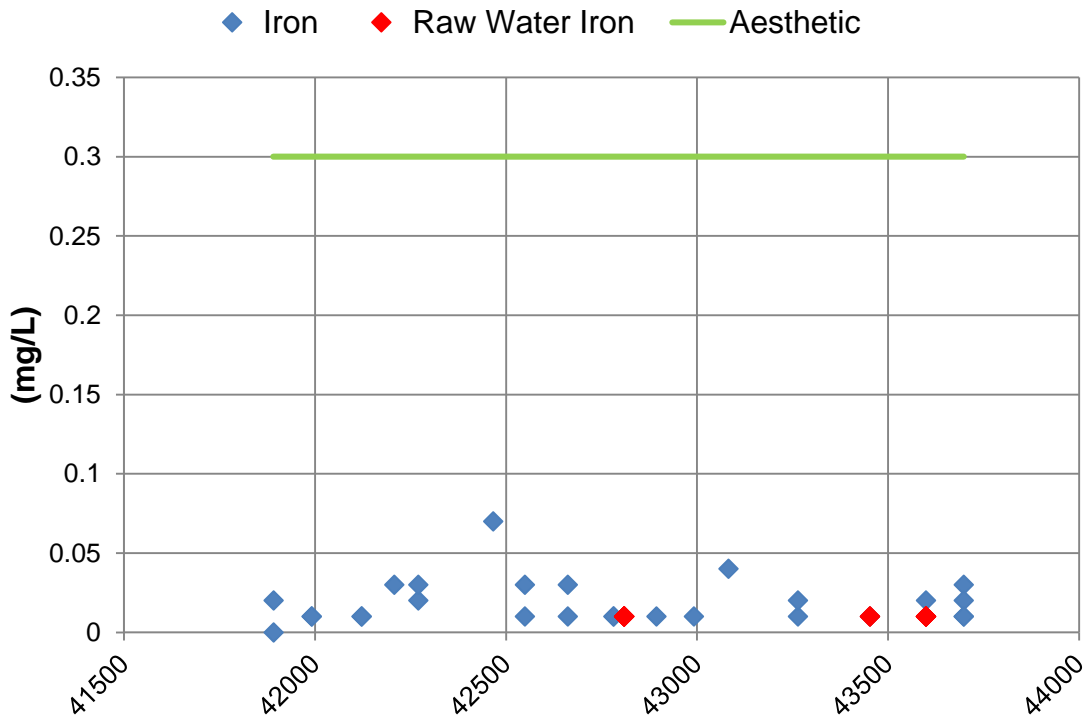


Figure 3.29 Eromanga Iron

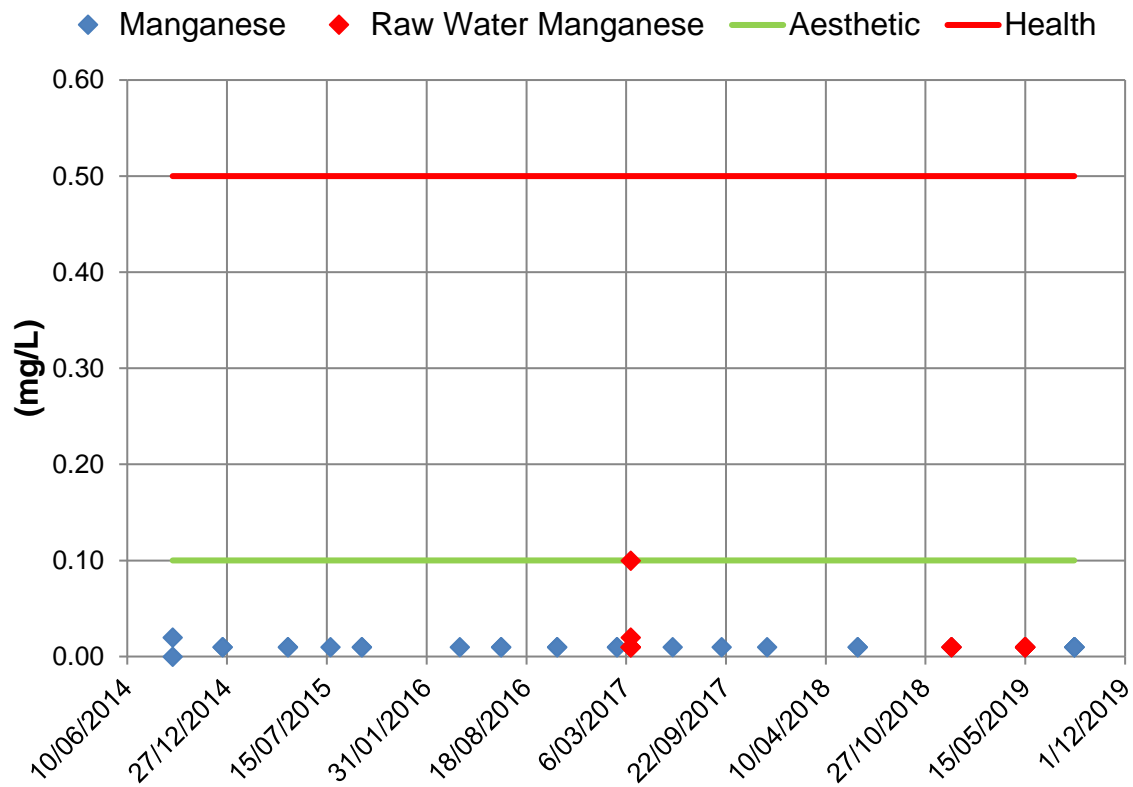


Figure 3.30 Eromanga Manganese

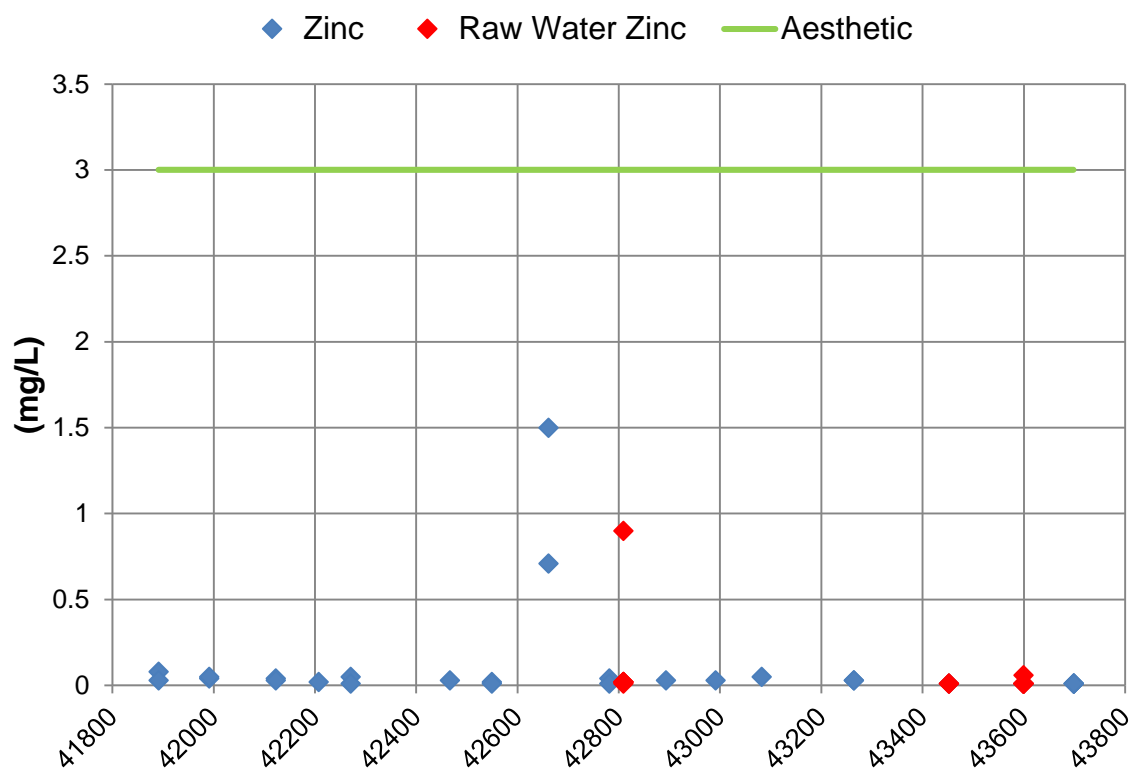


Figure 3.31 Eromanga Zinc

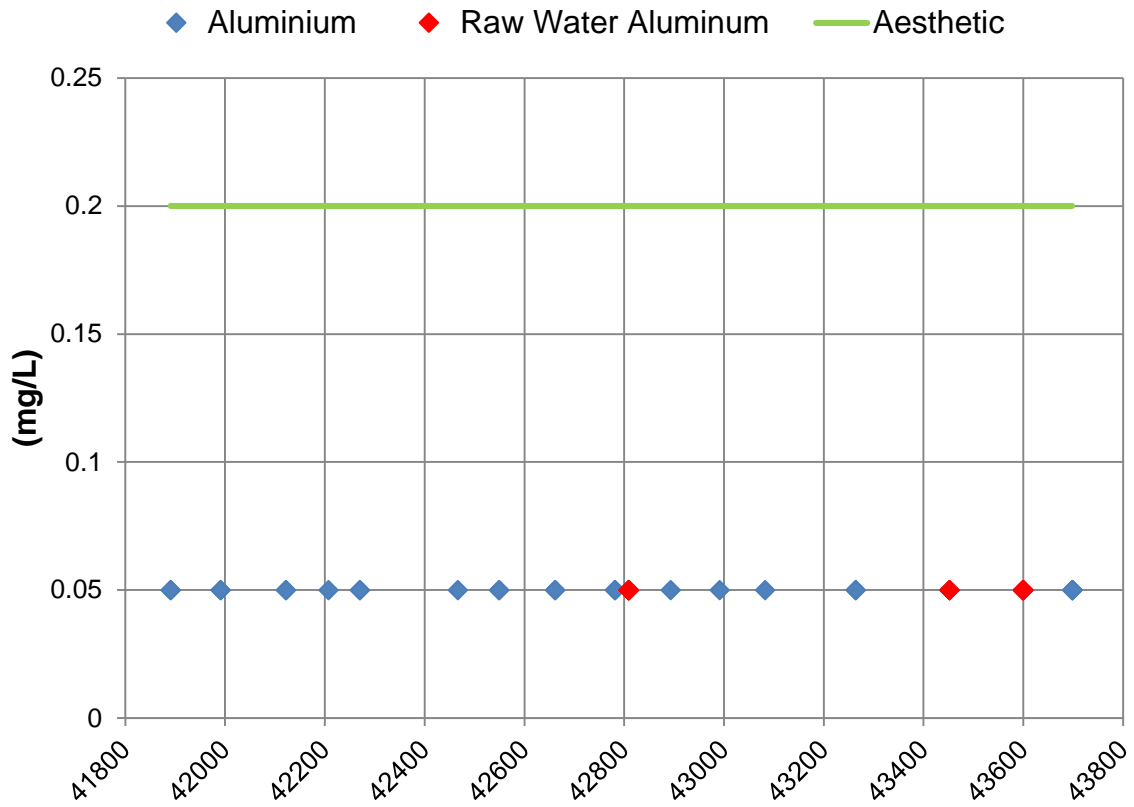


Figure 3.32 Eromanga Aluminium

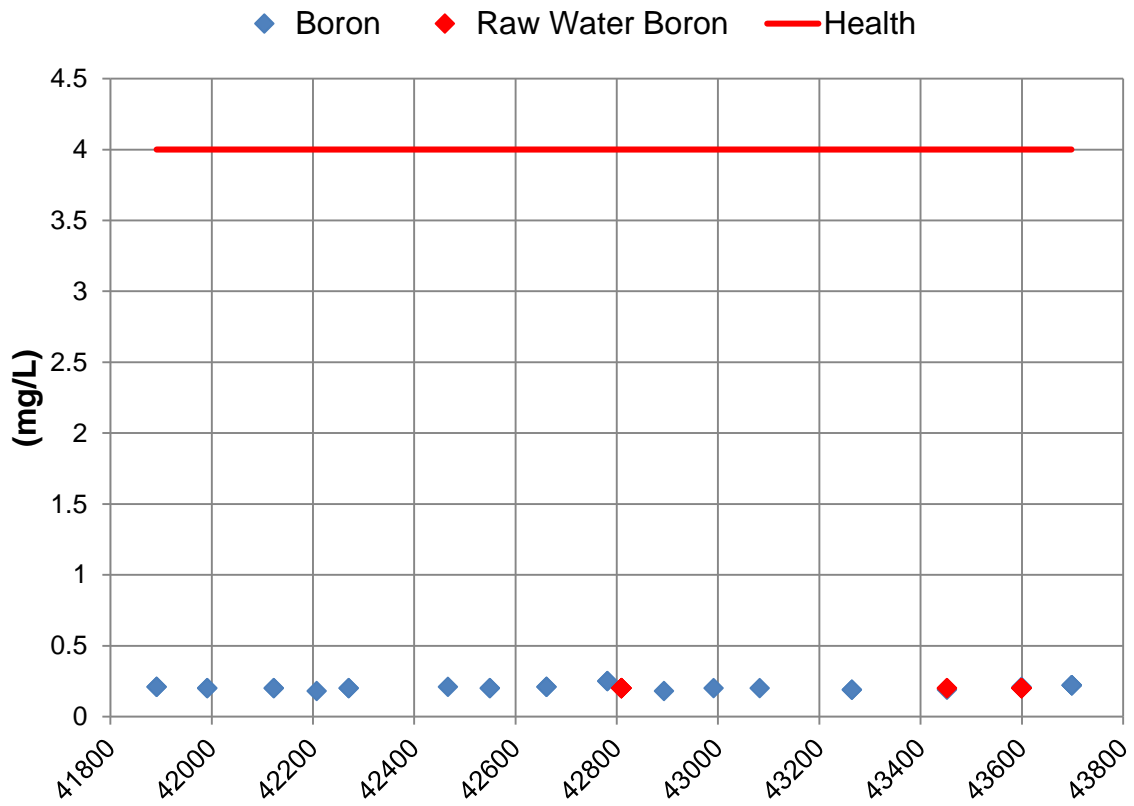


Figure 3.33 Eromanga Boron

3.2.1 (b) Interpretation

Table 3.5 provides a summary of water quality data sampled from the distribution system since the commissioning of the water treatment plant. This data identifies aesthetic guideline value exceedances² for a number of analytes, and no health guideline value exceedances detected in the distribution system.

The following aesthetic characteristics were detected (Bold items show exceedances):

- pH
- Silica
- **Total Dissolved Solids**
- **Total Hardness**
- Colour
- **Turbidity**
- **Sodium**
- **Chloride**
- Aluminium

Figure 3.19 provides a trend for the analysis of Total Hardness; there are 2 exceedances. A maximum value of 340 mg/l, average value of 73 mg/l and a 95th percentile value of 267 mg/l have been determined. The aesthetic guideline value is 200 mg/l for Total Hardness no health-based guideline value is considered necessary Total Hardness above 200 mg/l may lead to the scaling of pipes.

Figure 3.21 provides a trend for the analysis of Total Dissolved Solids; there are two exceedances. The aesthetic guideline value is 600 mg/l. For Total Dissolved Solids no health-based guideline is considered necessary. A maximum value of 1310 mg/l, average value of 361 mg/l and a 95th percentile of 1074 mg/l have been determined for this parameter. High Total Dissolved Solids values are associated with reduced palatability and increased scaling in pipes.

Figure 3.23 provides a trend for the analysis of Turbidity; there are two exceedances. The aesthetic guideline value is 5 NTU. For Turbidity no health-based guideline is considered necessary. A maximum value of 30 NTU, average value of 2.26 NTU and a 95th percentile of 5.8 NTU have been determined. High Turbidity values can be associated with an increased risk of pathogens in water supplies.

Figure 3.24 provides a trend for the analysis of Sodium; there are two exceedances. The aesthetic guideline value is 180 mg/l. For Sodium no health-based guideline is considered necessary. A maximum value of 330 mg/l, average value of 97.8 mg/l and a 95th percentile of 276 mg/l have been determined. Sodium values >180 mg/l cause taste issues.

Figure 3.21 provides a trend for the analysis of Chloride; there are two exceedances. The aesthetic guideline value is 250 mg/l. For Chloride no health-based guideline is considered necessary. A maximum value of 480 mg/l, average value of 140 mg/l and a 95th percentile of 405 mg/l have been determined. Relatively high Chloride values identified Eromanga's water supply area associated with the dissolution of minerals from the underlying geology of the groundwater system.

The ADWG Aesthetic threshold exceedances identified above are associated with RO treatment plant bypass in early 2017, due to scaling of membrane filters in the RO plant, where the RO process was bypassed for a short period whilst specialist maintenance was completed. The

² As per the Australian Drinking Water Guidelines (2011)

scaling of membrane filters has been identified as a risk factor in section 3.7 below and also discussed as an improvement item in Section 5.

3.2.2 Catchment Characteristics

Eromanga is located in the Channel Country of South West Queensland. The main ranges in the Quilpie Shire are the Grey, McGregor and Willies Ranges. The Willies range forms the catchment boundary of the Quilpie and Paroo Rivers. The Grey Range separates the Cooper Creek catchment from the Bulloo River. The Bulloo River is the major drainage system in the shire, where the head of the catchment is in the Gowan Ranges north of Adavale. The Bulloo River also has a well-developed flood plain.

Eromanga is subject to flooding on rare occasions, and is identified as a level 1 flood hazard area in the QLD Governments Flood Plain Assessment Database. Eromanga's location is situated between two small watercourses in the upper reaches of the Kyabra Creek which flows into Cooper Creek approximately 150km to the north. Flooding in Eromanga is largely due to the low relief values associated with the Channel Country, where large rainfall events cause widespread inundation across the landscape. Local records indicate that high flood events cause flood waters to rise to approximately one meter reaching the periphery of the town.

The average annual rainfall for Eromanga is 349.2mm³ with the majority of the rain falling between late November and late March. The mean maximum temperature is 29.2°C although temperatures have exceeded the 45°C mark during the summer months. Eromanga has a current population of 50 permanent residents and has a current demand of .104 MI/day. Outdoor watering of treated water is discouraged in Eromanga to ensure the capacity of the RO plant is not exceeded.

Eromanga's economy is based on the grazing and mining industries. The region consists of one of the largest opal boulder deposits in the world along with extensive gas and oil deposits. Road infrastructure construction and maintenance also contribute significantly to provide a stable employment base for the area.

In 2014 Eromanga switched their source water supply from the **deep artesian water bore** to sub-artesian with the establishment of a water treatment facility in Eromanga. The sub artesian supply was chosen due to the improved water quality. The source water supply comes from four shallow sub artesian bores, approximately forty metres depth with a positive pressure of approximately ten metres. The source water bores in Eromanga have targeted the Winton formation which forms the uppermost sequence in the Great Artesian Basin, dating back to the Cretaceous between 98-95 million years old. According to bore logs in the vicinity, the Winton formation can be accessed at relatively shallow depths of approximately 20m, this aquifer is overlaid with quaternary sediments and as such is described as an unconfined aquifer.

Quilpie Shire Council have maintained the **deep** artesian water supply that was used as the scheme's water supply prior to the commissioning of the water treatment plant. **The bore operates continually and supplies water to a cooling pond for use in road construction, watering of animals on the town common and to supply wash down water for the IOR Oil Refinery.** This bore **can be used** for emergency situations where the treatment plant is not working.

In the event that the water treatment plant is not operational the **first** option will be to truck water in from Quilpie and pump the water into the clean water tank for distribution. In situations where water cannot be delivered from Quilpie **as would be the case if the road was closed by flooding**, as a last resort the water treatment plant will be bypassed and the **deep** artesian supply

³ Climate statistics for Quilpie Airport (nearest available climate statistics) – Bureau of Meteorology

fed directly into the mains supply. The water quality of the artesian bore water is non-potable. When this water is supplied to the customer's, Council will issue notices the residents of Eromanga. This will be done by council staff delivering the information in person to individual houses and where personal contact cannot be made a notice dropped off at the house.

Eromanga sewerage system is a common effluent drainage scheme constructed in 2001 which contains a biological effluent treatment system comprising oxidation lagoons and an artificial wetland, one effluent pumping station, one rising main and 2600m of reticulation mains.

3.2.3 **Hazard Identification**

The hazards and hazardous events and their sources that adversely affect water quality are documented in Table 3-6 below and include those affecting:

- Catchment
- Sourcing infrastructure
- Distribution system

3.2.4 Identifying and Documenting Hazards and Hazardous Events

The hazards and hazardous events were identified using data contained in the plan and following a risk assessment workshop;

Table 3-6 Eromanga Hazard Identification, Risk Assessment and Uncertainty

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum risk			Existing Preventive Measures / Barriers.	Residual risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Catchment	Sewage system discharges, agricultural run-off	Biological	Catastrophic	Unlikely	High 10	Disinfection UV treatment Operational and verification monitoring	Moderate	Unlikely	Medium 6	Reliable	E1. Undertake bore water quality investigation to assess risk of water pathogens in sub artesian system.
	Hazard that arises from the natural geological processes in the aquifer.	Chemical	Major	Likely	High 16	Water treatment in place Boil water alert	Major	Unlikely	Medium 8	Reliable	Acceptable risk
	Draw down of water table	Physical	Moderate	Possible	Medium 9	Reliance on multiple bores/Continuous monitoring of water depth	Moderate	Rare	Low 3	Reliable	Ongoing monitoring of water level. Alternate supply if necessary
Sourcing Infrastructure	Bore Contamination	Biological	Catastrophic	Possible	High 15	Sealed bore headworks Treatment of shallow bore water Monitoring bore integrity Multiple source water bores and ability to isolate if required	Major	Unlikely	Medium 6	Reliable	E1. Undertake bore water quality investigation to assess risk of water pathogens in sub artesian system.
	Bore Failure	Physical	Moderate	Unlikely	Medium 6	O & M Procedure/Regular Inspections Truck water in from Quilpie Alternate bore availability Multiple source water bores and ability to isolate if required	Moderate	Rare	Low 3	Reliable	Acceptable risk
	Maintenance and repair of water main	Biological	Catastrophic	Possible	High 15	O&M Procedures in place	Catastrophic	Unlikely	High 10	Uncertain	E2. Update O & M Procedures to include safe practices for maintenance and repair of water mains
	Accidental or intentional contamination	Biological/Chemical	Catastrophic	Rare	Medium 6	Chain-link fencing and locked gates Sealed bore headworks	Moderate	Rare	Low 3	Reliable	E1. Undertake bore water quality investigation to assess risk of water pathogens in sub artesian system.

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum risk			Existing Preventive Measures / Barriers.	Residual risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
						O&M Procedures in place					
	Flood Event	physical	Catastrophic	Rare	Medium 6	Rarity of flood events Sealed bore headworks Bores located out of flood zone	Moderate	Rare	Low 3	Reliable	
	Power outage	Physical	Moderate	Unlikely	Medium 6	Backup generator	Minor	Rare	Low 2	Confident	Acceptable Risk
Treatment Plant	Equipment failure	Physical/Chemical	Catastrophic	Possible	High 15	Central control system capabilities Correct maintenance practices Automated tank level of 90% O&M Procedures in place Alternate water source, transport water in from Quilpie	Catastrophic	Unlikely	High 10	Uncertain	E 3. Engage water treatment specialist/s to undertake system review, Undertake critical maintenance, & develop detailed and succinct Plant Operational and Maintenance Procedures.
	Long term Power failure	Physical	Major	Possible	High 12	Backup generator in place for power outages If the Plant becomes inoperable, potable water will be trucked from the approved Quilpie water supply using suitable road tankers. Only if flooding closes the road between Quilpie and Eromanga, consideration will be given to use the artesian bore in Eromanga	Moderate	Rare	Low 3	Reliable	Generator maintenance

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum risk			Existing Preventive Measures / Barriers.	Residual risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
	Bypass treatment plant	Chemical (Fluoride)	Moderate	Unlikely	High 15	Continual public awareness Alternate water source, transport water in from Quilpie Operational monitoring	Moderate	Rare	Medium 8	Confident	Acceptable Risk
		Biological	Catastrophic	Unlikely	High 10	O&M Procedures in place	Moderate	Rare	Low 3	Confident	
	Head loss build up to media filters and RO membranes	Physical/Chemical	Catastrophic	Possible	High 15	Disinfection	Major	Unlikely	Medium 8	Confident	E4. Trend pre and post pressures of media and RO pressure gauges to ascertain safe operating parameters.
Disinfection Process (Sodium Hypochlorite)	Overdosing of chlorine leading to high levels of disinfection by products	Chemical	Moderate	Unlikely	Medium 6	Operational monitoring Verification monitoring Ultra Violet Light Disinfection	Minor	Unlikely	Low 4	Confident	Acceptable Risk
	Under dosing of chlorine leading to chlorine sensitive pathogen survival in finished water	Biological	Catastrophic	Unlikely	High 10	RO Microfiltration UV treatment O&M Procedures in place	Minor	Unlikely	Low 4	Confident	Acceptable Risk
	Chlorine Storage conditions, chemical degradation and gassing	Biological/Chemical	Catastrophic	Possible	High 15	Operational Monitoring Verification Monitoring	Major	Unlikely	Medium 8	Uncertain	E.5 Investigate and modify chlorine storage system to avoid chemical degradation and gassing
	Failure of disinfectant dosing pumps	Biological	Catastrophic	Unlikely	High 10	Weekly chlorine testing Standby pump Ultra Violet Light Disinfection RO Microfiltration O&M Procedures in place	Minor	Unlikely	Low 4	Confident	Acceptable Risk
	Power outage	Physical	Moderate	Unlikely	Medium 6	Backup generator	Minor	Rare	Low 2	Confident	Acceptable Risk

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum risk			Existing Preventive Measures / Barriers.	Residual risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
Distribution System	Accidental or intentional contamination	Biological/ Chemical	Catastrophic	Possible	High 15	O&M Procedures	Catastrophic	Unlikely	High 10	Confident	E6.Caravan septic disposal point in the vicinity of Town hall bore to be concreted and bunded.
	Reticulation maintenance and repair	Bacteria	Catastrophic	Possible	High 15	O & M Procedures in place	Catastrophic	Unlikely	High 10	Uncertain	E2.Update O & M Procedures to include safe practices for maintenance and repair of water mains
	Clean water tank	Biological	Catastrophic	Possible	High 15	Vermin Proofing	Minor	Unlikely	Low 4	Confident	Regular checks and maintenance
	Unauthorised connections/ Backflow events	Biological	Catastrophic	Unlikely	High 10	Operational Monitoring Monitoring water usage	Moderate	Rare	Low 3	Confident	Acceptable Risk
Whole of System	Flights carrying water samples to be analysed delayed/cancelled	Logistics	Minor	Possible	Medium 6	Collect new samples and schedule testing for next available flight O & M Procedures in place	Minor	Rare	Low 2	Confident	Acceptable Risk
	Poor information management	Chemical/ Biological	Catastrophic	Possible	High 15	Water quality data analysis and management, routine operations and maintenance of scheme	Moderate	Unlikely	Medium 6	Uncertain	E2. Procedures to be developed and reviewed E7. Monitoring data and documentation consolidated and managed centrally
	Contamination of water samples	Chemical/ Biological	Major	Possible	High 12	O & M procedures	Major	Unlikely	Medium 8	Reliable	E8. Upgrade water testing facilities in Quilpie. Provide dedicated testing lab to ensure hygienic conditions for water testing
	Lack of human resources	Chemical/	Major	Likely	High 16	O & M procedures	Major	Possible	High 12	Uncertain	E3. Engage water treatment specialist/s develop detailed and succinct Plant Operational and Maintenance Procedures
		Biological/Physical				Knowledge succession					
Bush Fire	Physical	Major	Possible	High 12	Infrastructure management – fuel reduction	Major	Rare	Medium 5	Confident	Acceptable Risk	

Scheme Component / Sub-component	Hazardous Event	Hazard	Maximum risk			Existing Preventive Measures / Barriers.	Residual risk			Uncertainty	Comments/ Proposed Further Risk Reduction Actions
			Consequence	Likelihood	Risk level		Consequence	Likelihood	Risk level		
						Emergency services response unit Council disaster management preparedness					
	Cyber security vulnerability	Physical	Major	Possible	High 12	High grade security protection User authentication Restricted administration privileges Malware protection Anti-virus protection Sonic wall protection Restricted telemetry usage licence password secured access to telemetry data	Moderate	Rare	Low 3	Reliable	Acceptable Risk

4 ASSESSMENT OF RISKS

The plan details the risk assessment methodology used for the scheme in Section 4.1 below. Section 4.2 explains how the risks were assessed. Section 4.3 tabulates the relevant stakeholders in the risk assessment process.

4.1 Methodology

The methodology adopted for the risk assessment is described below. The methodology is based on the methodology exemplified in the document "Preparing a Drinking Water Quality Management Plan Guideline Supporting Information" (September 2010).

Table 4-1 below shows the qualitative measures of likelihood that was adopted in the risk assessment.

Table 4-1 Measures of Likelihood Utilised in the Risk Assessment

Likelihood	Descriptors
Rare	Occurs less than or equal to once every 5 years
Unlikely	Occurs more often than once every 5 years and up to once per year
Possible	Occurs more often than once per year and up to once a month (12/yr.)
Likely	Occurs more often than once per month (12/yr.) and up to once per week (52/yr.)
Almost Certain	Occurs more often than once per week (52/yr.)

Table 4-2 below shows the qualitative measures of consequence that was adopted in the risk assessment.

Table 4-2 Measures of Consequences Utilised in the Risk Assessment

Consequence	Descriptors
Insignificant	Isolated exceedance of aesthetic parameter with little or no disruption to normal operation
Minor	Potential local aesthetic, isolated exceedance of chronic health parameter
Moderate	Potential widespread aesthetic impact or repeated breach of chronic health parameter
Major	Potential acute health impact, no declared outbreak expected
Catastrophic	Potential acute health impact, declared outbreak expected

Table 4-3 below shows the degrees of uncertainty adopted for the risk assessment. Some of the risks assessed for the Water Supply Schemes remain an estimate or uncertain.

Table 4-3 Degrees of Uncertainty

Level of Uncertainty	Definition
Certain	There is 5 years of continuous monitoring data, which has been trended and assessed, with at least daily monitoring; or The processes involved are thoroughly understood.

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

Table 4.4 below shows the risk analysis matrix utilised, detailing the various levels of risk that was adopted in the risk assessment.

Table 4-4 Risk Analysis Matrix – Level of Risk

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Medium (6)	High (10)	High (15)	Extreme (20)	Extreme (25)
Likely	Medium (5)	Medium (8)	High (12)	High (16)	Extreme (20)
Possible	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
Unlikely	Low (2)	Low (4)	Medium (6)	Medium (8)	High (10)
Rare	Low (1)	Low (2)	Low (3)	Medium (5)	Medium (6)

Table 4-5 Defined Acceptable Risk Levels

Low risk	acceptable	manage for continuous improvement
Moderate risk	unacceptable	Implement short term measures, longer term risk reduction measures may be implemented within a reasonable timeframe
High risk	unacceptable	Implement short term measures immediately, longer term risk reduction measures need to be a priority
Extreme	unacceptable	Implement short term measures immediately, implementation of longer term risk reduction measures given top priority

Table 4-5 above details the acceptable risk levels for the water supply schemes.

4.1.1 Site Visits, Interviews and Risk Assessment Workshop

As a continual improvement strategy of Quilpie Shire Council an independent review of the towns' water supply schemes by an independent specialist. This review provided council with a number of improvement items which have been incorporated in to the DWQMP.

A DWQMP review and risk assessment teleconference (due to COVID-19 restrictions) was held in April 2020, members present at the meeting included Lalirra Lander – Administration Officer, Alan McNall - Water Officer, Peter See – Director of Engineering, William Green - George Bourne and Associates. The meeting was held as part of the DWQMP review and amendment process, suggested actions provided in Councils independent review were discussed in detail along with other perceives risks in the system.

4.2 Assessment of Risk

Details of the risk assessment results for each scheme’s identified hazards and hazardous events include:

- maximum risk level or equivalent process (i.e. without existing barriers in place, e.g.: no treatment and/or disinfection);
- existing preventive measures including multiple barriers
- residual risk level (i.e. with existing barriers in place); and
- any uncertainties.

The following sections will discuss each of these dot points in further detail.

4.2.1 Assessment of Maximum Risk

For all hazards, maximum risk (e.g. the risk from an uncontrolled hazard) was first assessed. Where there was insufficient data or information to complete a reliable assessment, this was highlighted as an uncertainty and discussed further in the Risk Management Improvement Program in Section 5.3 below.

4.2.2 Existing Preventative Measures/Barriers

All existing preventative measures are listed in the Risk Assessment. Existing preventative measures include all actions, barriers or measures currently in place to reduce the maximum risk. They include all treatment steps, active measures that protect raw water quality prior to treatment and measures to protect treated water quality.

4.2.3 Residual Risk

The residual risk is determined once existing preventative measures have been applied. Residual risk is the level of risk a particular hazard is assessed as posing to the safety of the drinking water once the existing preventative measure/s have been applied.

Residual risk is determined using the same methodology (e.g. likelihood and consequence descriptors) as the initial maximum risk assessment; however changes to the assessed likelihood (or consequence) should result in a lower resultant risk level.

4.3 Key Stakeholders

Table 4-6 Stakeholders – Risk Assessment

Stakeholder	Contact Name and Details	Rationale For Engagement And How Engagement Occurred
Quilpie Shire Council	Peter See Quilpie Shire Council P: (07) 4656 0500 E: PeterS@quilpie.qld.gov.au	Engineering Services Director for Quilpie Shire Council Review and Risk Assessment Workshop Management of DWQMP Preparation
	Alan McNall Water Officer	Review and Risk Assessment Workshop

Stakeholder	Contact Name and Details	Rationale For Engagement And How Engagement Occurred
	Quilpie & Eromanga Water Supplies	
	Lalirra lander Administration Officer QSC	Review and Risk Assessment Workshop Information management
Consultants	William Green George Bourne & Associates P (07) 4651 5177 E wgreen@gbassoc.com.au	Review and Risk Assessment Workshop Amendment of Quilpie DWQMP

5 MANAGING RISKS

Quilpie source water from a relatively deep artesian bore and does not undergo any treatment processes.

Eromanga’s raw water requires treatment prior to reticulation to meet acceptable drinking water quality levels. A new treatment plant was commissioned in 2014 to provide improved drinking water quality.

For Eromanga’s supply scheme there is a residual risk related to plant failure or shutdown, where a backup supply system will be required to supply the scheme. The backup water to be provided in the event of treatment plant failure will be sourced from the Quilpie drinking water supply, the water will be trucked in on a regular basis as demand requires. When the backup water supply is commissioned due to plant shutdown Eromanga residents will be required to be notified that an alternate water source has been provided. In this situation due to the small population of Eromanga notifying town residents is relatively easy, council plan on notifying residents in person by door knocking and or leaving notices at individual properties. The person responsible for most of the daily operations associated with the Eromanga water supply lives locally and would most likely be able to promptly notify residence in the event of plant failure.

In the event of the road flooding between Quilpie and Eromanga which stops the delivery of water from Quilpie by road, consideration will be given to using the old artesian bore for basic water supplies only. The analysis of the water is shown in Appendix H This will be the least favoured option and will only occur if the treatment plant has failed and flooding of the road has occurred. It is considered very unlikely that this option will ever be used.

The bore is operational and currently supplies water for roadworks oerations, animals on the town common and for wash down water at the IOR Oil Refinery.

Managing risks are discussed in the following sections below:

- 5.2 Operation and Maintenance Procedures
- 5.3 Management of Incidents and Emergencies
- 5.4 Risk Management Improvement Program

5.1 Operation and Maintenance Procedures

The risk assessment process for the QSC Schemes, has identified that residual risks could be reduced by reviewing and amending existing Operational and Maintenance Procedures. It has therefore been identified that existing Operations and Management Procedures are to be reviewed and amended to address related residual risks identified. Documentation to be reviewed or developed includes:

Table 5-1 DWQMP Operations and Maintenance Procedures QSC

<ul style="list-style-type: none"> • Operation and Maintenance Eromanga Water Treatment Plant
<ul style="list-style-type: none"> • Outline Water Supply Contamination Contingency Plan <ul style="list-style-type: none"> - Emergency Response - Boiled water alert procedure - Alternate water supply contingency
<ul style="list-style-type: none"> • Trunk Main Shut Down – Planned & Unplanned Maintenance <ul style="list-style-type: none"> - Water main repair procedure - Water repair disinfection procedures - Boiled water alert procedure

5.1.1 Information Management

Effective governance and mitigating prioritised risk associated with the delivery of safe drinking water is dependent on QSCs capacity to manage information effectively. In order to monitor water quality in the Quilpie and Eromanga schemes, regular water analysis is conducted in alignment with the Verification Monitoring Program outlined in Table 6.2 below.

Water quality results are received by councils Engineer. The water quality data is maintained in electronic format in a spreadsheet to maintain a single record of all water quality data. The spreadsheet is maintained with trends graph to provide visual guides depicting trends over time. Analytical reports received from QLD Health laboratories and in-house test results once received are uploaded into council's information management system *Info Expert and stored* in electronic format in a chronological order to ensure information is accessible accurate and up to date.

In order to manage information effectively it is necessary to identify stakeholders involved in the delivery and management of safe drinking water supplies. Table 5.2 below provides a breakdown of the information management requirements for the supply schemes of Quilpie and Eromanga.

Table 5-2 Staff Responsibilities: Information Management QSC

Role	Responsibility
Chief Executive Officer	Ensure quality management systems in place
Administration Officer	Record Keeping - Monitoring <ul style="list-style-type: none"> - Filing of operational monitoring inspection forms - Filing verification monitoring lab reports - Filing monthly in-house bacteriological results - Collation of weekly operational monitoring data - Collation of monthly bacteriological results to dataset - Collation of verification monitoring results to dataset - Filing chain of custody documents for verification testing samples
	Record Keeping General <ul style="list-style-type: none"> - Record all incidents, file notifications and associated data - Record water quality complaints on complaints register
	Document Control/ Quality Systems Management <ul style="list-style-type: none"> - Maintain document register for all DWQMP related documents including O&M procedures - Track review dates for documents and initiate reviews
Water Officer	Operational inspections of water bores in Quilpie and Eromanga <ul style="list-style-type: none"> - Completion of weekly inspection forms - Delivery of inspection forms to Administration Officer
	Weekly operational water testing and maintenance inspections at Eromanga water treatment plant <ul style="list-style-type: none"> - Completion of weekly inspection forms - Documentation of maintenance works - Delivery of water testing and maintenance documentation to Administration Officer
	Operations in-house Bacteriological testing <ul style="list-style-type: none"> - Record and document test results - Delivery of water testing results to Administration Officer

Role	Responsibility
	Monthly Water Officers Report <ul style="list-style-type: none"> - Record and document water management activities - Deliver Monthly Water Officers report to Engineer
	Quarterly Verification Monitoring <ul style="list-style-type: none"> - Signing chain of custody document prior to sending samples - Sampling water and freight tot lab
	DWQM Procedures <ul style="list-style-type: none"> - Develop or assist with the development of Operational & Maintenance procedures - Amend procedures when changes are implemented
	Incident Management <ul style="list-style-type: none"> - Compile or assist with compilation of incident notification - Record incident in monthly Water Officers report. - Direct water quality complaints or record complaint information to be recorded on the water quality complaints register

5.1.2 Document Control Procedures

Council document control procedures require Operation and Maintenance documents to be given a document number, title, and revision date used for maintaining the documented control procedure. The principal purpose of the document control procedures is to implement routine revision of documents and maintain up-to-date records as required to all necessary parties.

The document control procedures adopted by QSC form a key component of their quality assurance system. The control procedures track documentation preparation and handling and in turn place accountability with employees. The identification of version number and subsequent version date ensures that only the most recent valid information is published and circulated.

Based on control procedures, documents are routinely reviewed on a regular basis, and amended were required to ensure employees have access to the most current information. This process is reflective of QCS's commitment to continual development.

In order to provide a robust document control system a document register is to be developed identifying all of the documentation relating to DWQMP for the water supply schemes of QSC. The document register will record the title of all documents relating to drinking water quality management, stakeholders the document is targeted for, the locations that the documents are to be kept, the approval date of the document and the next scheduled review date for the document.

5.2 Management of Incidents and Emergencies

Table 5-3 shows the different levels of incidents for the entire drinking water service. There are five levels of incidents and emergencies ranging from Level 5 (most severe) to Level 1 (least severe). Quilpie Shire Council has developed a Local Disaster Management Plan (current version dated August 2016). Level 5 incidents and emergencies should be handled under the Quilpie Shire Council Local Disaster Management Plan and are likely to be the result or cause of other emergencies which are covered under the plan.

Table 5-4 shows how incidents and emergencies are managed relevant to drinking water quality.

The use of Eromanga Artesian bore water as a secondary and last resort where potable water cannot be imported from Quilpie during plant failure or shutdown has been identified as an emergency situation. Council's first response will always be by trucking in Quilpie potable water however if road flooding occurs this may not be possible. Only then will the Eromanga artesian water be used.

For Eromanga's supply scheme there is a residual risk related to plant failure or shutdown, the preferred option for the provision of a an alternate water supply is to transport water in from Quilpie's drinking water supply, which would be delivered by a water tanker and pumped into the clean-water tank.

In an emergency situation where the backup supply is sourced from the previous deep artesian water supply, provisions will need to be made to ensure the safety of the customers due to the artesian water quality being of a lower quality than the treated water and does not meet the ADWG for a number of characteristics such as Fluoride, Total Dissolved Solids and Sodium (i). Notices will be hand delivered to customers advising them of the poor quality of the water and that it is not suitable for drinking due to the characteristics above (i).

When the backup water supply is commissioned due to plant shutdown Eromanga residents will be notified that an alternate water source of lesser quality has been provided. In this situation due to the small population of Eromanga notifying town residents is relatively easy, as the person responsible for most of the daily operations associated with the Eromanga water supply lives locally and would most likely be able to promptly notify residence in the event of plant failure by door knocking and or leaving notices at individual properties. Furthermore, Fact Sheets will be provided at motel accommodations, the Tourist Information Centre, the Museum, the Eromanga Hotel and Caravan Park to ensure distribution to all residents and visitors.

In an emergency situation, additional notification will occur through media outlets such as ABC Local Radio, the QSC website and the Council Facebook page.

Table 5-4 details the emergency contact details for and protocols to be followed when a particular emergency or incident occurs. It is essential for effective incident and emergency management that these contact details are maintained by the service provider in order to effectively manage these situations. All other contact details for incident and emergency management are included in Quilpie Shire Council's Local Disaster Management Plan.

Table 5-3 Incident / Emergency Levels

Incident / Emergency level	Description of level
Level 5	<ul style="list-style-type: none"> • Widespread outbreak of waterborne disease • Declared disaster • Supply unable to be maintained • Gross exceedances of ADWG health guideline values for a chemical parameter (> five times the ADWG health guideline limit).
Level 4	<ul style="list-style-type: none"> • High level of E. coli (> 5 CFU/ 100 mL) or any pathogens detected in reticulation • Failure of infrastructure (severe or emergency level supply restrictions required to ensure continuity of supply) • Major Cyber security breach resulting in interference of the operation of the water supply scheme.

Level 3	<ul style="list-style-type: none"> • Detection of 1-5 CFU/100 mL 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	<ul style="list-style-type: none"> • Failure of infrastructure or source supply (water quality or supply unlikely to be compromised) • Exceedances of ADWG aesthetic guideline or an irregular value pertaining to a parameter with no criterion (customer complaints possible) • Cyber security breach resulting in minor interference of the operation of the water supply scheme water supply scheme.
Level 1	<ul style="list-style-type: none"> • Exceedances of operational limit managed through operational and maintenance procedures

Table 5-4 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	Disaster levels - Implement Quilpie Shire Council Local Disaster Management Plan Report to Department of Natural Resources Mines and Energy (Water Supply Regulator) by phone and written incident report within 24 hours		
4	High level of E. coli (> 5 CFU/ 100 mL) or any pathogens detected in reticulation	<ol style="list-style-type: none"> 1. Alert Engineer and Chief Executive Officer 2. Determine potentially affected area, isolate if possible. Issue Boil Water alert. Escalate emergency further if situation worsens. 3. Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au 4. Resample for E. coli and disinfectant residual in potentially affected infrastructure 5. Undertake comprehensive contamination investigation 6. Undertake necessary corrective actions 7. Upon resolution, provide written report to regulator (Part 2 incident form) and Chief Executive Officer 8. Non-compliance will be raised and will require signing off by the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 1. Engineer 2. Engineer 3. Engineer 4. Engineer 5. Engineer 6. As appropriate 7. Engineer 8. Engineer / Chief Executive Officer

Level	Incident or Emergency	Summary of Actions to Be Taken (With Documented Procedure Listed)	Position/S Responsible for Action/S
4	Failure of infrastructure including significant cyber security breach where electronic water supply infrastructure operation could be compromised, such as security breach of SCADA systems. (severe or emergency level supply restrictions required to ensure continuity of supply)	<ol style="list-style-type: none"> 1. Alert Engineer and Chief Executive Officer. Notify IT support services/infrastructure providers where major cyber security breach has occurred. 2. Determine reason for failure, isolate if possible. Consider options to recommence supply. 3. Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au 4. Undertake comprehensive failure investigation 5. Undertake necessary corrective actions to recommence supply and provide an estimate of when the supply can be recommenced 6. Implement severe or emergency level supply restrictions. Consider escalating to a Level 1 incident. Notify the public. 7. Upon resolution, provide written report to regulator (Part 2 incident form). Provide written report to the Chief Executive Officer 8. Non-compliance will be raised and will require signing off by the Engineer and the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 1. Engineer 2. Engineer 3. Engineer 4. Engineer 5. As appropriate 6. Engineer / Chief Executive Officer 7. Engineer 8. Engineer / Chief Executive Officer

Level	Incident or Emergency	Summary of Actions to Be Taken (With Documented Procedure Listed)	Position/S Responsible for Action/S
3	Detection of 1-5 CFU/100mL E.coli in reticulation	<ol style="list-style-type: none"> 1. Alert Engineer and Chief Executive Officer 2. Determine potentially affected area, isolate if possible. Consider Boil Water alert. Escalate emergency further if situation worsens. 3. Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au 4. Resample for E. coli and disinfectant residual in potentially affected infrastructure 5. Undertake comprehensive contamination investigation 6. Undertake necessary corrective actions 7. Upon resolution, provide written report to regulator (Part 2 incident form) 8. Non-compliance will be raised and will require signing off by the Engineer and the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 1. Engineer 2. Engineer 3. Engineer 4. Engineer 5. Engineer 6. As appropriate 7. Engineer 8. Engineer / Chief Executive Officer

Level	Incident or Emergency	Summary of Actions to Be Taken (With Documented Procedure Listed)	Position/S Responsible for Action/S
3	Minor exceedances of ADWG health guideline value for chemical parameter (determined value is close to guideline value).	<ol style="list-style-type: none"> 1. Alert Engineer and Chief Executive Officer 2. Determine potentially affected area, isolate if possible (i.e. individual bore). Consider Water alert. Escalate emergency further if situation worsens. 3. Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au 4. Resample for detected health parameter for all bores and combined bores (if possible) 5. Undertake comprehensive contamination investigation 6. Undertake necessary corrective actions 7. Upon resolution, provide written report to regulator (Part 2 incident form). Provide Report to Chief Executive Officer also. 8. Non-compliance will be raised and will require signing off by the Engineer and the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 1. Engineer 2. Engineer 3. Engineer 4. Engineer 5. Engineer 6. Engineer 7. Engineer 8. Engineer / Chief Executive Officer

Level	Incident or Emergency	Summary of Actions to Be Taken (With Documented Procedure Listed)	Position/S Responsible for Action/S
3	Failure of infrastructure (ability to supply water compromised – short term water restrictions may be required)	<ol style="list-style-type: none"> 1. Alert Chief Executive Officer, Notify IT support services/infrastructure providers of cyber security breach. 2. Determine reason for failure, isolate if possible. Consider options to recommence supply. 3. Undertake comprehensive failure investigation 	<ol style="list-style-type: none"> 1. Water Officer 2. Water Officer 3. Water Officer
3	Failure of infrastructure or source supply or minor cyber security breach such as computer virus or security breach on council server. (water quality or supply unlikely to be compromised)	<ol style="list-style-type: none"> 4. Report details to the Water Supply Regulator, Drinking Water Quality Incident Hotline - phone 1300 596 709 within 3 hours and Notify the Water Supply Regulator by Initial notification form within 24hours - drinkingwater.reporting@dnrme.qld.gov.au 5. Undertake necessary corrective actions to recommence supply and provide an estimate of when the supply can be recommenced 6. Implement Short Term Water restrictions if required 7. Provide written report to the Chief Executive Officer 8. Non-compliance to be raised and will require signing off by the Water Officer and the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 4. As appropriate 5. Water Officer 6. Water Officer 7. Water Officer / Chief Executive Officer
2	Exceedances of ADWG aesthetic guideline or an irregular value pertaining to a parameter with no criterion (customer complaints possible).	<ol style="list-style-type: none"> 1. Alert Engineer and Chief Executive Officer 2. Determine potentially affected area, isolate if possible (i.e. individual bore). Consider Water alert. 3. Resample for detected parameter for all bores and combined bores (if possible). 4. Undertake contamination investigation 5. Undertake necessary corrective actions 	<ol style="list-style-type: none"> 1. Engineer 2. Engineer 3. Engineer 4. Engineer 5. Engineer

Level	Incident or Emergency	Summary of Actions to Be Taken (With Documented Procedure Listed)	Position/S Responsible for Action/S
1	Exceedances of operational limit managed through operational and maintenance procedures	<ol style="list-style-type: none"> 1. Alert Engineer and Chief Executive Officer 2. Review operational procedures. 3. Rectify exceedance and bring parameter within operational limits. Parameter shall be corrected same day. 4. Non-compliance to be raised and will require signing off by the Engineer and the Chief Executive Officer after corrective actions have taken place. 	<ol style="list-style-type: none"> 1. Engineer 2. Engineer 3. Engineer 4. Engineer / Chief Executive Officer

****Note – QSC operational monitoring methodologies do not quantify the number of CFU/100mL E.coli in initial testing but undertake a presence or absence test to determine its presence. If E. coli is present, follow up tests are conducted to determine quantities present.***

Table 5-5 Community Notification Protocols

Level	Incident or Emergency	Communication process to customers
5	Disaster levels	Implement Quilpie Shire Council Local Disaster Management Plan
4	High level of E. coli (> 5 CFU/ 100 mL) or any pathogens detected in reticulation	Issue Boil Water Alert to sensitive users directly by phone and email
		Issue Boil Water Alert to community through, Council Facebook page, Email notification distribution list, door knocking if required
	Failure of infrastructure (severe or emergency level supply restrictions required to ensure continuity of supply)	Notify sensitive users directly by phone and email
		Notify Community through Council Facebook page, Email notification distribution list,
3	Detection of 1-5 CFU/100mL E.coli in reticulation	Notify sensitive users directly by phone and email
		Consider boil water alert and issue to community in accordance with level 4 above
	Minor exceedance of ADWG health guideline	Notify sensitive users directly by phone and email
	Failure of infrastructure (ability to supply water compromised – short term water restrictions may be required)	Notify sensitive users directly by phone and email
2	Failure of infrastructure or source supply (water quality or supply unlikely to be compromised)	Community notifications not required
	Exceedances of ADWG aesthetic guideline or an irregular value pertaining to a parameter with no criterion (customer complaints possible)	
1	Exceedance of operational limit managed through operational and maintenance procedures	

Table 5-6 DWSP Sensitive Users

Sensitive Users	Address	Phone	Email
Quilpie Hospital	30 Gyrica St, Quilpie, QLD 4480	P: (07) 4656 0100	Swhhs- quilpie_admin@health.qld.gov.au
Mulga Mates Centre (Quilpie Kindergarten)	68 Winchu St, Quilpie QLD 4480	P: (07) 4656 1182	quilpiekindergarten@bigpond.com
St Finbarr's School Quilpie	Jabiru St, Quilpie QLD 4480	P: (07) 4656 1412	quilpie@twb.catholic.edu.au
Quilpie State College	Chulungra St, Quilpie QLD 4480	P: (07) 4656 0333	admin@quilpiesc.eq.edu.au
Gyrica Gardens (aged pensioners units) Contact: Lisa Hamlyn Corporate Services QSC	Units 9-21 Gyrica St, Quilpie, QLD 4480	P: (07) 4656 0500	dceo@quilpie.qld.gov.au

5.3 Risk Management Improvement Program

Unacceptable residual risks or risks identified in the plan have been included in the Risk Management Improvement Program (RMIP) below for Quilpie in 5.3.1 and Eromanga in 5.3.2 below.

The RMIP also includes for improvements to parts of the plan where deficiencies in information or uncertainties exist. Priorities of the improvements and target dates for completion have also been included.

5.3.1 Quilpie RMIP

Table 5-7 below outlines the proposed RMIP to be implemented for Quilpie.

Table 5-7 Quilpie Risk Management Improvement Program

Comments/ Proposed Further Risk Reduction Actions	Scheme Component / Sub-component	Hazardous Event	Priority	Action(s)			Estimated Cost (\$)	Target date/s	Responsibility
				Interim	Short-term	Long-term			
Q1. Construct new water supply bore	Sourcing Infrastructure	Bore Failure	Medium	Contract awarded	Construct additional artesian bore	Construct additional artesian bore	650,000.00	Dec-20	Overall Responsibility - CEO
Q2. Update O & M Procedures address microbial contamination risks for maintenance and repair of water mains	Sourcing Infrastructure Distribution System Whole of System	Maintenance and repair of water main	High	N/A	Completion of updated procedures	N/A	5,000.00	Dec-20	
Q3. Undertake a temperature monitoring program for the reticulation system to determine if temperatures are reducing the risk of pathogen presence	Sourcing Infrastructure Distribution System	Maintenance and repair of water main	High	N/A	Undertake water temperature analysis project	N/A	20,000.00	Dec-20	
Q4. Reduce contamination risks at standpipe locations. Install backflow prevention protection and improved hose storage system	Distribution System	Accidental or intentional contamination	High	N/A	install non-return valve and hose coil	N/A	10,000.00	Dec-20	
Q5. Monitoring data and documentation consolidated and managed centrally	Whole of System	Poor information management	High	N/A	Consolidate water quality data	N/A	10,000	Jun-21	
Q6. Upgrade water testing facilities. Provide dedicated testing facility to ensure hygienic conditions for water testing	Whole of System	Contamination of water samples	High	Undertake project planning and investigations	Set up water testing laboratory in Quilpie	N/A	30,000.00	Dec-20	

5.3.2 **Eromanga RMIP**

Table 5-10 below outlines the proposed RMIP to be implemented for Eromanga.

Table 5-8 Eromanga Risk Management Improvement Program

Comments/ Proposed Further Risk Reduction Actions	Scheme Component/ Sub-component	Hazardous Event	Priority	Action(s)			Estimated Cost (\$)	Target date/s	Responsibility
				Interim	Short-term	Long-term			
E1. Undertake bore water quality investigation to assess risk of water pathogens in sub artesian water.	Catchment Sourcing Infrastructure	Sewage system discharges, agricultural run-off Flood Event Accidental or intentional contamination	High	Project planning and budgeting	Undertake testing program to identify potential hazards associated with water quality at individual bores.	N/A	40,000.00	Jun-21	Overall Responsibility - CEO
E2. Update O & M Procedures address microbial contamination risks for maintenance and repair of water mains	Sourcing Infrastructure Distribution System	Reticulation maintenance and repair	High	N/A	Completion of updated procedures.	N/A	10,000.00	Dec-20	
E 3. Engage water treatment specialist/s to undertake system review, Undertake critical maintenance, & develop detailed and succinct Plant Operational and Maintenance Procedures.	Treatment Plant Whole of System	Equipment failure Lack of human resources	High	Project planning	Engage Specialist to undertake review of plant system and implement improvements, develop plant operating procedures.	N/A	100,000.00	Jun-21	
E4. Trend pre and post pressures of media and RO pressure gauges to ascertain safe operating parameters.	Treatment Plant	Head loss build up to media filters and RO membranes	High	N/A	Trend existing treatment plant data, continue to monitor and analyse trends	N/A	10,000.00	Jun-21	
E.5 Investigate and modify chlorine storage and deliver system to avoid chemical degradation and gassing	Disinfection Process (Sodium Hypochlorite)	Chlorine Storage conditions, chemical degradation and gassing	High	N/A	Assess options to avoid chlorine degradation and gassing in hot climate	N/A	15,000.00	Jun-21	
E6. Caravan septic disposal point in the vicinity of Town hall bore to be concreted and bunded.	Distribution System	Accidental or intentional contamination	High	Project planning and budgeting	Bund septic disposal point to reduce risk of contamination	N/A	25,000.00	Jun-21	
E7. Monitoring data and documentation consolidated and managed centrally	Whole of System	Poor information management	High	N/A	Consolidate water quality data	N/A	10,000	Jun-21	
E7. Upgrade water testing facilities. Provide dedicated testing lab to ensure hygienic conditions for water testing	Whole of System	Contamination of water samples	High	Project planning and budgeting	Set up water testing laboratory in Quilpie	N/A	50,000.00	Dec-20	

6 OPERATIONAL AND VERIFICATION MONITORING PROGRAMS

Details of the operational monitoring programs are tabulated below for Quilpie in Table 6-1.

Details of the verification monitoring programs for Eromanga are tabulated in Table 6-3.

6.1 Operational Monitoring

Operational monitoring for Council's water supply schemes is tabulated in Table 6-1 and 6.2 below detailing monitoring locations, parameters measured, target and critical levels and actions to be taken in the event the levels are exceeded.

The persons responsible for operational monitoring include the Chief Executive Officer, Engineer and the Water Officer. The Water Officer is responsible for conducting operational monitoring.

The Water Officer will be required to log all maintenance issues in a monthly report and a copy of this shall be sent to the Engineer. While the Water Officer will be encouraged to maintain informal lines of communication, formal communications shall also be required so as to enable a means for improved record keeping. Maintenance monitoring shall include but not limited to visual inspections to ensure that access to bore sites is restricted.

Table 6-1 Quilpie Operational Monitoring

Location	Parameter	Associated Hazard	Sampling/ Assessment		Target limit	Monitoring Location	Action if target limit exceeded	Critical limit	Action if critical limit exceeded	Positions Responsible
			Frequency	Method						
Bores	Pressure	Bore pressure exceedance or blockage	Weekly	Visual	200-550kPa	Bore head works below pressure reducing valve	<ul style="list-style-type: none"> - Check pressure reducing valves - Replace valves if necessary - Check bore pressure 	785kPa	<ul style="list-style-type: none"> - Replace pressure reducing valve - Flush Bore - CCTV bore inspection 	Overall Responsibility Chief Executive Officer Implementation, review and actions: Engineer Operations: Water Officer
	Integrity	Microorganism ingress	Weekly	Visual	0 - E.coli detection	Water samples taken from distribution system (fortnightly) Testing to be conducted at bore head if bore integrity deemed to be compromised	<ul style="list-style-type: none"> - Record issues in maintenance log - Implement incident management process - Conduct E.coli testing if bore integrity is compromised and potential for infiltration is identified 	0 - E.coli detection	<ul style="list-style-type: none"> - Commission maintenance activities immediately - Implement incident management process 	
	Security	Unauthorised access	Weekly	Visual	N/A	Bore Head	<ul style="list-style-type: none"> - Record issues in maintenance log - Program maintenance 	N/A	<ul style="list-style-type: none"> - Record issues in maintenance log - Program maintenance - Repair security fence if required 	
Reticulation System	E.coli	Bacteria	Fortnightly	Colilert test	0 - E.coli detection	3 Sites on rotational basis Quilpie Hospital Quilpie Shire Office Quilpie Shire Depot John Waugh Park Bulloo Park Complex	<ul style="list-style-type: none"> - Implement incident management process - Isolate if possible - Boil water alert if necessary - Incident investigation and improvement actions implemented 	0 - E.coli detection	<ul style="list-style-type: none"> - Implement incident management process - Isolate if possible - Boil water alert if necessary - Incident investigation and improvement actions implemented 	
	Integrity	Microorganism infection	Opportunistically	Visual	N/A	All over	<ul style="list-style-type: none"> - Record issues in maintenance log - Program maintenance 	N/A	<ul style="list-style-type: none"> - Record issues in maintenance log - Program maintenance 	

Table 6-2 Eromanga Operational Monitoring

Location in System	Parameter	Associated Hazard	Sampling/Assessment		Target limit	Monitoring Location	Action if target limit exceeded	Critical limit	Action if critical limit exceeded	Positions Responsible
			Frequency	Method						
Bores	Integrity	Microorganism ingress	Weekly	Visual	0 - E.coli detection	Weekly bacteriological testing in reticulation	<ul style="list-style-type: none"> - Record issues in maintenance log - Implement incident management process - Conduct E.coli testing if bore integrity is compromised and potential for infiltration is identified 	0 - E.coli detection	<ul style="list-style-type: none"> - Commission maintenance activities immediately - Implement incident management process 	<p>Overall Responsibility Chief Executive Officer</p> <p>Implementation, review and actions: Engineer</p> <p>Operations: Water Officer</p>
	Security	Microorganism ingress	Weekly	Colilert testing	0 - E.coli detection	Weekly bacteriological testing in reticulation	<ul style="list-style-type: none"> - Implement incident management process - Conduct E.coli testing if bore integrity is compromised and potential for infiltration is identified 	0 - E.coli detection	<ul style="list-style-type: none"> - Implement incident management process - Conduct E.coli testing if bore integrity is compromised and potential for infiltration is identified 	
Raw Water Tanks	Volume (L)	Insufficient Tank Supply	Constant	Electronic Monitoring	95% raw water tank capacity	Pressure sensor raw water tank outlet	Stop Bore supply pumps until capacity reaches 90%	<p>Upper Critical Limit: 99%</p> <p>Lower Critical Limit: 15%</p>	<p>Upper Critical Limit</p> <ul style="list-style-type: none"> - Shutdown Bore supply pumps <p>Lower Critical Limit</p> <ul style="list-style-type: none"> - Shut down Media Filter Pumps <p>Engage Bore supply pumps</p>	
Treatment Plant	Antiscalant Dosing	Severe RO Plant Damage	Constant	Electronic Monitoring	0.28L/hr	Electronic dosage meter antiscalant tank	Adjust dosage pump speed as required	<0.28L/hr	<ul style="list-style-type: none"> - Shutdown RO plant to prevent damage - Check antiscalant tanks and replace if low capacity 	
	Media filtration pressure	Blinding of filter media	Weekly	Visual	To be determined	Pre and post media filter	N/A	To be determined	<ul style="list-style-type: none"> - If obvious pre-filter pressure differentials are occurring and automatic backwashes are not reducing pressures media should be replaced. 	
	RO Conductivity	Scaling / Aesthetics	Constant	Electronic Monitoring	<350µs/cm	Conductivity sensor prior to RO on butterfly valve & Blended water sensor post Ro membranes	- Clean/Replace RO membranes	>875µs/cm Blend Conductivity	<ul style="list-style-type: none"> - Reduce blend valve opening % - Check HMI faults page and conduct maintenance - Engage specialist if required 	
	RO pressure	Scaling of membranes	Constant	Electronic Monitoring	To be determined	Pressure valve prior to RO membranes and Post RO membranes	- Clean/Replace RO membranes	To be determined	<ul style="list-style-type: none"> - If obvious pre-membrane pressure differentials are occurring, cleaning or replacement of membranes required. - Engage specialist if required 	

Location in System	Parameter	Associated Hazard	Sampling/Assessment		Target limit	Monitoring Location	Action if target limit exceeded	Critical limit	Action if critical limit exceeded	Positions Responsible
			Frequency	Method						
	Free Chlorine	Pathogens	Weekly	Water sample Clean water tank monitoring equipment	0.5 - 0.2mg/L	Three locations on rotation: Clean water tank outlet Eromanga Pub Eromanga Hall Neil St Council House	Adjust dosage pump speed as required	Upper Critical Limit: >2.5mg/L Lower Critical Limit: <0.2mg/L	Upper Critical Limit <ul style="list-style-type: none"> - Reduce dosage pump speed - Top up supply with lower chlorine concentration - Engage disinfection specialist if required Lower Critical Limit <ul style="list-style-type: none"> - Check chlorine storage tank level - Increase dosage pump speed - Conduct E.coli test - Engage specialist if required - Issue boil water alert 	
Reticulation System	E.coli	Bacteria	Weekly	Colilert test	0 - E.coli detection	Three locations on rotation: Clean water tank outlet Eromanga Pub Eromanga Hall Neil St Council House	<ul style="list-style-type: none"> - Implement incident management process - Isolate if possible - Boil water alert if necessary Incident investigation and improvement actions implemented	0 - E.coli detection	<ul style="list-style-type: none"> - Implement incident management process - Isolate if possible - Boil water alert if necessary - Incident investigation and improvement actions implemented 	

6.2 Verification Monitoring

Table 6-3 below tabulates the parameters to be monitored, monitoring locations and frequency of monitoring for Quilpie and Eromanga schemes.

6.2.1 Quilpie and Eromanga Verification Monitoring

Quilpie have two deep artesian bores. In Quilpie bore water is supplied directly to reticulation without pumping, storage or disinfection.

Eromanga's water supply comes from four sub artesian bores; source water then goes through a reverse osmosis treatment process, chlorination and storage before distributed to residents.

For Quilpie and Eromanga schemes, microbial, physical and inorganics verification monitoring will be conducted at various points in the reticulation system. These points will include public buildings to facilitate access.

Data from verification monitoring shall be recorded in a master spread sheet which when each new analysis suite is added, trends will be automatically updated based on the date and each data set. The trends for each scheme and each parameter sampled are enclosed in section 0 above.

Refer to Appendix B for sampling locations. Locations were chosen in public facilities to allow for authorised access to sampling locations.

Table 6-3 Quilpie Verification Monitoring

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Frequency	Sampling Locations	Analysing Authority	Response to Exceedances
Microbial quality	E.coli	Nil detect	Bacteria	Quarterly	One site within distribution system on rotation: Quilpie Hospital Quilpie Shire Office Quilpie Shire Depot John Waugh Park Bulloo Park Complex One bore on rotation: No.1 & 2. Tap located at bore. Rotate testing each quarter to sample each bore twice annually.	QHFSS	Refer to incident management Plan
Physical	pH	pH 6.5–8.5	Hazard that arises from the natural geological processes in the aquifer.				
	Temperature	N/A					
	Colour	15 HU - Aesthetic					
	Turbidity	5 NTU - Aesthetic					
Inorganics	Chloride	250mg/L - Aesthetic					
	Iron	0.3mg/L - Aesthetic					
	Silica	80mg/L - Aesthetic					
	Sodium	180mg/L - Aesthetic					
	Manganese	0.5mg/L - Health					
	Fluoride	1.5mg/L - Health					
						Acceptable risk, continue to monitor for exceedances	
						Notify DNRME and complete incident reporting forms	

Table 6-4 Eromanga Verification Monitoring

Characteristic	Parameter	ADWG &/or Regulation Value	Associated Hazard	Frequency	Sampling Locations	Analysing Authority	Response to Exceedances
Microbial quality	E.coli	Nil detect	Bacteria	Quarterly	<p>Three samples in total - One sample from the clean water tank outlet</p> <p>One sample from the reticulation system from one of the following locations: Eromanga Pub Eromanga Hall Neal St House</p> <p>And one sample from the Town Bores, Rotate testing location each quarter to sample each bore annually.</p>	QHFSS	Refer to incident management Plan
Physical	pH	pH 6.5–8.5	Hazard that arises from the natural geological processes in the aquifer.				
	Temperature	N/A					
	Colour	15 HU - Aesthetic					
	Turbidity	5 NTU - Aesthetic					
Inorganics	Chloride	250mg/L - Aesthetic					Chlorination by-product
	Iron	0.3mg/l - Aesthetic					
	Sodium	180mg/l - Aesthetic					
	Silica	80mg/L - Aesthetic					
	Phosphate	N/A					
	Manganese	0.5mg/l - Health					
	Fluoride	1.5mg/l - Health					
	Nitrate	50mg/l -Health					
Trihalomethanes	25mg/l - Health						
Chlorate	N/A						
							Acceptable risk, continue to monitor for exceedances
							Notify DNRME and complete incident reporting forms

APPENDIX A
DRINKING WATER QUALITY MANAGEMENT PLAN APPROVAL APPLICATION

4. Relevant Documents


List below all supporting documentation attached to this application that form part of the DWQMP. Where a document applies to a specific scheme or schemes please state this (e.g. scheme name).

Document Name(s)	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

(If space provided is insufficient, additional information may be attached)

5. Declaration

I/we declare and warrant that I/we have all the necessary and appropriate authority on behalf of the drinking water service provider to declare the information in this approved form, including any attachments or supporting information provided, are true and accurate to the best of my/our knowledge.

Family name Burges	Given name(s) Dave
Position CEO	Signature 
	Date (dd/mm/yyyy) 27/8/2012
Family name	Given name(s)
Position	Signature
	Date (dd/mm/yyyy) / /

6. Submission

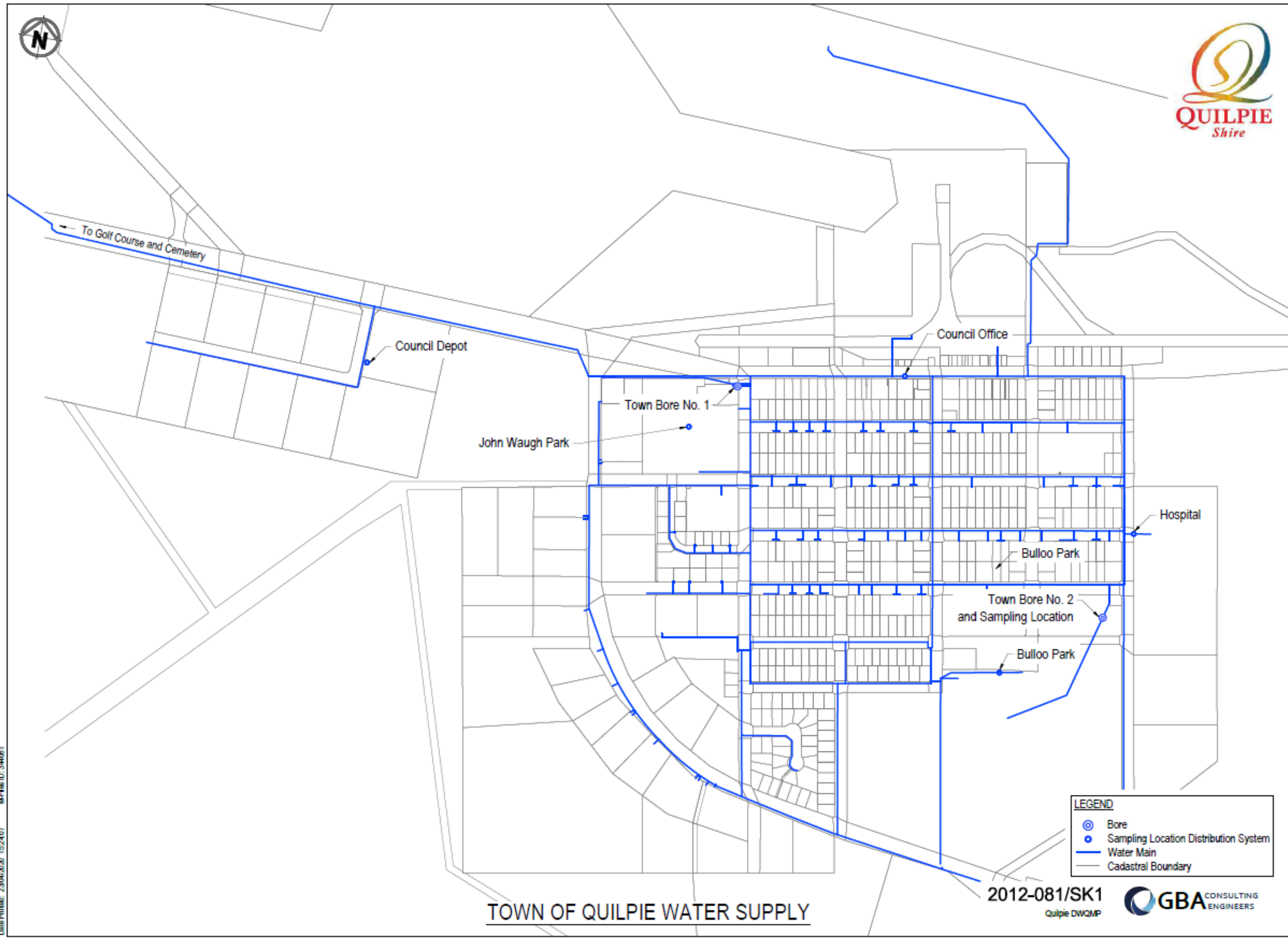
Please complete and sign the form and send one (1) printed copy of all relevant materials, along with all materials saved on to CD (or equivalent electronic device) to:

Director
Water Industry Asset Management and Standards
Office of the Water Supply Regulator
Department of Environment and Resource Management
GPO Box 2454
Brisbane Qld 4001

APPENDIX B
WATER SUPPLY LAYOUTS SUPERIMPOSED ON AERIAL PHOTOS

GBA-2012-081 Quilpie Water Supply Scheme

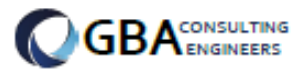
GBA-2000-109 Eromanga Water Supply Scheme

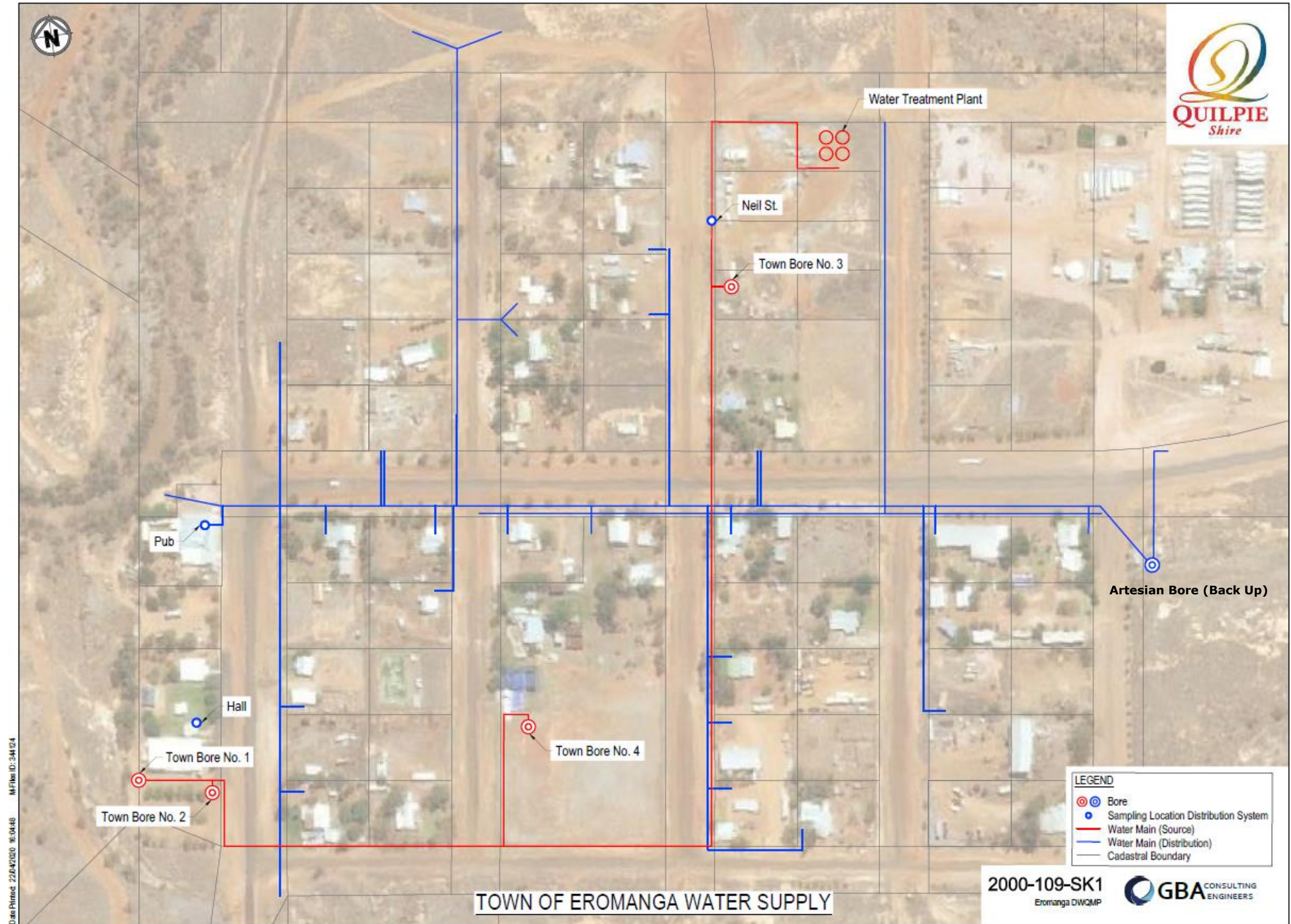


Date Printed: 23/04/2020 15:24:07 MFFile ID: 34081

TOWN OF QUILPIE WATER SUPPLY

2012-081/SK1
Quilpie DWQMP





Date Printed: 22/04/2020 9:04:48 MF: 100: 34124

TOWN OF EROMANGA WATER SUPPLY

2000-109-SK1
Eromanga DWQMP



LEGEND

- ⊙ Bore
- ⊙ Sampling Location Distribution System
- Water Main (Source)
- Water Main (Distribution)
- Cadastral Boundary

APPENDIX C
BORE WATER REPORT CARD

GROUNDWATER DATABASE

DATE 22/08/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 390

REGISTRATION DETAILS

OFFICE Charleville	BASIN 0112	LATITUDE 26-37-05	MAP-SCALE 254
DATE LOG RECD	SUB-AREA	LONGITUDE 144-15-44	MAP-SERIES M
D/O FILE NO. V17 0274	SHIRE 6150-QUILPIE	EASTING 227403	MAP-NO SG55-9
R/O FILE NO. 561333	LOT	NORTHING 7052931	MAP NAME EUILPIE
H/O FILE NO. L04841B	PLAN	ZONE 55	PROG SECTION
	ORIGINAL DESCRIPTION BORE RESERVE 20	ACCURACY	PRES EQUIPMENT
		GPS ACC	
GIS LAT -26.618182012	PARISH NAME 5162-WOORBIL		ORIGINAL BORE NO QUILPIE TOWN BORE
GIS LNG 144.26229913	COUNTY NICKAVILLA		BORE LINE -
CHECKED N	PROPERTY NAME		POLYGON
	FIELD LOCATION		RN OF BORE REPLACED
FACILITY TYPE AF	DATE DRILLED 07/10/1933		DATA OWNER
STATUS EX	DRILLERS NAME		CONFIDENTIAL
ROLES	DRILL COMPANY		
	METHOD OF CONST. CABLE TOOL		

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (m m)	SIZE DESC	OUTSIDE DIAM	TOP (m)	BOTTOM (m)
A	07/10/1933	1	Steel Casing (unspecified)		WT	254	0.00	66.40
A	07/10/1933	2	Steel Casing (unspecified)		WT	203	0.00	177.10
A	07/10/1933	3	Steel Casing (unspecified)		WT	152	0.00	899.80
A	07/10/1933	4	Perforated or Slotted Casing		AP		878.50	900.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	1.22	RED SOIL
2	1.22	38.10	ROCK
3	38.10	80.16	CLAY
4	80.16	96.93	SHALE
5	96.93	118.26	CLAY

GROUNDWATER DATABASE
BORE CARD REPORT - PUBLISHABLE

REG NUMBER 390

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
6	118.26	166.12	SHALE
7	166.12	289.56	CLAY WITH HARD STREAKS
8	289.56	449.58	SHALE WITH HARD STREAKS
9	449.58	452.63	SANDSTONE SAND
10	452.63	480.06	CLAY
11	480.06	601.37	SHALE
12	601.37	614.78	LIMESTONE SHALE
13	614.78	731.22	SHALE
14	731.22	734.57	SANDSTONE SAND
15	734.57	798.58	CLAY
16	798.58	801.62	SANDSTONE QUARTZ
17	801.62	841.25	CLAY AND SAND
18	841.25	852.53	SANDROCK
19	852.53	858.01	CLAY
20	858.01	873.25	SANDROCK
21	873.25	882.40	CLAY
22	882.40	899.77	SANDROCK, SANDSTONE

STRATIGRAPHY DETAILS

SOURCE	RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
DNR	1	0.00		ALLUVIUM
DNR	2		30.50	TERTIARY SEDIMENTS
DNR	3	30.50		WINTON FORMATION
DNR	4			MACKUNDA FORMATION
DNR	5		440.10	ALLARU MUDSTONE
DNR	6	440.10	449.60	TOOLEBUC FORMATION
DNR	7	449.60		COREENA MEMBER
DNR	8		731.20	DONCASTER MEMBER
DNR	9	731.20	749.80	WYANDRA SANDSTONE MEMBER
DNR	10	749.80	823.00	CADNA-OWIE FORMATION

GROUNDWATER DATABASE

DATE 22/08/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 390

SOURCE	RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
DNR	11	823.00	899.80	HOORAY SANDSTONE

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	27.40		SDST							PS	TERTIARY SEDIMEFORM
2	64.00		SHLE							FR	WINTON FORMATION
3	94.50		SHLE							FR	WINTON FORMATION
4	143.30		SHLE							FR	WINTON FORMATION
5	213.40		SHLE							FR	WINTON FORMATION
6	449.60		SDST							PS	COREENA MEMBER
7	731.50		SDST							PS	WYANDRA SANDSTONE MEMBER
8	824.50	826.60	SDST							PS	HOORAY SANDSTONE
9	843.10	852.50	SDST							PS	HOORAY SANDSTONE
10	861.10	873.30	SDST							PS	HOORAY SANDSTONE
11	885.40	886.90	SDST							PS	HOORAY SANDSTONE
12	890.00		SDST							PS	HOORAY SANDSTONE
13	893.10		SDST							PS	HOORAY SANDSTONE

PUMP TEST DETAILS PART 1
**** NO RECORDS FOUND ****

PUMP TEST DETAILS PART 2
**** NO RECORDS FOUND ****

BORE CONDITION

DATE	DRAIN DETAILS		HEADWORKS			LEAK	FLOW IRREGULARITY	PRECIPITATE	EST USE (ML/yr)	STOCK		COMMENT
	TOT LEN (km)	MAX C RUN D (km) N	RET LEN (km)	C D N	C T L					CATTLE	SHEEP	

GROUNDWATER DATABASE

DATE 22/08/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 390

14/11/1985

water distribution through town mains for domestic supply. Mains open ended and partial bore blow runs 2 drains to Paroo River on town common, requirements - remove and fit new headworks to eliminate lead packer, threaded gun metal flange and casing joint, rotted casing inside 254mm casing shroud. Cement 152.4mm to 203.2mm casing annulus. Incorporate in new headworks provision for connecting testing apparatus without disturbing town reticulation connecting gear.

08/10/1975

30/08/1960

29/08/1960

G P

Report on generator etc. on File 65.

Bore has only 4" discharge.

ELEVATION DETAILS

PIPE	DATE	ELEVATION	PRECISION	DATUM	MEASUREMENT POINT	SURVEY SOURCE
X	13/SEP/74	197.00	SVY	STD	N	

WATER ANALYSIS PART 1

PIPE	DATE	RD	ANALYST	QAN	DEPTH (m)	RMK	SRC	COND (uS/cm)	pH	Si (mg/L)	TOTAL IONS	TOTAL SOLIDS	HARD	ALK	FIG. OF MERIT	SAR	RAH
A	03/03/1976	1	GCL	066622		PU	GB	950	8.2		724.20	0.00	12	339	0.0	27.5	6.54
A	24/04/1981	1	GCL	089759		MA	GR	925	8.6	43	705.70	549.95	7	336	0.0	34.6	6.58
A	14/11/1985	1	GCL	112346	900.00	PU	GB	900	8.7	36	679.32	529.80	5	321	0.0	38.0	6.31
X	01/09/1986	1	GCL	115676	900.00	PU	GB	900	8.1	37	737.12	563.18	7	346	0.0	35.8	6.79
X	01/09/1986	2	GCL	115677	900.00	PU	GB	880	8.2	36	723.82	553.96	6	339	0.0	39.0	6.67

WATER ANALYSIS PART 2

PIPE	DATE	RD	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	03/03/1976	1	216.0	2.2	4.0	0.4		405.0		4.1	88.0	1.30		3.2				
A	24/04/1981	1	205.0	2.0	2.5	0.1		391.0		9.3	85.0	1.80	0.0	9.0				
A	14/11/1985	1	200.0	2.2	2.1	0.0	0.01	365.0	0.01	13.0	87.0	1.70	0.5	7.8				

GROUNDWATER DATABASE

DATE 22/08/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 390

PIPE	DATE	RD	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
X	01/09/1986	1	210.0	2.5	2.6	0.0	0.01	415.0	0.01	3.5	93.0	1.60	0.5	8.4				
X	01/09/1986	2	210.0	2.4	2.2	0.0	0.01	405.0	0.01	4.4	88.0	1.60	0.5	9.7				

WATER LEVEL DETAILS

PIPE	DATE	MEASURE	N/R	RMK	LOG	PIPE	DATE	MEASURE	N/R	RMK	LOG	PIPE	DATE	MEASURE	N/R	RMK	LOG
X	13/09/1974	85.80		N		X	20/11/1985	85.08		N				(m)			

WIRE LINE LOG DETAILS

DATE	RUN	OPERATOR	TYPE	SOURCE	TOP	BOTTOM	COMMENTS
03/08/2000	1	B ISBISTER	CALU	QUILPIE	249.91	253.61	
03/08/2000	2	B ISBISTER	CALU	QUILPIE	-1.47	901.43	
03/08/2000	1	B ISBISTER	GR	QUILPIE	49.02	901.52	
03/08/2000	2	B ISBISTER	GR	QUILPIE	-1.52	901.38	

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK	METH	SOURCE
A	07/10/1933				75.0					PU	GB
A	14/11/1938				75.0					PU	GB
A	29/10/1941				75.0					PU	GB
A	13/09/1948				75.0					PU	GB
A	29/08/1960				75.0					PU	GB
A	30/03/1965				73.0					PU	GB
A	08/10/1975				73.5						
A	12/05/1981				73.0					PU	GB
A	20/11/1985				75.0					PU	GB

SPECIAL WATER ANALYSIS

**** NO RECORDS FOUND ****

GROUNDWATER DATABASE
BORE CARD REPORT - PUBLISHABLE

REG NUMBER 390

VALIDATION LOG - PART 1

REGDET	CASING	STRLOG	AQUIFR	PUMTES	ELVDET	WLVDDET	FIELDQ
Y 26/11/1990	Y 26/11/1990	Y 20/11/2000	Y 26/11/1990	Y 26/11/1990	Y 26/11/1990	Y 26/11/1990	Y 26/11/1990

VALIDATION LOG - PART 2

WATANL	SAMPLE	STRTIG	WIRLOG	MULCND	BRCOND	FPREAD	GNOTES
Y 26/11/1990		Y 26/11/1990		Y 26/11/1990			

GENERAL NOTES

**** NO RECORDS FOUND ****

GROUNDWATER DATABASE

DATE 18/07/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 116266

REGISTRATION DETAILS

OFFICE Charleville	BASIN 0112	LATITUDE 26-37-05	MAP-SCALE 254
DATE LOG RECD 19/MAR/09	SUB-AREA	LONGITUDE 144-16-26	MAP-SERIES N
D/O FILE NO. V17 0274	SHIRE 6150-QUILPIE	EASTING 228555	MAP-NO SG55-9
R/O FILE NO.	LOT 3	NORTHING 7052981	MAP NAME QUILPIE
H/O FILE NO.	PLAN SP204518	ZONE 55	PROG SECTION
	ORIGINAL DESCRIPTION	ACCURACY GPS	PRES EQUIPMENT HW
		GPS ACC 3	
GIS LAT -26.61809	PARISH NAME 5162-WOORBIL		ORIGINAL BORE NO
GIS LNG 144.2737307	COUNTY NICKAVILLA		BORE LINE -
CHECKED Y	PROPERTY NAME		POLYGON
	FIELD LOCATION		RN OF BORE REPLACED
FACILITY TYPE AF	DATE DRILLED 07/03/2009		DATA OWNER
STATUS EX	DRILLERS NAME TAYLER, STEPHEN CHARLES		CONFIDENTIAL N
ROLES WS	DRILL COMPANY DALY BROS		
	METHOD OF CONST. MUD ROTARY		

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (m m)	SIZE DESC	OUTSIDE DIAM	TOP (m)	BOTTOM (m)
A	21/02/2009	1	Steel Casing (unspecified)	6.400	WT	219	0.00	156.00
A	21/02/2009	2	Grout			279	0.00	156.00
A	04/03/2009	3	Steel Casing (unspecified)	6.400	WT	168	0.00	817.00
A	05/03/2009	4	Grout			200	0.00	817.00
A	07/03/2009	5	Steel Casing (unspecified)	6.000	WT	141	809.30	966.30
A	07/03/2009	6	Perforated or Slotted Casing	3.000	AP	141	858.30	966.30

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	1.00	TOP SOIL
2	1.00	20.00	WHITE ROCK
3	20.00	61.00	GREY CLAY

GROUNDWATER DATABASE

DATE 18/07/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 116266

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
4	61.00	73.00	SDST
5	73.00	85.00	GREY CLAY
6	85.00	93.00	SDST
7	93.00	111.00	GREY SHALE
8	111.00	136.00	SHALE & SILTSTONE
9	136.00	143.00	GREY SHALE
10	143.00	870.00	SILTSTONE WITH SHALE LAYERS
11	870.00	904.00	WHITE MUDSTONE
12	904.00	914.00	SHALE & SDST LAYERS ****
13	914.00	930.00	SDST **** 45 L/SEC
14	930.00	960.00	SILTSTONE AND SDST LAYERS
15	960.00	966.30	SHALE WITH SILTSTONE

STRATIGRAPHY DETAILS

**** NO RECORDS FOUND ****

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	914.00	960.00	SDST	07/03/2009	79.70	Y	POTABLE		Y	PS	HOORAY SANDSTONE

PUMP TEST DETAILS PART 1

**** NO RECORDS FOUND ****

PUMP TEST DETAILS PART 2

**** NO RECORDS FOUND ****

BORE CONDITION

DATE	DRAIN DETAILS		HEADWORKS			LEAK	FLOW IRREGULARITY	PRECIPITATE	EST USE (ML/yr)	STOCK		COMMENT
	TOT LEN (km)	MAX C RUN D (km) N	RET LEN (km)	C D N	C T L					CATTLE	SHEEP	

GROUNDWATER DATABASE

DATE 18/07/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 116266

26/03/2008

G F

Town supply not hooked up when tested.

ELEVATION DETAILS

PIPE	DATE	ELEVATION	PRECISION	DATUM	MEASUREMENT POINT	SURVEY SOURCE
X	26/MAR/09	188.00	GPS	AHD	N	JOHN YOUNG

WATER ANALYSIS PART 1

PIPE	DATE	RD ANALYST	QAN	DEPTH (m)	RMK	SRC	COND (uS/cm)	pH	Si (mg/L)	TOTAL IONS	TOTAL SOLIDS	HARD	ALK	FIG. OF MERIT	SAR	RAH
A	26/03/2009	1 GCL	195495	914.00	PU	GB	778	8.6	43	621.00	488.00	6	296	0.0	32.0	5.80

WATER ANALYSIS PART 2

PIPE	DATE	RD	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	26/03/2009	1	184.0	2.9	2.4	0.1	< 0.01	345.0	< 0.01	7.9	72.0	1.90	< 0.5	4.6	< 0.01	< 0.05	0.27	< 0.03

WATER LEVEL DETAILS

**** NO RECORDS FOUND ****

WIRE LINE LOG DETAILS

**** NO RECORDS FOUND ****

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK	METH	SOURCE
A	26/03/2009	914.00	794	9.2	78.0					PU	GB

SPECIAL WATER ANALYSIS

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 1

REGDET	CASING	STRLOG	AQUIFR	PUMTES	ELVDET	WLVDet	FIELDQ
Y	27/03/2009						

DATE 18/07/2012

GROUNDWATER DATABASE
BORE CARD REPORT - PUBLISHABLE

Page 4 of 5

REG NUMBER 116266

WATANL	SAMPLE	STRTIG	<u>VALIDATION LOG - PART 2</u>		BRCOND	FPREAD	GNOTES
			WIRLOG	MULCND			

GENERAL NOTES
**** NO RECORDS FOUND ****

GROUNDWATER DATABASE

DATE 10/02/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 358

REGISTRATION DETAILS

OFFICE Charleville	BASIN 0031	LATITUDE 26-40-10	MAP-SCALE 254
DATE LOG RECD	SUB-AREA	LONGITUDE 143-16-22	MAP-SERIES M
D/O FILE NO. V17 0465	SHIRE 6150-QUILPIE	EASTING 726185	MAP-NO SG54-12
R/O FILE NO. 561133	LOT 8	NORTHING 7048162	MAP NAME EROMANGA
H/O FILE NO. L04841B	PLAN GO23	ZONE 54	PROG SECTION
	ORIGINAL DESCRIPTION EROMANGA TOWN	ACCURACY GPS	PRES EQUIPMENT
		GPS ACC 4	
GIS LAT -26.66938894	PARISH NAME 1782-EROUNGHOOLA		ORIGINAL BORE NO EROMANGA NO 2 BORE
GIS LNG 143.2727374	COUNTY GORDON		BORE LINE -
CHECKED Y	PROPERTY NAME		POLYGON
	FIELD LOCATION		RN OF BORE REPLACED
FACILITY TYPE AF	DATE DRILLED 03/03/1909		DATA OWNER
STATUS EX	DRILLERS NAME		CONFIDENTIAL
ROLES	DRILL COMPANY		
	METHOD OF CONST. CABLE TOOL		

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (m m)	SIZE DESC	OUTSIDE DIAM	TOP (m)	BOTTOM (m)
A	03/03/1909	1	Steel Casing (unspecified)		WT	203	0.00	89.30
A	03/03/1909	2	Steel Casing (unspecified)		WT	152	0.00	915.60
A	03/03/1909	3	Steel Casing (unspecified)		WT	127	0.00	1303.63
A	03/03/1909	4	Steel Casing (unspecified)		WT	254	0.00	13.10
A	03/03/1909	5	Perforated or Slotted Casing		AP		1276.20	1303.63
X	17/10/1985	1	Grout			190	1.50	7.80
X	22/11/1985	1	Grout			142	1.50	95.00
X	28/11/1985	1	Grout			304	0.00	1.50

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	13.11	CLAY AND COPIE

GROUNDWATER DATABASE

DATE 10/02/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 358

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
2	13.11	51.82	GRAVEL AND ROCK
3	51.82	65.53	CLAY
4	65.53	480.36	SHALE WITH HARD STREAKS OF LIMESTONE
5	480.36	587.65	SANDROCK SEAMS OF CLAY
6	587.65	932.69	SHALE AND LIMESTONE
7	932.69	1089.66	SHALE SAND SEAMS
8	1089.66	1149.10	SHALE WITH BANDS OF SANDROCK
9	1149.10	1207.01	SHALE
10	1207.01	1220.11	SHALE SANDROCK
11	1220.11	1275.89	SANDSTONE AND SHALE
12	1275.89	1286.26	SHALE WITH BARS SANDROCK
13	1286.26	1303.63	SANDROCK

STRATIGRAPHY DETAILS

SOURCE	RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
DNR	1	0.00		QUATERNARY ALLUVIUM
DNR	2			WINTON FORMATION
DNR	3			MACKUNDA FORMATION
DNR	4			ALLARU MUDSTONE
DNR	5			TOOLEBUC FORMATION
DNR	6			WALLUMBILLA FORMATION
DNR	7		1207.00	CADNA-OWIE FORMATION
DNR	8	1207.00	1303.63	HOORAY SANDSTONE

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	13.70		GRAV						N	UC	WINTON FORMATION
2	499.90		SDST						N	PS	MACKUNDA FORMATION
3	1213.10		SDST						N	PS	HOORAY SANDSTONE

GROUNDWATER DATABASE

DATE 10/02/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 358

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
4	1234.40		SDST						N	PS	HOORAY SANDSTONE
5	1260.30		SDST						N	PS	HOORAY SANDSTONE
6	1286.30		SDST						Y	PS	HOORAY SANDSTONE
7	1297.20		SDST						Y	PS	HOORAY SANDSTONE

PUMP TEST DETAILS PART 1

**** NO RECORDS FOUND ****

PUMP TEST DETAILS PART 2

**** NO RECORDS FOUND ****

BORE CONDITION

DATE	DRAIN DETAILS		HEADWORKS			FLOW IRREGULARITY	PRECIPITATE	EST USE (ML/yr)	STOCK		COMMENT
	TOT LEN (km)	MAX C RUN D (km) N	RET LEN (km)	C D N	C T L				LEAK	CATTLE	
16/11/1998											BORE SUPPLIES TOWN & 4KMOF DRAIN, 1 TROUGH, 1 TANK
08/10/2001	1.0	F	5.00	G	F			21.6	100		Bore supplies approximately 50 houses 10 businesses two stock route tanks and 1 earth tank. Headworks - 127mm riser fitted with 1x4hole flanges: 2x80 and 1x12mm couplings. Valves 1x100; 2x80mm gate valves and 1x12mm ball valve. 2x 20000gal tanks, 1km drains, stock 100 sheep & cattle. 80mm valve to town leaking when shut down.
29/09/2004	4.0			G	F			4	100		Bore supplies the town of Eromanga.

ELEVATION DETAILS

PIPE	DATE	ELEVATION	PRECISION	DATUM	MEASUREMENT POINT	SURVEY SOURCE
X	03/MAR/09	158.20	EST	STD	N	
X	10/MAR/08	147.00	GPS	AHD	N	JOHN YOUNG

GROUNDWATER DATABASE

DATE 10/02/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 358

WATER ANALYSIS PART 1

PIPE	DATE	RD	ANALYST	QAN	DEPTH (m)	RMK	SRC	COND (uS/cm)	pH	Si (mg/L)	TOTAL IONS	TOTAL SOLIDS	HARD	ALK	FIG. OF MERIT	SAR	RAH
A	04/02/1972	1	GCL	051587		PU	GB	2850	8.1		2686.30	1787.12	15	1451			28.69
A	16/11/1998	1	GCL	187012	1289.30	PU	GB	2720	8.7	58	2586.23	1812.24	14	1444	0.0	84.9	28.58
A	10/03/2008	1	GCL	195483	1286.00	PU	GB	2820	8.7	61	2620.00	1820.00	14	1470	0.0	84.0	29.00

WATER ANALYSIS PART 2

PIPE	DATE	RD	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	04/02/1972	1	754.0		6.0			1769.0			122.0	4.30		31.0				
A	16/11/1998	1	731.3	12.6	5.3	0.2	0.01	1636.6	0.01	61.4	107.8	3.55	0.0	27.4	0.16	0.04	3.70	0.01
A	10/03/2008	1	724.0	12.0	5.1	0.3	0.01	1680.0	0.01	55.0	108.0	3.70	< 2.5	30.0	< 0.01	< 0.05	3.60	< 0.03

WATER LEVEL DETAILS

**** NO RECORDS FOUND ****

WIRE LINE LOG DETAILS

DATE	RUN	OPERATOR	TYPE	SOURCE	TOP	BOTTOM	COMMENTS
30/07/2000	1	B ISBISTER	CALU	EROMANGA	941.73	950.93	
30/07/2000	2	B ISBISTER	CALU	EROMANGA	1298.5	1302	
31/07/2000	1	B ISBISTER	CALU	EROMANGA	1277.38	1296.28	
31/07/2000	2	B ISBISTER	CALU	EROMANGA	1194.65	1277.5	
31/07/2000	3	B ISBISTER	CALU	EROMANGA	595.8	601	
31/07/2000	1	B ISBISTER	GR	EROMANGA	.14	1301.84	
31/07/2000	2	B ISBISTER	GR	EROMANGA	-.13	1301.67	
01/08/2000	1	B ISBISTER	CALU	EROMANGA	999.16	1004.06	
01/08/2000	2	B ISBISTER	CALU	EROMANGA	.16	1301.91	

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK	METH	SOURCE
A	01/03/1909				92.0					PU	GB

GROUNDWATER DATABASE

DATE 10/02/2012

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 358

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	DO (mg/L)	Eh (mV)	ALK	METH	SOURCE
A	08/09/1929				91.0					PU	GB
A	12/04/1955				74.0					PU	GB
A	07/02/1964				86.0					PU	GB
A	04/02/1972				86.0					PU	GB
A	25/01/1977				46.0					PU	GB
A	16/11/1998		2800	7.4	91.0					PU	
A	08/10/2001	1303.60	3006	7.8	89.9					PU	GB
A	29/09/2004		3150	8.2	97.0					PU	GB
A	10/03/2008		2860	7.7	99.0					PU	GB

SPECIAL WATER ANALYSIS

**** NO RECORDS FOUND ****

VALIDATION LOG - PART 1

REGDET	CASING	STRLOG	AQUIFR	PUMTES	ELVDET	WLVDET	FIELDQ
Y 27/01/2005	Y 26/11/1990	Y 20/11/2000	Y 26/11/1990	Y 26/11/1990	Y 26/11/1990	Y 26/11/1990	Y 26/11/1990

VALIDATION LOG - PART 2

WATANL	SAMPLE	STRTIG	WIRLOG	MULCND	BRCND	FPREAD	GNOTES
Y 26/11/1990		Y 26/11/1990		Y 26/11/1990			

GENERAL NOTES

PIPE	DATE	REC	NOTES
A	01/11/2001	1	Phone 46561133 Quilpie Shire Engineer who will arrange to advertise shut down of bore. 1 weeks notice required. Plumber Al McNeil 04 2756 1198

GROUNDWATER DATABASE

DATE 23/11/2005

BORE CARD REPORT

REG NUMBER 116169

REGISTRATION DETAILS

OFFICE Charleville	BASIN 0112	LATITUDE 25-54-41	MAP-SCALE 254
DATE LOG RECD 18/OCT/05	SUB-AREA	LONGITUDE 144-36-12	MAP-SERIES N
D/O FILE NO. V17 0166	SHIRE 6150-QUILPIE	EASTING 259909	MAP-NO SG55-5
R/O FILE NO.	LOT 36	NORTHING 7133071	MAP NAME ADAVALE
H/O FILE NO.	PLAN MCK5320	ZONE 55	PROG SECTION
	ORIGINAL DESCRIPTION	ACCURACY GPS	PRES EQUIPMENT HW
		GPS ACC 3	
GIS LAT -25.9012315	PARISH NAME 23-ADVALE		ORIGINAL BORE NO ADAVALE TOWN BORE
GIS LNG 144.6035239	COUNTY MCKINLAY		BORE LINE -
CHECKED Y	PROPERTY NAME ADAVALE TOWN		
	FIELD LOCATION		POLYGON
FACILITY TYPE AF	DATE DRILLED 08/OCT/05		RN OF BORE REPLACE 305
STATUS EX	DRILLERS NAME DALY, KENNETH PATRICK		DATA OWNER
ROLES WS	DRILL COMPANY DALY BROS. PTY. LTD.		CONFIDENTIAL N
	METHOD OF CONST. MUD ROTARY		

LICENSE DETAILS

**** NO RECORDS FOUND ****

CASING DETAILS

PIPE	DATE	RECORD NUMBER	MATERIAL DESCRIPTION	MAT SIZE (mm)	SIZE DESC	OUTSIDE DIAM (mm)	TOP (m)	BOTTOM (m)
A	12/09/2005	1	Steel Casing (unspecified)	6.400	WT	219	0.00	192.50
A	12/09/2005	2	Grout			279	0.00	192.50
A	27/09/2005	3	Steel Casing (unspecified)	6.400	WT	168	0.00	1000.00
A	27/09/2005	4	Grout			200	0.00	1000.00
A	03/10/2005	5	Steel Casing (unspecified)	6.400	WT	141	992.00	1184.00
A	03/10/2005	6	Perforated or Slotted Casing	8.000	AP	141	1100.00	1184.00

STRATA LOG DETAILS

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
1	0.00	1.00	RED TOP SOIL

GROUNDWATER DATABASE

DATE 23/11/2005

BORE CARD REPORT

REG NUMBER 116169

RECORD NUMBER	STRATA TOP (m)	STRATA BOT (m)	STRATA DESCRIPTION
2	1.00	3.50	RED/YELLOW CLAY
3	3.50	10.60	YELLOW/GREY CLAY
4	10.60	13.60	GRAVEL
5	13.60	20.60	WHITE ROCK
6	20.60	22.60	YELLOW/WHITE & GREY CLAY
7	22.60	42.00	GREY CLAY
8	42.00	55.00	WHITE/GREY CLAY
9	55.00	57.00	LIGHT GREY CLAY
10	57.00	60.00	COAL
11	60.00	63.00	LIGHT GREY CLAY
12	63.00	109.00	GREY CLAY
13	109.00	372.00	GREY SHALE
14	372.00	373.00	WHITE ROCK
15	373.00	800.00	GREY SHALE
16	800.00	806.00	PUGGY SHALE
17	806.00	944.00	GREY SHALE
18	944.00	1037.00	DARK GREY SHALE WITH HARD & SOFT BAND
19	1037.00	1053.00	SANDSTONE
20	1053.00	1067.00	MUDSTONE WITH SHALE LAYERS
21	1067.00	1070.50	VERY HARD GREY SHALE
22	1070.00	1094.50	LIGHT GREY SILTSTONE
23	1094.50	1112.00	PUGGY GREY SHALE
24	1112.00	1184.00	SANDSTONE ***** 35L/SEC 675KPA

STRATIGRAPHY DETAILS
 **** NO RECORDS FOUND ****

AQUIFER DETAILS

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
1	0.00	373.00	CLAY						N	PS	WINTON FORMATION

GROUNDWATER DATABASE

DATE 23/11/2005

BORE CARD REPORT

REG NUMBER 116169

REC	TOP BED(M)	BOTTOM BED(M)	BED LITHOLOGY	DATE	SWL (m)	FLOW	QUALITY	YIELD (l/s)	CTR	CONDIT	FORMATION NAME
2	373.00	800.00	SHLE						N	PS	ALLARU MUDSTONE
3	800.00	1037.00	SHLE						N	PS	WALLUMBILLA FORMATION
4	1037.00	1053.00							N	SC	WYANDRA SANDSTONE MEMBER
5	1053.00	1112.00							N	SC	CADNA-OWIE FORMATION
6	1112.00	1184.00	SDST						Y	PS	HOORAY SANDSTONE

PUMP TEST DETAILS PART 1

PIPE	DATE	REC NO.	RN OF PUMP-BORE	TOP (m)	BOTTOM (m)	DIST (m)	METH	TEST TYPES	PUMP TYPE	SUCTION SET (m)	Q PRIOR TO TEST (l/s)	DUR OF TEST (min)	PRES ON ARRIV (m)	Q ON ARRIV (l/s)
A	18/10/2005	1	116169	1100.00	1184.00	0.70	ART	AC ST FR ST DT			0.00	10	70.51	3.00

PUMP TEST DETAILS PART 2

PIPE	DATE	REC	TEST DUR (mins)	SWL (m)	RECOV. TIME (mins)	RESID. DD (m)	MAX DD or P RED (m)	Q at MAX DD (l/s)	TIME TO MAX DD (mins)	Max Q (l/s)	CALC STAT HD (m)	DESIGN YIELD (l/s)	DESIGN BP (m)	SUCT. SET (m)	TMSY (m2/DAY)	STOR
A	18/10/2005	1	380	73.06	120		61.82	45.54	120	45.54	73.24				287	

BORE CONDITION

**** NO RECORDS FOUND ****

ELEVATION DETAILS

PIPE	DATE	ELEVATION	PRECISIO	DATUM	MEASUREMENT POINT	SURVEY SOURCE
X	18/OCT/05	229.00	M GPS	AHD	N	JOHN YOUNG

WATER ANALYSIS PART1

**** NO RECORDS FOUND ****

WATER ANALYSIS PART 2

**** NO RECORDS FOUND ****

BORE CARD REPORT

REG NUMBER 116169

WATER LEVEL DETAILS
**** NO RECORDS FOUND ****

WIRE LINE LOG DETAILS
**** NO RECORDS FOUND ****

FIELD MEASUREMENTS
**** NO RECORDS FOUND ****

SPECIAL WATER ANALYSIS
**** NO RECORDS FOUND ****

VALIDATION LOG - PART 1

REGDET	CASING	STRLOG	AQUIFR	PUMTES	ELVDET	WLVDET	FIELDQ
N	02/11/2005						

VALIDATION LOG - PART 2

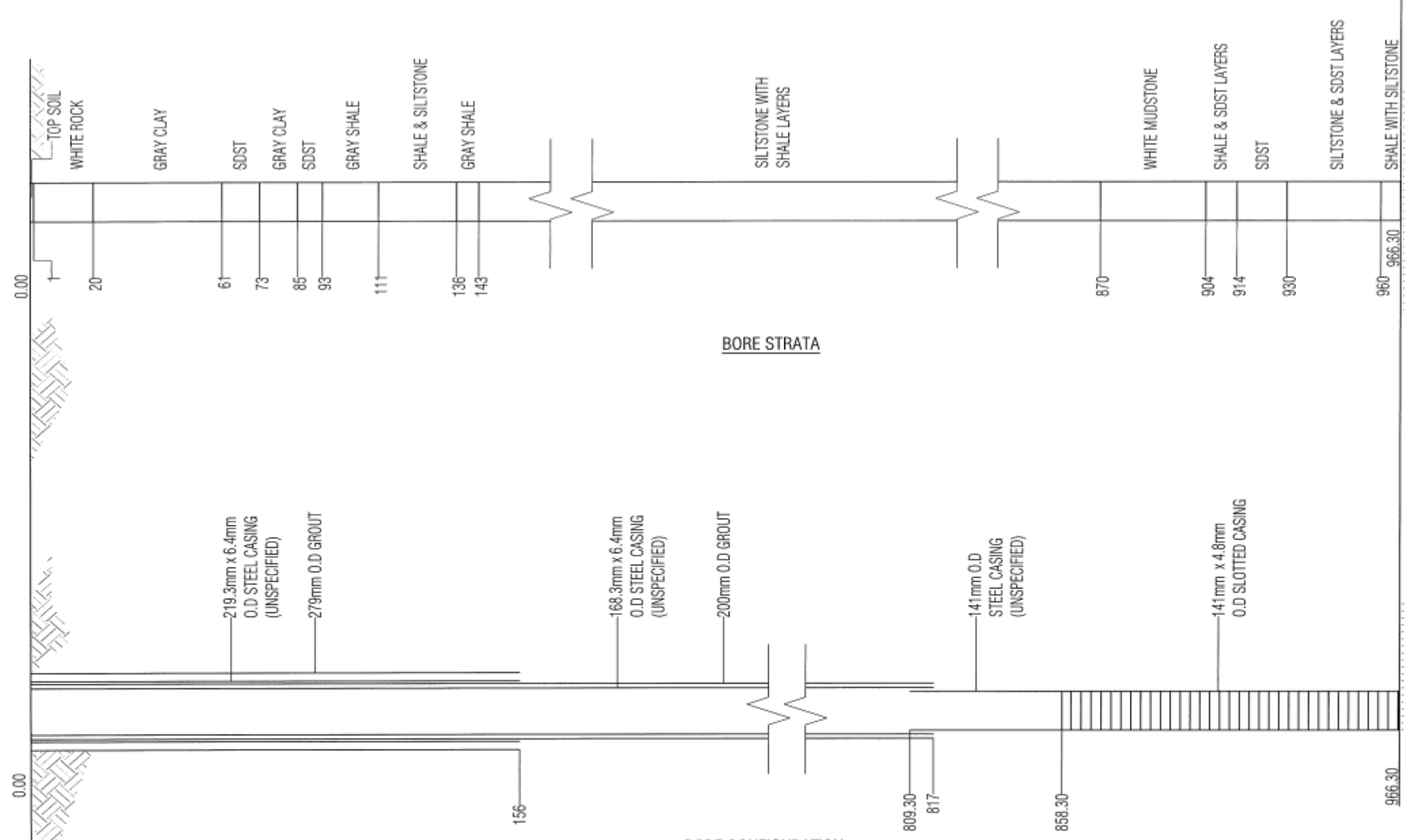
WATANL	SAMPLE	STRTIG	WIRLOG	MULCND	BRCND	FPREAD	GNOTES
--------	--------	--------	--------	--------	-------	--------	--------

GENERAL NOTES
**** NO RECORDS FOUND ****

METERED USE
**** NO RECORDS FOUND ****

** End of Report **

APPENDIX D
BORE CASING AND STRATA DETAILS



DATE DRILLED: 07/03/2009
 DRILLERS NAME: TAYLER, STEPHEN CHARLES
 DRILL COMPANY: DALY BROS
 METHOD OF CONST.: MUD ROTARY
 LOCATION - EASTING: 228555
 NORTHING: 7052981

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No.	Revision Description	By	Date	Survey:
A	ORIGINAL ISSUE	JC	27/08/2012	

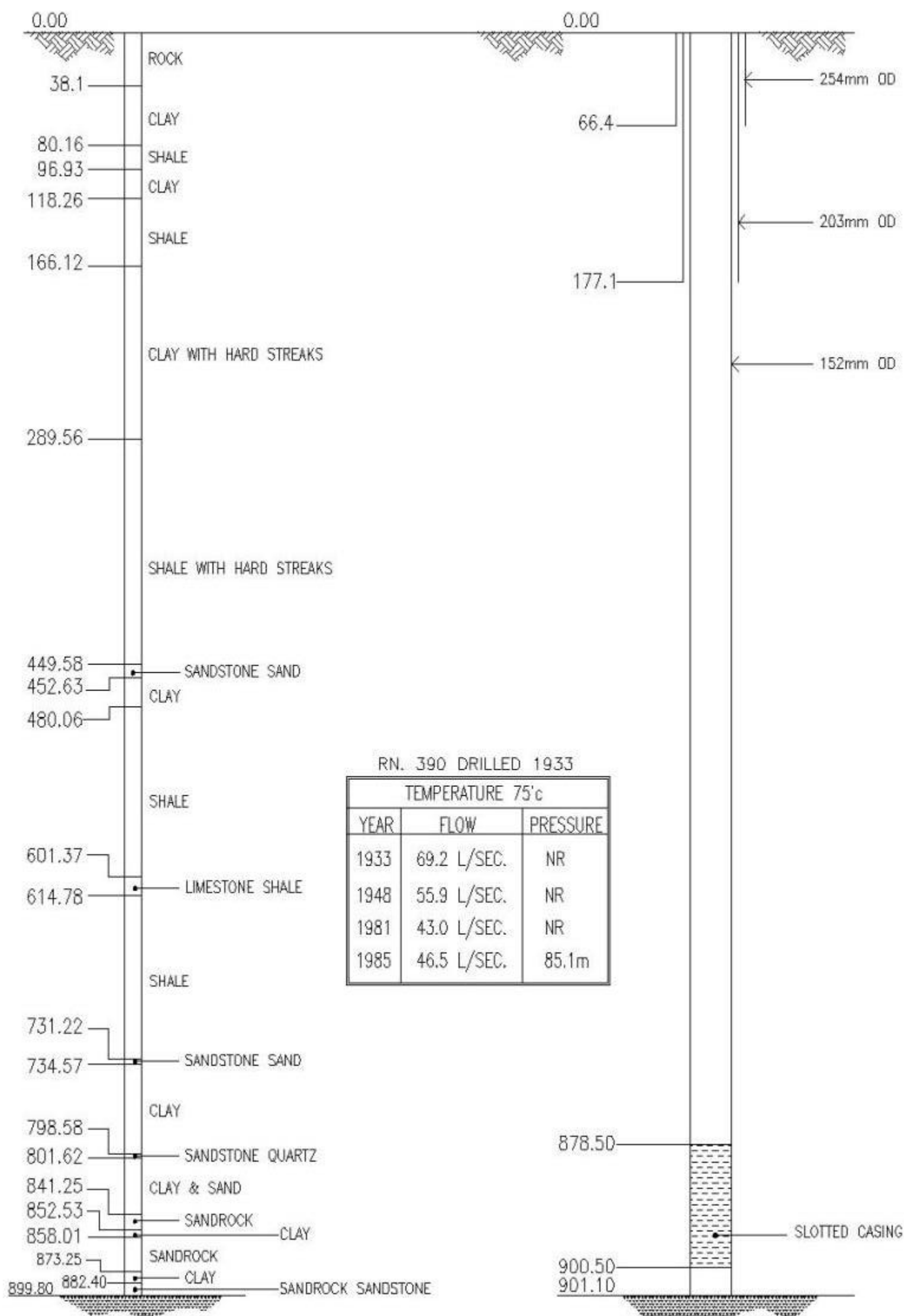
Drawn: JC
 Check: AF

GEORGE BOURNE & ASSOCIATES
 Consulting Civil Engineers
 Scale: AS SHOWN
 Approved: *[Signature]*
 SLJ Bourne 1513 RPEQ

QUILPIE SHIRE COUNCIL
 TOWN OF QUILPIE
 QUILPIE NEW BORE
 RN. 116266 DRILLED 2009
 PLAN LAYOUT

Job No.	11/16A	Rev.	
Drawing No.	2012-064/01		A
Category:	WATER		A3

ORIGINAL

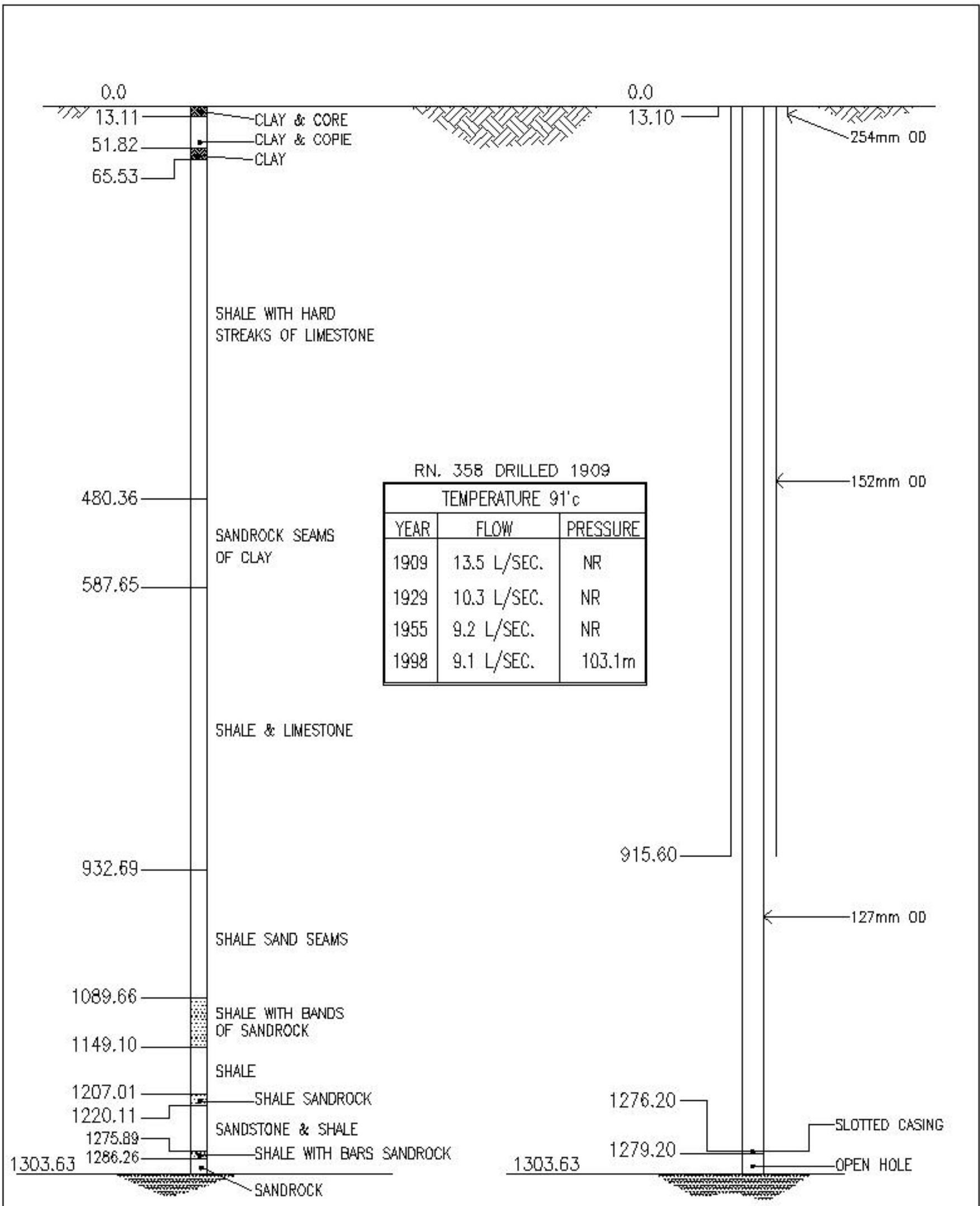


RN. 390 DRILLED 1933


TEMPERATURE 75°c		
YEAR	FLOW	PRESSURE
1933	69.2 L/SEC.	NR
1948	55.9 L/SEC.	NR
1981	43.0 L/SEC.	NR
1985	46.5 L/SEC.	85.1m

QUILPIE TOWN BORE

A	SLOTTED CASING DEPTH CHANGED	LLI	05/10/08	QUILPIE SHIRE COUNCIL		Job No.
Rev.		By	Date	Quilpie Town Bore		Dwg. No.
Sur.	GEORGE BOURNE & ASSOCIATES Consulting Civil Engineers			RN. 390 Drilled 1933		Rev.
Des.	Scale:	As 1:1	Approved:	Plan Layout		87-00/1 A
Drawn:	S. Bourne					Car. Water
Chk.	S. Bourne					A4



EROMANGA TOWN BORE

GEORGE BOURNE & ASSOCIATES CONSULTING CIVIL ENGINEERS		Assoc. Dwgs:	Size: A4	
Surv.	Approved:		QUILPIE SHIRE COUNCIL EROMANGA TOWN BORE RN. 358 DRILLED 1909	
Des.				Dwg No.
Draw. H.A 04/00	Scale:			86-00
Chk.				No. 1 of 1

APPENDIX E
ACKNOWLEDGEMENT OF NON-POTABLE WATER SUPPLIES (EROMANGA AND
ADAVALE)

File/Ref DWR/515/104(0400)

23 February 2010

Mr Carl Ninine
Chief Executive Officer
Quilpie Shire Council
P O Box 57
Quilpie QLD 4480

QUILPIE SHIRE COUNCIL 24 FEB 2010
ACTION <i>Angie - something in newsletter website</i>
FYI



**Queensland
Government**

Department of
Environment and Resource
Management

Dear Mr Ninine

Thank you for your letter to our Toowoomba office dated 25 September 2009 regarding Eromanga and Adavale water supplies and I apologise for the delay in responding.

The department acknowledges Council's advice that the above water supply schemes do not provide a drinking water service. On this basis, Council is not required to provide monitoring reports and to report drinking water quality parameter exceedences for Eromanga and Adavale water supply schemes as outlined in the *Drinking Water Service Provider Monitoring and Reporting Requirement Notice* and covering letter of 3 December 2008.

However you are advised that, as Council is providing a non-drinking water supply service, it has a duty of care to ensure action is taken to inform all residents and visitors of the public health limitations of the water supply.

To assist service providers, the department is preparing – in consultation with Queensland Health – information outlining the appropriate uses for non-drinking water and the measures that should be employed to establish and maintain an adequate level of community awareness regarding public safety when using such supplies.

Community awareness measures generally involve appropriate signage on publically accessible taps as well as periodic reminders to all households through mechanisms such as rate notices.

Once the information has been finalised, a copy will be forwarded to you. Should you have any further enquiries, please do not hesitate to contact Mr Ian Ryan, Principal Engineer - Western Queensland of the department on telephone 4688 1014.

Yours sincerely

**Russell Cuerel
Manager
Infrastructure Management
Water Industry Asset Management & Standards
Office of the Water Supply Regulator**

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GPO Box 2454, Brisbane
Queensland 4001 Australia
Telephone + 61 7 3247 0369
Facsimile + 61 7 3224 7999
Website www.derm.qld.gov.au

**APPENDIX F
WATER LICENCES**

Client Ref: 159339
File Ref: CHA/515/001(0274)2

3 March 2011

QUILPIE SHIRE COUNCIL
Attention to: CHIEF EXECUTIVE OFFICER
PO BOX 57
QUILPIE QLD 4480

QUILPIE SHIRE COUNCIL
7 MAR 2011
ACTION
VI Angie - always thought it was 630 mpa, but is 600



Queensland
Government

Department of
Environment and Resource
Management

Dear Sir/Madam

Application for Renewal of Water Licence: reference 00390E, application reference 529540

Attached is a Water Licence granted in accordance with the provisions of the *Water Act 2000*.

Please note that this Water Licence does not negate the requirement to obtain any other approvals or to enter into other statutory arrangements, such as those relating to Aboriginal cultural heritage, which may be required. In particular, the *Aboriginal Cultural Heritage Act 2003*, places a duty of care on anyone undertaking an activity to protect Aboriginal Cultural Heritage. Please refer to the attached information sheet for further information on this legislation.

If you have any further enquiries please call (07) 46881000.

Yours Sincerely

Margaret McClymont
Administration Officer

DEEDI / DERM Complex
203 Tor Street TOOWOOMBA
PO BOX 318
TOOWOOMBA 4350
Telephone +61 7 46881000
Facsimile +61 7 746881188
Website <http://www.derm.qld.gov.au/>

WATER LICENCE
Water Act 2000



Reference	00390E	Expiry Date	31/03/2021
Licensee	QUILPIE SHIRE COUNCIL		
Authorised Activity	The taking of underground water from the Warrego West 3 Management Unit (Great Artesian Basin) with the point of take under Lot 1 on Q68045 and Lot 1 on Q68042.		
Authorised Purpose	Urban		
Nominal Entitlement	600 Megalitres		

This water licence is subject to the conditions endorsed hereon or attached hereto.

Under the *Sustainable Planning Act 2009* a development permit may be required for operational works to take or interfere with the water described in this licence. The licensee must ensure that the relevant development approvals have been obtained prior to installing or constructing new or additional operational works.

Given at Charleville this **THIRD** day of **MARCH 2011**.

A handwritten signature in black ink, appearing to read "John Bradley".

John Bradley
Director-General
Department of Environment and Resource Management

Water Licence: 00390E
Expiry Date: 31/03/2021



Conditions: Schedule A

6.31

The water taken under this water licence must be reticulated by pipeline to tanks and troughs. The use of a bore drain or a system of bore drains to distribute any of the water taken is not permitted.

Water Licence: 00390E
Expiry Date: 31/03/2021



Conditions: Schedule B

Spec 1

The supply of water from this bore shall be controlled to the satisfaction of the chief executive, by valves and piping to the town reticulation system and shall not be permitted to flow outside that system.

Client Ref: 159339
File Ref: CHA/515/001(0465)2



9 September 2011

Department of
Environment and Resource
Management

QUILPIE SHIRE COUNCIL
Attention to: CHIEF EXECUTIVE OFFICER
PO BOX 57
QUILPIE QLD 4480

Dear Sir/Madam

Application for Renewal of Water Licence: reference 00358E, application reference 537003

Attached is a Water Licence granted in accordance with the provisions of the *Water Act 2000*.

Please note that this Water Licence does not negate the requirement to obtain any other approvals or to enter into other statutory arrangements, such as those relating to Aboriginal and Torres Strait Islander cultural heritage, which may be required. In particular, the *Aboriginal Cultural Heritage Act 2003* and the *Torres Strait Islander Cultural Heritage Act 2003*, places a duty of care on anyone undertaking an activity to protect Aboriginal and Torres Strait Islander Cultural Heritage. Please refer to the attached information sheet for further information on this legislation.

If you have any further enquiries please call (07) 46881000.

Yours Sincerely

A handwritten signature in black ink, appearing to read "V. Marsh".

Vanessa Marsh
Administration Officer

QUILPIE SHIRE COUNCIL
1-4 SEP 2011
ACTION ANGIE
FYI

DEEDI / DERM Complex
203 Tor Street TOOWOOMBA
PO BOX 318
TOOWOOMBA 4350
Telephone +61 7 46881000
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Website <http://www.derm.qld.gov.au/>

WATER LICENCE
Water Act 2000



Reference	00358E	Expiry Date	30/09/2021
Licensee	QUILPIE SHIRE COUNCIL		
Authorised Activity	The taking of underground water from the Warrego West 3 Management Unit (Great Artesian Basin) with the point of take under Lot 8 on GO23.		
Authorised Purpose	Stock and Urban		
Description of Land	Attached to the land described as Lot 8 on GO23.		
Nominal Entitlement	70 Megalitres		

This water licence is subject to the conditions endorsed hereon or attached hereto.

Under the *Sustainable Planning Act 2009* a development permit may be required for operational works to take or interfere with the water described in this licence. The licensee must ensure that the relevant development approvals have been obtained prior to installing or constructing new or additional operational works.

Given at Charleville this NINTH day of SEPTEMBER 2011.

A handwritten signature in black ink, appearing to read "Jim Reeves".

Jim Reeves
Director-General
Department of Environment and Resource Management

Water Licence: 00358E
Expiry Date: 30/09/2021



Conditions: Schedule B

SPEC 01 The supply of water from this bore shall be controlled to the satisfaction of the chief executive, by valves and piping to the town reticulation system and shall not be permitted to flow outside that system.

Client Ref: 159339
File Ref: CHA/515/001(0166)



18 November 2010

Department of
**Environment and Resource
Management**

QUILPIE SHIRE COUNCIL
Attention to: CHIEF EXECUTIVE OFFICER
PO BOX 57
QUILPIE QLD 4480

Dear Sir/Madam

Grant of a water licence to replace an authority : reference 603804

Attached is an information notice which is advice of the decision and the reasons for the decision for the abovementioned granting of a water licence under a plan or declaration process in accordance with section 1037 of the *Water Act 2000*, which replaces a continuing authority under this Act.

If you have any further enquiries please call (07) 46881000.

Yours Sincerely

A handwritten signature in black ink, appearing to read "Teresa Lever".

Teresa Lever
Technical Officer

QUILPIE SHIRE COUNCIL
23 NOV 2010
ACTION
FYI Angie

DEEDI / DERM Complex
203 Tor Street TOOWOOMBA
PO BOX 318
TOOWOOMBA QLD 4350
Telephone +61 7 46881000
Facsimile +61 7 746881188
Website <http://www.derm.qld.gov.au/>

WATER LICENCE
Water Act 2000



Reference	603804	Expiry Date	31/10/2020
Licensee	QUILPIE SHIRE COUNCIL		
Authorised Activity	The taking of underground water from the Warrego West 3 Management Unit (Great Artesian Basin) with the point of take under Lot 33 on A2455 and Lot 36 on MCK5320. Township of ADAVALE.		
Authorised Purpose	Town Water Supply		
Nominal Entitlement	200 Megalitres		

This water licence is subject to the conditions endorsed hereon or attached hereto.

Under the *Sustainable Planning Act 2009* a development permit may be required for operational works to take or interfere with the water described in this licence. The licensee must ensure that the relevant development approvals have been obtained prior to installing or constructing new or additional operational works.

Given at Charleville this EIGHTEENTH day of NOVEMBER 2010.



John Bradley
Director-General
Department of Environment and Resource Management

Water Licence: 603804
Expiry Date: 31/10/2020

Conditions: Schedule A

6.31

The water taken under this water licence must be reticulated by pipeline to tanks and troughs. The use of a bore drain or a system of bore drains to distribute any of the water taken is not permitted.

APPENDIX G
LOCAL DISASTER MANAGEMENT GROUP CONTACT DETAILS

Position Title	Organisation Name	Contact Details
QSC Mayor	Quilpie Shire Council	mayor@quilpie.qld.gov.au
QSC CEO	Quilpie Shire Council	ceo@quilpie.qld.gov.au
QSC Works Manager	Quilpie Shire Council	works@quilpie.qld.gov.au
QPS – Officer in Charge – Quilpie	Queensland Police Service	Buln Buln St, Quilpie QLD 4480
Area Director Scott Walsh	Emergency Management Qld	Scott.Walsh@dcs.qld.gov.au
Mike Castles	SES Local Controller QSC	whs@quilpie.qld.gov.au
Michael Thompson	SES Deputy Local Controller QSC	59 Jabiru St, Quilpie QLD 4480
Officer in Charge Chris Seng	Queensland Police Service - Adavale	Klugh St, Adavale QLD 4474
Robert Walker	SES Group Leaders QSC – Eromanga	Cranstoun, Eromanga QLD 4480
CAPTAIN	QFRS – Quilpie Fire Brigade	PO Box 108, Quilpie QLD 4480
	QAS – Quilpie	PO Box 27, Quilpie QLD 4480
Guy McPherson	Ergon Energy	Winchu St, Quilpie QLD 4480
DON	Queensland Health DON – Quilpie Hospital	PO Box 27, Quilpie QLD 4480
CEO	Murweh Shire Council	95-101 Alfred St, Charleville QLD 4470
CEO	Paroo Shire Council	49 Stockyard St, Cunnamulla QLD 4490s
CEO	Bulloo Shire Council	53 Dowling St, Thargomindah QLD 4492
CEO	Blackall-Tambo Regional Council	PO Box 21 <i>Blackall</i> QLD 4472.
District Disaster Coordinator	Charleville District Disaster Management Group	56 Alfred St, Charleville QLD 4470
Lyn Baxter	Quilpie Shire Council Library (Abridged version)	N/A
Station Master	QRail	Quilpie Rail Depot, Quilpie QLD 4480
Ralph Walker	SES Member – Eromanga	eromangacontracting@harbours at.com.au
Owen Cecil	SES Member - Eromanga	osweldingworks@yahoo.com.au
Mitch Field	Telstra Account Manager	Mitch.Field@team.telstra.com

Appendix H Typical water analysis for Eromanga Deep Artesian bore

DATE 10/02/2012

GROUNDWATER DATABASE

Page 4 of 64

BORE CARD REPORT - PUBLISHABLE

REG NUMBER 358

WATER ANALYSIS PART 1

PIPE	DATE	RDANALYST	QAN	DEPTH (m)	RMK	SRC	COND (uS/cm)	pH	SI (mg/L)	TOTAL IONS	TOTAL SOLIDS	HARD	ALK	FIG. OF MERIT	SAR	RAH
A	04/02/1972	1 GCL	051587		FLJ	GB	2850	8.1		2586.30	1787.12	15	1451			28.69
A	16/11/1998	1 GCL	187012	1289.30	FLJ	GB	2720	8.7	58	2586.23	1812.24	14	1444	0.0	84.9	28.58
A	10/03/2008	1 GCL	195483	1286.00	FLJ	GB	2820	8.7	61	2620.00	1820.00	14	1470	0.0	84.0	29.00

WATER ANALYSIS PART 2

PIPE	DATE	RD	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	04/02/1972		754.0		6.0			1769.0			122.0	4.30		31.0				
A	16/11/1998		731.3	126	5.3	0.2	0.01	1636.6	0.01	614	107.8	35.5	0.0	27.4	0.16	0.04	3.70	0.01
A	10/03/2008		724.0	120	5.1	0.3	0.01	1680.0	0.01	55.0	108.0	3.70	2.5	30.0	< 0.01	< 0.05	3.60	< 0.03

WATER LEVEL DETAILS

-- NO RECORDS FOUND

WIRELINE LOG DETAILS

DATE	RUN	OPERATOR	TYPE	SOURCE	TOP	BOTTOM	COMMENTS
30/07/2000		BISBISTER	CALU	EROMANGA	941.73	950.93	
30/07/2000	2	BISBISTER	CALU	EROMANGA	1298.5	1302	
31/07/2000		BISBISTER	CALLU	EROMANGA	1277.38	1296.28	
31/07/2000	2	BISBISTER	CALLU	EROMANGA	1194.65	1277.5	
31/07/2000	3	BISBISTER	CALLU	EROMANGA	595.8	601	
31/07/2000		BISBISTER	GR	EROMANGA	.14	1301.84	
31/07/2000	2	BISBISTER	GR	EROMANGA	-.13	1301.67	
01/09/2000		BISBISTER	CALLU	EROMANGA	999.16	1004.06	
01/09/2000	2	BISBISTER	CALLU	EROMANGA	.16	1301.91	

FIELD MEASUREMENTS

PIPE	DATE	DEPTH (m)	COND (uS/cm)	pH	TEMP (C)	NO3 (mg/L)	OO (mg/l)	Eh (mV)	ALK	METH	SOURCE
A	01/03/1998			92.0						FLJ	GB