



Gladstone Area Water Board

Drinking Water Service

Annual Report 2022/23

CONTENTS

1 DOCUMENT STATUS	4
2 GLOSSARY OF TERMS.....	4
3 INTRODUCTION	5
3.1 REGISTERED SERVICE DETAILS	5
0BTABLE 1.1: WATER SERVICE PROVIDER INFORMATION FOR GLADSTONE AREA WATER BOARD	6
3.2 PURPOSE OF THIS REPORT	6
4 OVERVIEW OF OPERATIONS 2022/23.....	6
4.1 GLADSTONE WATER TREATMENT PLANT SCHEME	7
TABLE 1.2 – GWTP 2022/23 PERFORMANCE.....	8
4.2 YARWUN WATER TREATMENT PLANT SCHEME	9
TABLE 1.3 – YWTP 2022/23 PERFORMANCE	10
5 ACTIONS TAKEN TO IMPLEMENT THE DWQMP	11
6 IMPROVEMENT ACTIONS IDENTIFIED IN THE DWQMP	12
7 COMPLIANCE WITH WATER QUALITY CRITERIA FOR DRINKING WATER	16
TABLE 1.4 – WATER QUALITY CRITERIA AND SAMPLING	17
8 NOTIFICATIONS TO THE REGULATOR.....	19
9 CUSTOMER SATISFACTION	19
10 FINDINGS AND RECOMMENDATIONS OF THE DWQMP AUDITOR	20
11 OUTCOME OF THE REVIEW OF THE DWQMP	20
APPENDIX A – SUMMARY OF COMPLIANCE WITH WATER QUALITY CRITERIA.....	22
TABLE A1: VERIFICATION MONITORING RESULTS.....	22
TABLE A2 - RETICULATION E. COLI VERIFICATION MONITORING IN GLADSTONE WTP DISTRIBUTION. THIS INCLUDES THE WTP TREATED WATER, DISTRIBUTION NETWORK.....	30
TABLE A3 - RETICULATION E. COLI VERIFICATION MONITORING IN YARWUN WTP DISTRIBUTION.....	31

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1 DOCUMENT STATUS

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12/2023	V1	Annual drinking water quality information updated for 22/23. Issued for review and submission to DRDMW.	Craig Fox-Andrews		

2 GLOSSARY OF TERMS

Term	Description
WSSRA	Water Supply (Safety & Reliability) Act 2008
GAWB	Gladstone Area Water Board
GRC	Gladstone Regional Council
WSP	Water Service Provider
DRDMW	Department of Regional Development, Manufacturing and Water
DWQMP	Drinking Water Quality Management Plan
ADWG	Australian Drinking Water Guidelines (2011). Published by the National Health and Medical Research Council of Australia
GWTP	Gladstone Water Treatment Plant
WTP	Water Treatment Plant
YWTP	Yarwun Water Treatment Plant
DAF	Dissolved Air Flotation
CCP	Critical Control Point
SCADA	Supervisory Control and Data Acquisition
PLC	Programmable Logic Controller
<i>E. coli</i>	<i>Escherichia coli</i> , a bacterium which may indicate the presence of faecal contamination and therefore potential health risk
HACCP	Hazard Analysis and Critical Control Points assessment for protecting drinking water quality
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
MPN/100mL	Most probable number per 100 millilitres
CFU/100mL	Colony forming units per 100 millilitres
<	Less than
>	Greater than
OBS	Observation
Minor NC	Minor Non-Conformance

3 INTRODUCTION

This is the Gladstone Area Water Board's (GAWB) Drinking Water Service Annual Report for the financial year 2022/23. Under section 95 of the *Water Supply (Safety and Reliability) Act 2008* (WSSRA), GAWB, as a drinking water service provider (SPID200), must prepare a Drinking Water Quality Management Plan (DWQMP). The purpose of the DWQMP is to protect public health.

GAWB is also required to prepare a Drinking Water Service Annual Report to comply with the requirements of sections 141 and 142 of the WSSRA. The purpose of the report is to demonstrate to our customers, stakeholders, and the water supply regulator (the Director-General of the Department of Regional Development, Manufacturing and Water) that we have successfully implemented the approved DWQMP each financial year. The Report must be submitted to the regulator within 120 days from the end of the relevant financial year.

GAWB is the bulk water provider for the Gladstone region, supplying drinking water services to the Gladstone Regional Council (GRC) (for reticulation to the city of Gladstone, the towns of Calliope, Boyne Island, Tannum Sands, Benaraby and Mt Larcom), and to major industrial facilities located around Gladstone. GAWB also supplies a small number of domestic connections directly off the GAWB trunk mains.

Safe drinking water is essential to sustaining a healthy community. GAWB provides safe drinking water at a cost reasonable to the consumer. GAWB employs a multiple barrier system to ensure safe drinking water for its customers, using risk management methods consistent with the National Health and Medical Research Council's (NHMRC) Australian Drinking Water Guidelines 2011 (ADWG).

3.1 Registered Service Details

GAWB is a registered Water Service Provider (WSP) under the WSSRA, and is regulated by the Department of Regional Development, Manufacturing and Water (DRDMW). Powers under the WSSRA have been delegated to the officers of the relevant section of the department; DRDMW is the primary contact for communications regarding the DWQMP, including reporting requirements under the approval terms and conditions.

In addition, pursuant to section 1084 of the *Water Act 2000* (Water Act), GAWB is taken to be a Category 1 Water Authority from 1 July 2000 and is responsible to the Minister for Regional Development and Manufacturing and Minister for Water. GAWB operates as a commercialised statutory authority with the function of carrying out water activities and has a key objective to ensure its operations are as efficient as possible, with its prices being cost reflective. GAWB's WSP details are provided in Table 1.1 below.

Table 1.1: Water Service Provider information for Gladstone Area Water Board

Information Required	Details
SPID	200
Service Provider Name	Gladstone Area Water Board
Contact Details	PO Box 466 Gladstone QLD 4680 136 Goondoon St (p) 07 4976 3000 (fax) 07 4972 5632 www.gawb.qld.gov.au
Name of Schemes	Gladstone Water Treatment Plant Scheme Yarwun Water Treatment Plant Scheme

3.2 Purpose of this Report

The purpose of this report is to summarise the performance of GAWB against criteria detailed in its DWQMP. As per the regulator's reporting guidelines, this Report:

- Documents the actions undertaken by GAWB to implement the DWQMP.
- Summarises any non-compliances and incidents under section 102 and 102A of the WSSRA.
- Summarises the results of the verification water quality monitoring program undertaken by GAWB.
- Summarises customer satisfaction and GAWB's response to any complaints regarding drinking water quality.
- Summarises any reviews of the DWQMP.

4 OVERVIEW OF OPERATIONS 2022/23

GAWB operates two drinking water schemes, from which it provides bulk drinking water to the Gladstone Regional Council (GRC) for reticulation to domestic users and to various industrial customers.

The table below details GAWB's potable water customer connections of its two schemes as of 2022/23.

GAWB's current drinking water connection details

Customer	Number of Metered Connections
Gladstone WTP Scheme	
Boyne Smelters Limited	2
Gladstone Regional Council	10
Queensland Alumina Limited	2
APLNG	1
GLNG	1
QCLNG	1
Non-commercial connections	34
Yarwun WTP Scheme	
Cement Australia	2
Gladstone Regional Council	5
Jemena	1
Orica	3
Aurizon	2
WICET	2
Rio Tinto Aluminium Yarwun	2
Alpha HPA	1
TOTAL	69

4.1 Gladstone Water Treatment Plant Scheme

Drinking water supplied from the Gladstone scheme is treated at the Gladstone Water Treatment Plant (GWTP) and then distributed to GAWB's customers either directly off the mains or from the outlet of seven service reservoirs. Gladstone Water Treatment Plant (GWTP) services the requirements of the Gladstone Regional Council drinking water reticulation system for the City of Gladstone and surrounding townships (a population of about 63,515 – source, Australian Bureau of Statistics, Regional population (Rebased 2020-21 data to the 2021 Census was released on 26 July 2022), a number of industrial customers and 34 residential customers.

Treatment Process and Delivery Network

Gladstone Water Treatment Plant (GWTP) conventional water treatment process has a design capacity of 57 ML per day and consists of parallel up-flow clarification and Dissolved Air Flotation (DAF) processes which can be operated together or independently of one another.

The plant has six operating modes, allowing either or both plants to be run and the filters can be configured in such a way as to keep the process streams separate or run water from either or both plants over all filters. Direct filtration modes on the plant are disabled and can only be operated manually with direct management approval.

Once filtered, water is corrected for pH and disinfected with sodium hypochlorite in two clear water wells, after which the process streams rejoin, and the fully treated water enters the 2.25ML clear water contact tank.

During the 2022/23FY, GWTP produced approximately 8.98 gigalitres of drinking water, as can be seen in the table below. Average production was approximately less than half of the capacity of the plant, with maximum day approximately 61.9% of plant capacity. Water is delivered either directly to a number of GRC reservoirs, or into GAWBs distribution system, which includes a number of reservoirs and re-chlorination facilities.

Water quality

GAWB undertakes comprehensive operational and verification monitoring of water quality. The operational monitoring is concentrated around the quality of source water and the treatment process and includes daily measurements throughout the plant as well as online monitoring through the process and of re-chlorination facilities. There have been only minor changes to the operational monitoring program since development of the DWQMP.

Filter operation is a Critical Control Point (CCP) in the treatment process and the turbidity of each filter is monitored continuously using online turbidity meters. The target filtrate turbidity is less than 0.1 nephelometric turbidity units (NTU) during normal operation (not including backwash or filter ripening). During the 2022/23 financial year, the GWTP consistently produced filtered waters of 0.08 NTU.

Verification monitoring focuses on the finished product as it leaves the plant and is delivered to customer supply points. This includes weekly monitoring of parameters to verify effective disinfection and less-frequent monitoring of parameters which have been identified as having a lower risk in the drinking water. In terms of water quality, water delivered from the GWTP, and transmission network achieved 100% compliance against ADWG health criteria. A full list of parameters and summary results can be found in Appendix A.

Table 1.2 – GWTP 2022/23 Performance

GWTP 2022/23 Performance		
Water production per annum	8,975.334 ML	
Average daily production	24.59 ML	
Maximum daily production	35.29 ML	Day Month 2023
Minimum daily production	13.66 ML	Day Month 2023
Filtered water turbidity (NTU)	0.08	Average
Water Quality Compliance ADWG	100% compliance	

*Fluoridation has since ceased on 28 August 2016 as per Gladstone Regional Council directive.

4.2 Yarwun Water Treatment Plant Scheme

Drinking water supplied from the Yarwun scheme is treated at the Yarwun WTP which can be partially or fully supplemented with drinking water from the Gladstone scheme via an interconnection between the two systems, commissioned in early 2017. Drinking water is distributed to GAWB's customers either directly off the mains or from the outlet of two service reservoirs. GRC reticulates the water to domestic users after the points of supply.

Treatment Process and Delivery Network

The Yarwun WTP, located on Reid Road in the Yarwun Industrial Estate, has a total current design capacity of 5 ML/day based on 20hrs availability.

Yarwun WTP conventional treatment is a single stream process with one clarifier and 3 mono-media filters, pH correction, and chlorine disinfection. The plant operates automatically, with daily operator visits to conduct general duties, monitoring and maintenance. The plant programmable logic controller (PLC) and Supervisory Control and Data Acquisition (SCADA) control system supervises all necessary functions and will shut the plant down automatically in the event of equipment failure or power loss. Online monitors are used throughout the system to facilitate control of the process.

Yarwun WTP services the requirements of the GRC and a number of industrial customers. Water is pumped from Yarwun WTP to the Mt Miller Reservoir and then gravitates to the Boat Creek Pump Station, supplying several industrial customers with drinking water. Water is then pumped to East End Reservoir, where it is re-chlorinated and supplied to the GRC for reticulation.

Since early 2017 the Gladstone and Yarwun systems have been interconnected to provide greater resilience to both YWTP and the network. There are several modes of interconnection operation, which GAWB can use to suit the needs of operation.

To ensure a disinfectant residual is maintained through to customer supply points GAWB practices supplementary disinfection at the East End Reservoir, where sodium hypochlorite is dosed to a set point in a recirculation stream from the reservoir. The chlorine residual is continuously monitored, with alarms for low and high dose relayed back to the treatment plant.

During the 2022/23FY YWTP produced approximately 0.95 gigalitres of drinking water, as can be seen in the table below. The average daily production was 2.61 ML/day with maximum day production 4.69 ML.

Water quality

GAWB undertakes comprehensive operational and verification monitoring of water quality. The operational monitoring is concentrated around the quality of source water and the treatment process and includes daily measurements throughout the plant as well as online monitoring through the process and delivery network.

Filter operation is a Critical Control Point (CCP) in the treatment process at YWTP and the combined turbidity of the three filters is monitored continuously using an online turbidity meter.

The target filtrate turbidity is less than 0.1 nephelometric turbidity units (NTU) during normal operation (that is, not including backwash or filter ripening). During the 2022/23FY and under normal operation, the YWTP consistently produced filtered waters of 0.08 NTU.

Verification monitoring focuses on the finished product as it leaves the plant and is delivered to customer supply points. This includes weekly monitoring of parameters to verify effective disinfection and less-frequent monitoring of parameters which have been identified as having a lower risk in the drinking water. In terms of water quality, the YWTP and distribution network achieved 100% compliance against ADWG criteria. A full list of parameters and summary results can be found in Appendix A.

Table 1.3 – YWTP 2022/23 Performance

Measure	YWTP 2022/23 Performance	
Water production per annum	952.273 ML	
Average daily production	2.61 ML	
Maximum daily production	4.69 ML	Day Month 2023
Minimum daily production	0.00 ML	Day Month 2023
Filtered water turbidity (NTU)	0.08	Average
Water Quality Compliance ADWG	100% compliance	

5 ACTIONS TAKEN TO IMPLEMENT THE DWQMP

The DWQMP is being implemented by monitoring and adhering to the CCPs which ensure safety of the treated water supply. Further improvements have been made such as:

- All filters were refurbished with media replaced, and other repairs as necessary.
- SCADA CT calculations checked and embedded to shut down plant at minimum acceptable chlorine contact time.
- Ongoing training of operators e.g., “Aquacard” and Certificate IV in Water Operations.
- Investigations into feasibility of additional treatment barriers.
- Risk Assessment was reviewed, and a new suite of improvement actions identified.

6 IMPROVEMENT ACTIONS IDENTIFIED IN THE DWQMP

Gladstone

Process step	Hazard	Hazardous Event	Inherent Risk 2021	Preventive Measure	Residual Risk 2021	Final treatment barrier for hazard?	Required improvements	Timing	Actions Taken to Date	Status (and revised target date)	Responsibility
1.1 Powder activated carbon (PAC) dosed intermittently into raw water to remove trace organics including algal toxins, T&O compounds and DOC. Dosed before Aluminium Sulphate coagulant	Extra-cellular (dissolved) algal toxin measured as Cylindrospermopsin	Contact time not sufficient, Dose Rates under/overdose Equipment Failure, for removal of free algal toxins. Contamination of chemical	High 7	Dose PAC when needed PAC contact time optimisation study complete. Daily Drop tests& Routine Inspections/Preventative Maintenance. PAC CT is about 3 minutes	Low 3	N	PAC screw feeder not operational and is currently dosing manually.	2023-25 FY	Review of non-operational equipment undertaken with project scheduled for completion Q3, FY2022/24.	Q4 - FY2024	Water Treatment Manager/Drinking Water Quality Specialist
2.1 Plant 1 Coagulation/ Flocculation of particulate and colloidal matter with aluminium sulphate and Magna Flocc LT 25 polyelectrolyte	Ineffective coagulant	pH outside range, Dose Rates under/overdose Equipment Failure where Alum can be effective, Contamination of Chemical	Medium 6	Alum normally drops pH to acceptable range, but seasonally becomes borderline. Daily Drop tests& Routine Inspections/Preventative Maintenance Add Soda Ash/Sui table chemical to raise the pH.	Low 4	N	Conduct Jar tests regularly and the records are saved	Ongoing	Jar tests are completed monthly, with the frequency increased as required.	Ongoing	Water Treatment Manager
3.3 Filter Ripening water	Pathogen - Cryptosporidium, Giardia	Filters do not ripen adequately allowing pathogen breakthrough, filters overcleaned lengthening ripening, or ripening water sent to finished water	High 8	Plant design parameters filter ripening parameters Seeding of filters with backwash water Filter maintenance & monitoring program Operators trained in filter optimisation Soft Start of Plant Optimisation. Upgrade of programming in Scada to allow Filters to settle for a set time prior to Filter coming Online	Medium 6	Y	Filter Media replacement, Filter optimisation of the plant	Annually/or as required	Filter media replacement completed in Q2 FY2022/23.	Ongoing	Water Treatment Manager/Drinking Water Quality Specialist

Process step	Hazard	Hazardous Event	Inherent Risk 2021	Preventive Measure	Residual Risk 2021	Final treatment barrier for hazard?	Required improvements	Timing	Actions Taken to Date	Status (and revised target date)	Responsibility
4.1 Sodium hypochlorite dosed into clear water well and enters contact tank	Bacteria and viruses	Incorrect dose for pathogen inactivation due to equipment failure. Contamination of Hypo. Disabling of Scada controls	Extreme 10	Set point dosing to target concentration by analyser feedback on sample taken from 2.25ML clear water reservoir. Increase Testing Frequency. Adequate Operator Training. Documentation for receiving chemicals	Medium 5	N	Calculate minimum CT at first customer offtake given low CCP critical limit.	Annually	Treatment plant set up to read CT via SCADA and has been reviewed and tested.	Ongoing	Water Treatment Manager/Drinking Water Quality Specialist
8.1 General Maintenance	Pathogens/Chemicals	Sick workers in contact with water	Medium 5	Personal Hygiene in site induction and contracts	Low 3	N	Qld Water Directorate 'Aquacard' under consideration	Annually/As required	Qld Water Directorate 'Aquacard' training is to be undertaken by Operational Staff.	Ongoing	Drinking Water Quality Specialist/Water Treatment Manager
8.1 General Maintenance	Incorrect Analyser Readings-CCP Alarms	Water not Treated to drinking water Standards (ADWG)	High 7	1.Regular Verifications 2. Scheduled PM	Low 4	Y	Maintain & upgrade as required	Ongoing Maintenance & Replacement schedule	Turbidity and chlorine analysers calibrated monthly (or as required). Chlorine analysers overhauled every 6 months (or as required). Turbidity analysers overhauled every 12 months (or as required).	Ongoing	Water Treatment & Maintenance Manager
8.1 General Maintenance	Contaminants - metals, organics, solvents	Product not suitable for use in potable water	Medium 6	Chemical register updated by Health and Safety Team and Risk & Compliance Team. Contracts include requirement for products suitable for use in potable water Work orders issued AMS system to flag potable water assets	Low 4	N	Qld Water Directorate 'Aquacard' under consideration	Annually/As Required	Qld Water Directorate 'Aquacard' training is to be undertaken by Operational Staff.	Ongoing	Water Treatment Manager/Drinking Water Quality Specialist

Process step	Hazard	Hazardous Event	Inherent Risk 2021	Preventive Measure	Residual Risk 2021	Final treatment barrier for hazard?	Required improvements	Timing	Actions Taken to Date	Status (and revised target date)	Responsibility
7.2 Emergency	Pathogens/Chemicals	Cyber security breach - accidental or deliberate attack on SCADA system resulting in no disinfection, outages, negative pressure, overriding alarms, control of systems, permanent loss of system	Extreme 10	Monitoring of traffic in and out of SCADA through managed service, SCADA & corporate network segregation, firewall separation between internal & external networks Cyber security audit Cyber security training	Medium 6	N	Consider annual cybersecurity penetration testing and cybersecurity review Closing outstanding OT cybersecurity audit actions - end point security on SCADA devices and physical security on SCADA Devices OT Cybersecurity Disaster Recovery Plan Require detailed procedure for manual running of treatment	Bi-Anneal	Action items found as part of audits are actioned. Annual penetration testing is actioned.	Ongoing	Head of Technology
4.1 Filtration of clarified water through Dual media	Pathogens, particularly Protozoa - Cryptosporidium, Giardia	Breakthrough of protozoa due to any of: a) flow rate change b) filter bed develops mudballs c) filter bed cracks/shears d) Loss of media e) plant operated outside operating philosophy due to demand/ maintenance f) hydraulic shock	Extreme 9	Plant design parameters for flow rates and media depth Filter maintenance & monitoring program CMMS Plant ramping operating philosophy Operator competent in minimum Cert II and trained to optimise filters Reactive & preventative maintenance requires consideration of water quality. Scada Monitoring. Filter Media Replacement Program in place which reduces the impacts of having hazardous events raised.	Medium 6	Y	Filter Media replacement, scada monitoring of filter turbidity in absence of UV disinfection to be considered with introduction of HBT in ADWG	Action item to be reviewed annually or as required	Replacement of filter media completed with garnet-based material for filter optimisation. Repair work to tanks also conducted during refurbishment. Alarms via SCADA for turbidity reading and monitoring 24hr/day by onsite Operators.	Complete	Water Treatment Manager/Drinking Water Quality Specialist

Yarwun

Process step	Hazard	Hazardous Event	Inherent Risk 2021	Preventive Measure	Residual Risk 2021	Final treatment barrier for hazard?	Required improvements	Timing	Actions Taken to Date	Status (and revised target date)	Responsibility
7.4 GWTP to Yarwun WTP Interconnection	disinfection by products	Interconnection increases hydraulic residence time allowing for increased disinfection by products	Medium 6	Manned Intermittent Mode Changes on Scada to operate the Interconnection Line. Regular water Testing at customer offtake.	Medium 5	N	Investigate additional Lead Indicators. Operator Training & SOP's, additional monitoring for potential of Disinfection by products at WTP outlet	To commence from late 2022	Operators trained and all hold a Certificate III in Water Operations. SOP implemented for delivery of chemicals.	Ongoing	Water Treatment Manager/Drinking Water Quality Specialist
7.4 GWTP to Yarwun WTP Interconnection	Low Residual Chlorine	Low usage in interconnection branch results in Lower chlorine levels and increase in pH	Medium 6	Plan to operate with continuous flow. Operator Training, SOP, Regular Testing.	Low 4	N	Investigate additional Lead Indicators. Operator Training & SOP's, additional monitoring for potential of Disinfection by products at WTP outlet	To commence from late 2022	Operators trained and all hold a Certificate III in Water Operations. Online monitoring for chlorine residual.	Ongoing	Water Treatment Manager/Drinking Water Quality Specialist
2.1 Recovered Water - Backwash Water and Clarifier Waste sent to settling ponds. Supernatant returned to start of process at rate of up to 10% of flow	Pathogens	Pathogens build up in ponds and are returned in higher concentrations than raw water to head of plant	Extreme 10	Recovered water returned at up to 10% of plant flow. Pond cleaned out on regular schedule. Pre chlorine Dosing Daily Operator Duties to inspect ponds	Medium 6	N	Pre dosing of chlorine project to be commenced in absence of UV disinfection	2023-25	Chlorine pre dose implemented at YWTP. Pond de-sludge implemented on a 2 yearly bases.	Ongoing	Water Treatment Manager/Drinking Water Quality Specialist

7 COMPLIANCE WITH WATER QUALITY CRITERIA FOR DRINKING WATER

The results from the Verification Monitoring Program have been compared against the levels of the water quality criteria specified by the Regulator in the *Water Quality and Reporting Guideline for a Drinking Water Service* and are summarised in Appendix A, Table A1. As can be seen, GAWB drinking water is compliant with the ADWG 2011 and meets the water quality criteria specified by the Queensland Water Supply Regulator.

The reported statistics do not include results derived from quality control, blank or repeat samples, or from emergency or investigative samples undertaken in response to an elevated result.

Consistency of monitoring results over the 2022/23FY with previous years demonstrates a level of surveillance consistent and appropriate with the risks to drinking water quality. GAWB far exceeds the number of *E. coli* samples required to be taken under the Public Health Act 2005 according to population. The below table provides a summary of verification monitoring conducted for the 2022/23 FY. The figures in the below table consider the full distribution (Gladstone and Yarwun), including water treatment plant outlets and customer service points. The actual number of samples taken versus the sampling program reflects shutdowns and access issues, whereby sampling was not appropriate during various plant and network shutdowns or because safe access to sites was not available during sampling runs. Actual samples collected this year exceeded those required to be collected by the approved DWQMP due to the addition of Hetherington Reservoir, Kirkwood Booster Pump Station, and additional customer connection at Alpha HPA.

Table 1.4 – Water Quality Criteria and Sampling

Scheme name	Parameter	No of samples required to be collected (as per the approved DWQMP)	No of samples actually collected	Water quality criteria		No of non-compliant samples	Comments
Gladstone	Free Chlorine	480	537	Health guideline limit	<5mg/l	0	
Gladstone	Dissolved Oxygen	480	536	Aesthetic guideline limit - treated water only	>85%	1	11 samples were found to be less than 85%
Gladstone	pH	480	537	Aesthetic guideline limit	6.5 - 8.5 pH Unit	0	
Gladstone	Turbidity	480	531	Aesthetic guideline limit	<5NTU	0	
Gladstone	Colour	148	64	Aesthetic guideline limit	<15HU	0	Colour determination occurred only at selected sites in addition to WTP Outlet. Verification Program to be reviewed accordingly.
Gladstone	Hardness	4	4	Recommended limit	<200mg/l	0	
Gladstone	Total dissolved solids	4	4	Recommended limit	<600mg/l	0	
Gladstone	Bromate	16	4	Health Guideline			Bromate analysed at GWTP Outlet only.
Gladstone	Aluminium	110	126	Aesthetic guideline limit	<0.2mg/l	0	
Gladstone	Arsenic (Total)	37	41	Health guideline limit	0.01mg/l	0	
Gladstone	Ba, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn (total)	37	41	Health and Aesthetic guideline limit	Various depending on metal	0	
Gladstone	Cyanide	37	8	Health guideline limit	<0.08mg/l	0	Cyanide analysis performed only at WTP outlets; Verification Program shall be reviewed accordingly
Gladstone	Iron	150	165	Aesthetic guideline limit	<0.3mg/l	0	

Scheme name	Parameter	No of samples required to be collected (as per the approved DWQMP)	No of samples actually collected	Water quality criteria	No of non-compliant samples	Comments	Scheme name
Gladstone	Manganese	150	165	Aesthetic guideline limit	<0.1mg/l	0	
Gladstone	THM's	110	126	Health guideline limit	<0.25mg/l	0	
Gladstone	Cyanobacteria	52	51	No guideline limit		0	
Gladstone	<i>E. coli</i>	480	493	Health guideline limit	0mg/l in any 100ml sample	0	
Gladstone	<i>Chlorate</i>	156	233	Qld Health Interim Health Guideline	0.8mg/l	0	
Yarwun	Free Chlorine	364	362	Health guideline limit	<5mg/l	0	
Yarwun	Dissolved Oxygen	364	362	Aesthetic guideline limit	>85%	19	
Yarwun	pH	364	363	Aesthetic guideline limit	6.5 - 8.5 pH Unit	0	
Yarwun	Turbidity	364	361	Aesthetic guideline limit	<5NTU	0	
Yarwun	Colour (Number reduced in amended DWQMP)	124	24	Aesthetic guideline limit	<15HU	0	Colour determination occurred only at YWTP Outlet and 1 selected site. Verification Program to be reviewed accordingly.
Yarwun	Hardness	4	4	Recommended limit	<200mg/l	0	
Yarwun	Total dissolved solids	4	4	Recommended limit	<600mg/l	0	
Yarwun	Aluminium	84	96	Aesthetic guideline limit	<0.2mg/l	0	
Yarwun	Arsenic (Total)	28	32	Health guideline limit	0.01mg/l	0	
Yarwun	Ba, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn (total)	28	32	Health and Aesthetic guideline limit	Various depending on metal	0	
Yarwun	Bromate	8	8	Health Guideline			
Yarwun	Cyanide	28	4	Health guideline limit	<0.08mg/l	0	Cyanide analysis performed only at GWTP Outlet. Verification Program to be reviewed accordingly.
Yarwun	Iron	124	136	Aesthetic guideline limit	<0.3mg/l	0	
Yarwun	Manganese	124	136	Aesthetic guideline limit	<0.1mg/l	0	
Yarwun	THM's	84	96	Health guideline limit	<0.25mg/l	0	

Scheme name	Parameter	No of samples required to be collected (as per the approved DWQMP)	No of samples actually collected	Water quality criteria	No of non-compliant samples	Comments	Scheme name
Yarwun	Cyanobacteria	52	52	No guideline limit		0	
Yarwun	<i>E. coli</i>	364	363	Health guideline limit	0mg/l in any 100ml sample	0	
Yarwun	<i>Chlorate</i>	104	101	QLD Health Interim Health Guideline	0.8mg/L	0	

8 NOTIFICATIONS TO THE REGULATOR

During the 2022/23FY, there were no notifications submitted to the regulator.

9 CUSTOMER SATISFACTION

During 2022/23FY, GAWB did not record any complaints regarding water quality from its customers.

The Gladstone Regional Council (GRC) reticulates bulk drinking water produced by GAWB to domestic users. Consumer feedback on quality or supply of drinking water from domestic users is generally managed by the GRC, who maintain a database of customer feedback. In practice, GAWB will assist the regional council with enquiries on water quality where applicable and escalate issues internally if there is cause.

In general, industrial customers use the bulk of their treated water reservation for process water (e.g., in boilers) and to provide drinking water to their sites. GAWB maintains an open and responsive relationship with its customers. GAWB receives several enquiries each year from current or potential customers for information on the quality of water, to inform the design of processing plants. During the 2022/23FY, GAWB's industrial drinking water customers did not report any water quality complaints to GAWB.

10 FINDINGS AND RECOMMENDATIONS OF THE DWQMP AUDITOR

There were no Regulatory Audits of the GAWB DWQMP in the 2022/23FY. The next audit is due to be completed by 28 February 2024.

11 OUTCOME OF THE REVIEW OF THE DWQMP

GAWB are required to carry out reviews of our approved DWQMP on a biennial cycle, or as otherwise directed by the regulator. The purpose of the regular review is to ensure the DWQMP remains relevant, having regard for the current circumstances and operation of the water service.

In accordance with Section 99 (2)(b) and Section 106 of the Act, GAWB last undertook a review of the DWQMP in March 2022, with submission of the amended DWQMP in April 2022.

In July 2022, the DRDMW issued a formal Information Requirement Notice (IRN) to GAWB. In relation to this IRN, GAWB submitted an amended DWQMP on 12 September 2022 and 20 September 2022 (contained inclusions missed in the attachments during the 12 September submission).

On 10 November 2022, the DRDMW approved GAWB's DWQMP Version 5 Issue 5 (22 November 2022 cited as day of approval), however on condition of this approval further information was requested. On 31 May 2023, GAWB submitted the amended DWQMP Version 5 Issue 6 to the DRDMW.

The clarifications and inclusions for the 31 May 2023 submission have been outlined below:

Item	Actions	DWQMP
(a) Revise 'Appendix E – DWQ Emergency Action Plan' to address the issues stated herein, including incident response protocol flowcharts		
• DWQ Emergency Action Plan needs to include 'incident notification to the other two key stakeholders, i.e., Gladstone Regional Council (GRC) and/or the Central Queensland Public Health Unit (CQPHU);	DWQ Emergency Action Plan has been updated and includes engagement with the relevant stakeholders.	Appendix E (DWQMP) Table 10-3 (EAP)
• Make it clear who is responsible for issuing 'media statements and notices' pertaining to any water quality incident/event, which will adversely impact public health and/or safety; and	Appendix C of the EAP states that "the GAWB CEO is responsible for the responsible for authorising media releases". No change is required as the information is already clear.	Appendix E (DWQMP) Appendix C (EAP)
• Ensure incident flow charts are consistent with the most contemporary regulatory reporting requirements stated in this notice, including, but not limited to missed verification samples and your verification and operational monitoring programs.	The flow charts have all been reviewed and updated.	Appendix E (DWQMP) Appendix A (EAP)

Item	Actions	DWQMP
<p>(b) Revise the Risk Assessment in 'Appendix D GAWB Risk Assessment Register' and update it to include all existing and proposed preventative measures intended to achieve acceptable residual risks and identify the procedures used to ensure that these measures are effective in managing the identified risks.</p> <p>It is noted you only included information about chlorate in your IRN response and the associated preventative measure was limited to reducing the 'age of chlorine'. Preventative measures to achieve acceptable residual risks for chlorate would also include, but may not be limited to:</p>		
(i) 'reducing rate of chlorate formation prior to use' (e.g., storing sodium hypochlorite solutions in cool areas and out of direct sunlight, i.e., air-conditioning room or shaded, well vented storage areas;	Preventative measures already listed as "high turnover of sodium hypochlorite. Weekly analysis for chlorate and COA. Weekly analysis for chlorates in chlorination sites. Work orders raised internally to clean the tanks. The corrective action is identified as minimising chlorine age.	Appendix D (DWQMP) Section 4.2 (GWTP Risk Assessment)
(ii) process optimisation, e.g., chlorine dose optimisation to avoid high doses of chlorine; and	There is not a history of ongoing repeated chlorate detections impacting GRC. Therefore, the current management of chlorine, while an ongoing challenge, is appropriate to ensure safe drinking water.	Appendix D (DWQMP)
(iii) developing a 'chemical acceptance & handling SOP'	<p>We already have a chemical supply agreement with suppliers and have indicated that we report incidents if chlorate is >0.8 mg/L.</p> <p>We had identified the need to develop a chemical acceptance and handling SOP, and this was developed and is a current procedure.</p>	Appendix D (DWQMP)
You must address all identified hazards with an unacceptable risk rating similarly.	There are no unacceptable mitigated risks in the risk register. Nonetheless, the risk assessment was reviewed with a desktop review. Several items with no preventative measures were identified, and in these cases the mitigated risk was re-adjusted to the inherent risk as the inherent risk is already acceptable.	Appendix D (DWQMP)

APPENDIX A – SUMMARY OF COMPLIANCE WITH WATER QUALITY CRITERIA

The results from the verification monitoring program have been compared against the levels of the water quality criteria specified by the Regulator in the *Water Quality and Reporting Guideline for a Drinking Water Service* and are summarised in Table A1. As can be seen, GAWB drinking water is compliant with the ADWG 2011 and meets the water quality criteria specified by the Office of the Water Supply Regulator

The reported statistics do not include results derived from quality control, blank or repeat samples, or from emergency or investigative samples undertaken in response to an elevated result. Nor does it include results from booster stations not considered to be direct customer offtakes as per recommendation by the DWQMP auditors. All 'less than' results have been analysed as having a value of zero (0), consistent with the quarterly reporting requirements of the QWSR.

Consistency of monitoring results over the 2022/23FY reporting period with previous years demonstrates a level of surveillance consistent and appropriate with the risks to drinking water quality.

Table A1: Verification monitoring results

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	95 th %tile	Limit of reporting	Laboratory name
Lake Awoonga	Source Water	4.4'-DDD	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	4.4'-DDE	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	4.4'-DDT	µg/L	Q	4	0	0	0	0	0	0	2	ALS
Lake Awoonga	Source Water	Acenaphthene	µg/L	Q	4	0	0	0	0	0	0	1	ALS
Lake Awoonga	Source Water	Acenaphthylene	µg/L	Q	4	0	0	0	0	0	0	1	ALS
Lake Awoonga	Source Water	Aldrin	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	alpha-BHC	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	alpha-Endosulfan	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	beta-BHC	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	beta-Endosulfan	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	cis-Chlordane	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	delta-BHC	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	95 th %tile	Limit of reporting	Laboratory name
Lake Awoonga	Source Water	Dieldrin	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Endosulfan sulfate	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Endrin	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Endrin aldehyde	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Endrin ketone	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	gamma-BHC	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Heptachlor	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Heptachlor epoxide	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Hexachlorobenzene (HCB)	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Methoxychlor	µg/L	Q	4	0	0	0	0	0	0	2	ALS
Lake Awoonga	Source Water	Sum of Aldrin + Dieldrin	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Sum of DDD + DDE + DDT	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Total Chlordane (sum)	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	trans-Chlordane	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Azinphos Methyl	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Bromophos-ethyl	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Carbophenothion	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Chlorfenvinphos	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Chlorpyrifos	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Chlorpyrifos-methyl	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Demeton-S-methyl	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Diazinon	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	95 th %tile	Limit of reporting	Laboratory name
Lake Awoonga	Source Water	Dichlorvos	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Dimethoate	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Ethion	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Fenamiphos	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Fenthion	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Malathion	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Monocrotophos	µg/L	Q	4	0	0	0	0	0	0	2	ALS
Lake Awoonga	Source Water	Parathion	µg/L	Q	4	0	0	0	0	0	0	2	ALS
Lake Awoonga	Source Water	Parathion-methyl	µg/L	Q	4	0	0	0	0	0	0	2	ALS
Lake Awoonga	Source Water	Pirimphos-ethyl	µg/L	Q	4	0	0	0	0	0	0	0.5	ALS
Lake Awoonga	Source Water	Prothiofos	µg/L	Q	4	0	0	0.0	0.0	0.0	0.0	0.5	ALS
Lake Awoonga	Source Water	Dissolved Oxygen	%	W	103	103	0	24.1	94.2	64.2	85.5	0.1	Internal
Lake Awoonga	Source Water	pH	pH Unit	W	103	103	0	6.7	8.8	7.5	8.1	0.1	Internal
Lake Awoonga	Source Water	Turbidity	NTU	W	103	103	0	0.5	2.5	1.3	1.8	0.1	Internal
Lake Awoonga	Source Water	Hardness	mg/L	Q	8	8	0	77	95	86	95	1	Internal
Lake Awoonga	Source Water	Total Dissolved Solids	mg/L	Q	8	8	0	156	194	178	193	10	ALS
Lake Awoonga	Source Water	Arsenic	mg/L	Q	4	4	0	0.0010	0.0021	0.0014	0.0020	0.0002	ALS
Lake Awoonga	Source Water	Barium	mg/L	Q	4	4	0	0.0128	0.0156	0.0140	0.0154	0.0005	ALS
Lake Awoonga	Source Water	Cadmium	mg/L	Q	8	0	0	0.0000	0.0000	0.0000	0.0000	0.00005	ALS
Lake Awoonga	Source Water	Chromium	mg/L	Q	4	0	0	0.000	0.0000	0.0000	0.0000	0.0002	ALS
Lake Awoonga	Source Water	Copper	mg/L	Q	4	4	0	0.0009	0.0010	0.0009	0.0010	0.0005	ALS
Lake Awoonga	Source Water	Lead	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0001	ALS
Lake Awoonga	Source Water	Mercury	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0001	ALS
Lake Awoonga	Source Water	Nickel	mg/L	Q	4	1	0	0.0000	0.0009	0.0000	0.0008	0.0005	ALS

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	95 th %tile	Limit of reporting	Laboratory name
Lake Awoonga	Source Water	Selenium	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0002	ALS
Lake Awoonga	Source Water	Zinc	mg/L	Q	4	1	0	0.000	0.002	0.000	0.002	0.001	ALS
Lake Awoonga	Source Water	Cyanide	mg/L	Q	8	0	0	0.000	0.000	0.000	0.000	0.004	ALS
Lake Awoonga	Source Water	Manganese-Dissolved	mg/L	W	104	18	0	0.0000	0.0243	0.0005	0.0015	0.0005	ALS
Lake Awoonga	Source Water	Manganese-Total	mg/L	W	104	102	0	0.0000	0.0811	0.0216	0.0436	0.0005	ALS
Lake Awoonga	Source Water	Cyanobacteria	cells/mL	W	104	104	0	50	8760	2696	6199	1	Ecoscope
Lake Awoonga	Source Water	Escherichia coli	MPN/100 mL	W	104	32	0	0	365	5	4	1	Ecoscope
Lake Awoonga	Source Water	Cryptosporidium	oocysts/L	Q	4	0	0	0	0	0	0	0.1	ALS
Lake Awoonga	Source Water	Giardia	cysts/L	Q	4	0	0	0	0	0	0	0.1	ALS
Lake Awoonga	Source Water	Total PAHs	µg/L	Q	4	0	0	0	0	0	0	0.5	ALS
GWTP	Treatment Plant	Free Chlorine	mg/L	W	52	52	0	1.1	2.5	2.0	2.5	0.1	Internal
GWTP	Treatment Plant	Dissolved Oxygen	%	W	52	52	0	86.4	99.6	93.4	99.3	0.1	Internal
GWTP	Treatment Plant	pH	pH Unit	W	52	52	0	6.7	7.7	7.1	7.5	0.1	Internal
GWTP	Treatment Plant	Turbidity	NTU	W	52	52	0	0.01	0.26	0.11	0.22	0.1	Internal
GWTP	Treatment Plant	Colour	TCU	M	12	12	0	0	5	2	3	1	ALS
GWTP	Treatment Plant	Hardness	mg/L	Q	4	4	0	77	91	87	91	1	ALS
GWTP	Treatment Plant	Total Dissolved Solids	mg/L	Q	4	4	0	172	185	180	185	10	ALS
GWTP	Treatment Plant	Aluminium	mg/L	M	12	12	0	0.027	0.111	0.063	0.099	0.005	ALS
GWTP	Treatment Plant	Arsenic	mg/L	Q	4	4	0	0.0004	0.0006	0.0005	0.0006	0.0002	ALS
GWTP	Treatment Plant	Barium	mg/L	Q	4	4	0	0.0096	0.0147	0.0123	0.0146	0.0005	ALS
GWTP	Treatment Plant	Cadmium	mg/L	Q	4	0	0	0.00000	0.00000	0.00000	0.00000	0.00005	ALS
GWTP	Treatment Plant	Chromium	mg/L	Q	4	1	0	0.0000	0.0004	0.0001	0.0003	0.0002	ALS
GWTP	Treatment Plant	Copper	mg/L	Q	4	4	0	0.0006	0.0021	0.0012	0.0020	0.0005	ALS

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	95 th %tile	Limit of reporting	Laboratory name
GWTP	Treatment Plant	Lead	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0001	ALS
GWTP	Treatment Plant	Mercury	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0001	ALS
GWTP	Treatment Plant	Nickel	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0005	ALS
GWTP	Treatment Plant	Selenium	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0002	ALS
GWTP	Treatment Plant	Zinc	mg/L	Q	4	3	0	0.000	0.004	0.002	0.004	0.001	ALS
GWTP	Treatment Plant	Cyanide	mg/L	Q	4	0	0	0.000	0.000	0.000	0.000	0.004	ALS
GWTP	Treatment Plant	Iron	mg/L	M	51	17	0	0.000	0.006	0.001	0.006	0.002	ALS
GWTP	Treatment Plant	Manganese-Dissolved	mg/L	W	51	31	0	0.0000	0.0019	0.0006	0.0015	0.0005	ALS
GWTP	Treatment Plant	Manganese-Total	mg/L	W	51	36	0	0.000	0.0225	0.0017	0.0060	0.0005	ALS
GWTP	Treatment Plant	Trihalomethanes	µg/L	M	12	12	0	13	40	24	36	5	ALS
GWTP	Treatment Plant	Cyanobacteria	cells/mL	W	51	4	0	0	120	5	35	1	Ecoscope
GWTP	Treatment Plant	Escherichia coli	MPN/100 mL	W	52	0	0	0	0	0	0	1	Ecoscope
GWTP	Treatment Plant	Chlorate	mg/L	W	52	52	0	0.028	0.190	0.078	0.149	0.005	ALS
GWTP Distribution	Transmission	Free Chlorine	mg/L	W	485	485	0	0.04	2.7	1.3	2.2	0.1	Internal
GWTP Distribution	Transmission	Dissolved Oxygen	%	W	484	484	0	81.9	105.6	96.8	101.4	0.1	Internal
GWTP Distribution	Transmission	pH	pH Unit	W	485	485	0	6.8	8.2	7.3	7.8	0.1	Internal
GWTP Distribution	Transmission	Turbidity	NTU	W	479	479	0	0.0	1.4	0.2	0.3	0.1	Internal
GWTP Distribution	Transmission	Colour	TCU	M	52	43	0	0	5	2	3	1.0	ALS
GWTP Distribution	Transmission	Aluminium	mg/L	M	114	114	0	0.023	0.094	0.052	0.087	0.005	ALS
GWTP Distribution	Transmission	Arsenic	mg/L	Q	37	37	0	0.0004	0.0006	0.0005	0.0006	0.0002	ALS
GWTP Distribution	Transmission	Barium	mg/L	Q	37	37	0	0.0010	0.0158	0.0128	0.0148	0.0005	ALS
GWTP Distribution	Transmission	Cadmium	mg/L	Q	37	0	0	0.0000	0.0000	0.0000	0.0000	0.0002	ALS

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	95 th %tile	Limit of reporting	Laboratory name
GWTP Distribution	Transmission	Chromium	mg/L	Q	37	4	0	0.0000	0.0036	0.0002	0.0004	0.0002	ALS
GWTP Distribution	Transmission	Copper	mg/L	Q	37	37	0	0.0012	0.0207	0.0053	0.0146	0.0005	ALS
GWTP Distribution	Transmission	Lead	mg/L	Q	37	25	0	0.0000	0.0010	0.0003	0.0007	0.0001	ALS
GWTP Distribution	Transmission	Mercury	mg/L	Q	37	0	0	0.0000	0.0000	0.0000	0.0000	0.0001	ALS
GWTP Distribution	Transmission	Nickel	mg/L	Q	37	0	0	0.0000	0.0000	0.0000	0.0000	0.0005	ALS
GWTP Distribution	Transmission	Selenium	mg/L	Q	37	0	0	0.0000	0.0000	0.0000	0.0000	0.0002	ALS
GWTP Distribution	Transmission	Zinc	mg/L	Q	37	34	0	0.000	0.012	0.004	0.009	0.001	ALS
GWTP Distribution	Transmission	Iron	mg/L	M	114	96	0	0.000	0.105	0.009	0.024	0.002	ALS
GWTP Distribution	Transmission	Manganese	mg/L	M	114	78	0	0.0000	0.0050	0.0007	0.0020	0.0005	ALS
GWTP Distribution	Transmission	Trihalomethanes	µg/L	M	114	114	0	17	180	91	152	5	ALS
GWTP Distribution	Transmission	Escherichia coli	MPN/100 mL	W	441	0	0	0	0	0	0	1	Ecoscope
GWTP Distribution	Transmission	Chlorate	mg/L	W	181	181	0	0.034	0.669	0.170	0.376	0.005	ALS
YWTP	Water Treatment	Free Chlorine	mg/L	W	52	52	0	1.8	2.9	2.4	2.7	0.1	Internal
YWTP	Water Treatment	Dissolved Oxygen	%	W	52	52	0	76.0	98.8	88.0	95.8	0.1	Internal
YWTP	Water Treatment	pH	pH Unit	W	52	52	0	6.8	8.3	7.2	7.5	0.1	Internal
YWTP	Water Treatment	Turbidity	NTU	W	52	52	0	0.01	0.3	0.1	0.3	0.1	Internal
YWTP	Water Treatment	Colour	PCU	M	12	12	0	1	5	2	4	1	ALS
YWTP	Water Treatment	Hardness	mg/L	Q	4	4	0	77	91	86	91	1	ALS
YWTP	Water Treatment	Total Dissolved Solids	mg/L	Q	4	4	0	173	202	192	202	10	ALS
YWTP	Water Treatment	Aluminium	mg/L	M	12	12	0	0.030	0.072	0.048	0.071	0.005	ALS
YWTP	Water Treatment	Arsenic	mg/L	Q	4	4	0	0.0004	0.0005	0.0004	0.0004	0.0002	ALS

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	95 th %tile	Limit of reporting	Laboratory name
YWTP	Water Treatment	Barium	mg/L	Q	4	4	0	0.0096	0.0140	0.0124	0.0139	0.0005	ALS
YWTP	Water Treatment	Cadmium	mg/L	Q	4	0	0	0.00000	0.00000	0.00000	0.00000	0.00005	ALS
YWTP	Water Treatment	Chromium	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0002	ALS
YWTP	Water Treatment	Copper	mg/L	Q	4	4	0	0.0007	0.0168	0.0060	0.0150	0.0005	ALS
YWTP	Water Treatment	Lead	mg/L	Q	4	3	0	0.0000	0.0004	0.0002	0.0004	0.0001	ALS
YWTP	Water Treatment	Mercury	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0001	ALS
YWTP	Water Treatment	Nickel	mg/L	Q	4	0	0	0.0000	0.000	0.000	0.000	0.0005	ALS
YWTP	Water Treatment	Selenium	mg/L	Q	4	0	0	0.0000	0.0000	0.0000	0.0000	0.0002	ALS
YWTP	Water Treatment	Zinc	mg/L	Q	4	4	0	0.001	0.005	0.003	0.005	0.001	ALS
YWTP	Water Treatment	Cyanide	mg/L	Q	4	0	0	0.000	0.000	0.000	0.000	0.004	ALS
YWTP	Water Treatment	Iron	mg/L	W	51	20	0	0.000	0.021	0.003	0.011	0.002	ALS
YWTP	Water Treatment	Manganese Dissolved	mg/L	W	51	27	0	0.0000	0.0029	0.0006	0.0019	0.0005	ALS
YWTP	Water Treatment	Manganese-Total	mg/L	W	51	29	0	0.000	0.0031	0.0008	0.0024	0.0005	ALS
YWTP	Water Treatment	Trihalomethanes	µg/L	M	12	11	0	18	45	30	44	5	ALS
YWTP	Water Treatment	Cyanobacteria	cells/mL	W	51	0	0	0	0	0	0	1	Ecoscope
YWTP	Water Treatment	Escherichia coli	MPN/100 mL	W	51	0	0	0	0	0	0	1	Ecoscope
YWTP	Water Treatment	Chlorate	mg/L	W	51	51	0	0.045	0.216	0.119	0.195	0.005	ALS
YWTP	Water Treatment	Bromate	mg/L	Q	4	0	0	0	0	0	0	0.005	ALS
YWTP Distribution	Transmission	Free Chlorine	mg/L	W	310	310	0	0.4	3.4	1.3	1.7	0.1	Internal
YWTP Distribution	Transmission	Dissolved Oxygen	%	W	310	310	0	88.8	129	97.7	101.5	0.1	Internal
YWTP Distribution	Transmission	pH	pH Unit	W	311	311	0	6.8	8.9	7.5	8.3	0.1	Internal
YWTP Distribution	Transmission	Turbidity	NTU	W	309	309	0	0.0	0.5	0.1	0.3	0.1	Internal
YWTP Distribution	Transmission	Colour	TCU	M	24	22	0	0	5	2	5	1	ALS

Scheme name	Scheme component	Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	95 th %tile	Limit of reporting	Laboratory name
YWTP Distribution	Transmission	Aluminium	mg/L	M	84	84	0	0.025	0.085	0.046	0.074	0.005	ALS
YWTP Distribution	Transmission	Arsenic	mg/L	Q	28	28	0	0.0004	0.0006	0.0004	0.0005	0.0002	ALS
YWTP Distribution	Transmission	Barium	mg/L	Q	24	24	0	0.0099	0.0152	0.0127	0.0146	0.0005	ALS
YWTP Distribution	Transmission	Cadmium	mg/L	Q	28	0	0	0.00000	0.00000	0.00000	0.00000	0.00005	ALS
YWTP Distribution	Transmission	Chromium	mg/L	Q	28	12	0	0.0000	0.0022	0.0004	0.0021	0.0002	ALS
YWTP Distribution	Transmission	Copper	mg/L	Q	28	27	0	0.0000	0.0276	0.0047	0.0114	0.0005	ALS
YWTP Distribution	Transmission	Lead	mg/L	Q	28	16	0	0.0000	0.0012	0.0002	0.0010	0.0001	ALS
YWTP Distribution	Transmission	Mercury	mg/L	Q	28	0	0	0.0000	0.0000	0.0000	0.0000	0.0001	ALS
YWTP Distribution	Transmission	Nickel	mg/L	Q	28	2	0	0.0000	0.0006	0.0000	0.0004	0.0005	ALS
YWTP Distribution	Transmission	Selenium	mg/L	Q	28	0	0	0.0000	0.0000	0.0000	0.0000	0.0002	ALS
YWTP Distribution	Transmission	Zinc	mg/L	Q	28	23	0	0.000	0.021	0.004	0.016	0.001	ALS
YWTP Distribution	Transmission	Iron	mg/L	M	84	50	0	0.000	0.010	0.003	0.007	0.002	ALS
YWTP Distribution	Transmission	Manganese-Total	mg/L	M	84	27	0	0.0000	0.0019	0.0002	0.0029	0.0008	ALS
YWTP Distribution	Transmission	Trihalomethanes	µg/L	M	84	84	0	33	104	58	95	5	ALS
YWTP Distribution	Transmission	Escherichia coli	MPN/100 mL	W	311	0	0	0	0	0	0	1	Ecoscope
YWTP Distribution	Transmission	Chlorate	mg/L	W	50	50	0	0.125	0.426	0.258	0.385	0.005	ALS

Tables A2 and A3 summarise the monthly results for all *E. coli* verification monitoring undertaken in the Gladstone and Yarwun systems.

Table A2 - Reticulation *E. coli* verification monitoring in Gladstone WTP Distribution. This includes the WTP Treated water, Distribution Network.

Gladstone WTP Distribution 2022/23												
Month	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec- 22	Jan- 23	Feb-23	Mar- 23	Apr- 23	May- 23	Jun- 23
No. Samples collected	38	52	47	56	46	41	56	48	50	47	54	49
No samples collected in which <i>E. coli</i> was detected	0	0	0	0	0	0	0	0	0	0	0	0
No samples collected in previous 12-month period	47	52	47	44	49	37	50	36	53	48	56	43
No samples in which <i>E. coli</i> detected for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% Samples that comply	100	100	100	100	100	100	100	100	100	100	100	100
Compliance with 98% annual value	100	100	100	100	100	100	100	100	100	100	100	100

Table A3 - Reticulation E. coli verification monitoring in Yarwun WTP Distribution

Yarwun WTP Distribution 2022/23												
Month	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec- 22	Jan- 23	Feb-23	Mar- 23	Apr- 23	May- 23	Jun- 23
No. Samples collected	33	48	33	33	36	27	39	33	33	32	40	33
No samples collected in which E. coli was detected	0	0	0	0	0	0	0	0	0	0	0	0
No samples collected in previous 12-month period	32	40	32	32	39	26	32	32	40	32	30	32
No samples in which E. coli detected for previous 12-month period	0	0	0	0	0	0	0	0	0	0	0	0
% Samples that comply	100	100	100	100	100	100	100	100	100	100	100	100
Compliance with 98% annual value	100	100	100	100	100	100	100	100	100	100	100	100