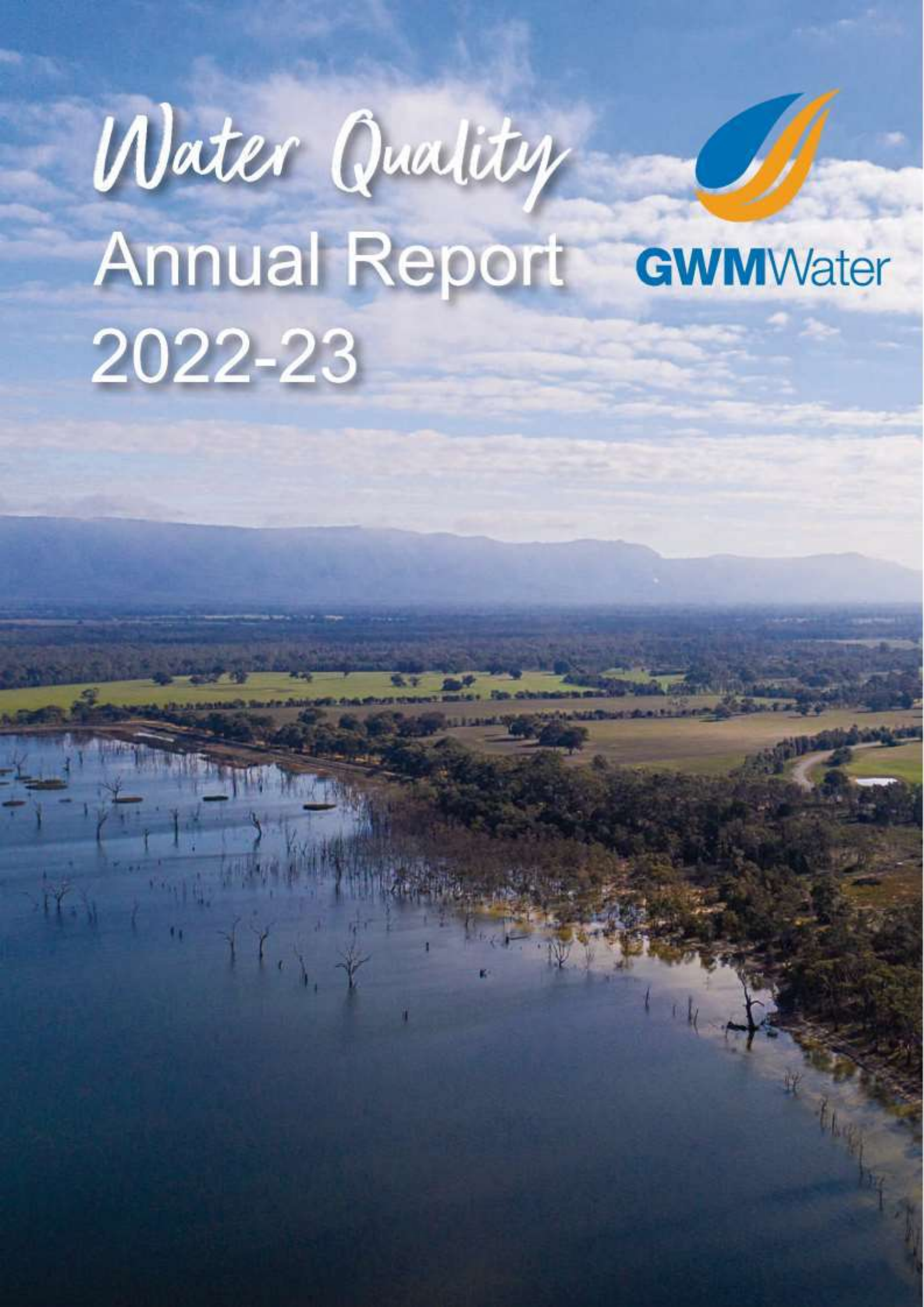
Water Quality Annual Report 2022-23

GWMWater



2022/2023 Annual Report for Water Quality

GWMWater has a water quality management system that follows the principles in the Australian Drinking Water Guidelines to ensure safe drinking water in accordance with the requirements of the *Safe Drinking Water Act 2003*. This involves the analysis and assessment of risks from catchment to customer tap and is supported by implementation of appropriate control and prevention measures. These measures are reinforced through proactive maintenance and operation carried out by trained staff, with further verification and reporting steps undertaken to ensure water quality targets are being met. GWMWater has a water quality improvement program that aims to improve reliability and the quality of water delivered to the community as well as expanding the number of customers to receive a drinking water supply.

In the 2022/2023 year, GWMWater installed a Dissolved Air Flotation system to treat Wemen pump station water from the Murray River. This has provided marked improvement in the water quality delivered to stock and domestic customers as well as the regulated towns of Walpeup, Patchewollock, Tempy, Speed and Nandaly. It has also improved the operational performance and quality of water produced from the Ouyen and Underbool Water Treatment Plants. A second stage of this project is planned for the Murray River Piangil/Nyah systems. Like the system on the Wemen pump station, this will improve water quality and protect against water quality risks that are expected to increase in severity due to climate change.

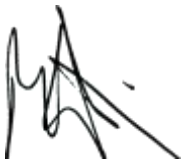
High rainfall towards the end of 2022 gave rise to a blackwater event in the Murray River that challenged the performance of the Manangatang WTP. In response, GWMWater installed a dissolved air floatation system to help remove the organics. This greatly improved plant performance and ensured water supply to the town of Manangatang.

Improved protection against pathogen risk has been achieved with the installation of ultra-violet disinfection units at the Ouyen and Underbool Water Treatment Plants. The ultra-violet disinfection provides an additional barrier to the existing filtration and chlorine disinfection to help ensure continued delivery of safe drinking water to customers.

The infrastructure component of the upgrade of the regulated town of Ultima to drinking water is physically complete, with town supply now connected to fully treated water from Swan Hill with booster chlorination to maintain safe drinking water. The regulated town of Elmhurst, which is having a new treatment plant built, is expected to be upgraded to

drinking water in the first half of 2024. Projects to upgrade regulated towns of Berriwillock, Culgoa, Kaniva and Moyston to drinking water are also underway. Upgrades for these town will be achieved by supplying treated water through pipelines from existing water treatment plants.

GWMWater will continue to maintain its systems of providing safe, good quality water throughout its operating area in line with its vision of 'healthy environment, thriving communities'.



Mark Williams
Managing Director

Section 23 of the Safe Drinking Water Act 2003 requires Grampians Wimmera Mallee Water Corporation (GWMWater) to make available for inspection by the public the results of any water quality monitoring program conducted on any drinking water supplied by GWMWater. Customers and members of the public may access drinking water quality data by contacting GWMWater either by telephone on 1300 659 961 or by the internet at www.gwmwater.org.au.

Revision	Revision Date	Details	Authorised
1	23/08/2023	Draft for internal review	Matthew Kube
2	24/08/2023	Water Regulation review	Suzy McDonald
3	30/08/2023	Executive Manager Infrastructure review	Nalaka Vitharana
4	08/09/2023	Department of Health review	Kamal Khatri
5	17/10/2023	Review by Senior Leadership Team	Senior Leadership Team
6	17/10/2023	Managing Director review and sign off	Mark Williams
7	27/10/2023	Final copy to Department of Health	

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1 Introduction

Grampians Wimmera Mallee Water Corporation (trading as GWMWater) is a government-owned corporation, created by an order of the Victorian Government under the *Water Act 1989*. On 1 July 2004, GWMWater assumed the responsibilities of the predecessor organisations Grampians Water and Wimmera Mallee Water. The vision and mission of GWMWater are:

Vision
'Healthy environment, thriving community.'

Mission
'Through partnerships with our stakeholders, we will provide affordable services using our precious resources to ensure a productive and liveable region.'

GWMWater provides water services to a region covering an area of 62,000 km^2, with a population of approximately 77,600 at a density of only a little over one person/km^2. This includes 32,500 water supply connections for people living in 71 urban areas throughout the region and providing domestic and stock water supply to 8,900 rural customers.

1.1 Safe Drinking Water Act 2003

1.1.1 Background

The *Safe Drinking Water Act 2003* (the Act) and the Safe Drinking Water Regulations 2015 (the Regulations) is the legislative framework for assuring drinking water quality in Victoria.

The Act is based on:
a) Adoption of 'catchment-to-tap' risk management obligations.
b) Standards are applicable to all drinking water samples for key water quality criteria.
c) Information disclosure obligations for water suppliers.
d) Adoption of systemic community consultation processes.

This approach is consistent with regulatory best practice for the management of complex and inter-dependent risks.

1.1.2 Purpose and Outline

The Act:
a) Requires water suppliers and water storage managers to prepare and implement Risk Management Plans (RMPs) to manage risk in relation to drinking water and some types of non-potable water.
b) Provides for the auditing of those plans by approved auditors.
c) Requires water suppliers to ensure that the drinking water they supply meets quality standards specified by the regulations.
d) Requires water suppliers to disclose to the public information concerning the quality of drinking water.

e) Provides for the variation, after community consultation, of water quality standards that relate only to aesthetic factors.
f) Requires the reporting of known or suspected contamination of drinking water to the Department of Health (DH).

1.1.3 Definitions

The Act provides the following definitions for water quality classification:

Drinking Water
Water that is intended for human consumption or for purposes connected with human consumption, such as the preparation of food or the making of ice for consumption or for the preservation of unpackaged food, whether or not the water is used for other purposes.

Regulated Water
Regulated water is defined as water that is not drinking water but may in circumstances be mistaken as being drinking water according to Section 6 (2) in the Act.

1.1.4 Safe Drinking Water Regulations 2015

This annual report includes the specific requirements from the Regulations.

The objective of the Regulations is to give effect to key aspects of the Act. In particular, the Regulations:
a) Specifies the major elements to be incorporated in risk management plans.
b) Specifies the standards relating to the quality of drinking water supplied to customers by water suppliers.
c) Specifies criteria for approval of auditors.
d) Specifies details to be included in annual reports.

1.1.5 *Health Fluoridation Act 1973*

The *Health Fluoridation Act 1973* governs the addition of fluoride to drinking water. Fluoridation of drinking water supplies requires a preventive risk management approach. For this purpose, the Code of practice for fluoridation of drinking water supplies, second edition (2018) supports utilities in the adoption and safe operation of fluoride addition to drinking water supplies.

1.2 Australian Drinking Water Guidelines 2011

The Australian Drinking Water Guidelines 2011 (ADWG) provide a framework for the management of drinking water supplies and is designed to assure safety at point of use. The ADWG has been developed after consideration of the best available scientific evidence.

The ADWG provides an authoritative reference of what comprises safe, good quality water, how it can be achieved and how it can be assured. The ADWG is concerned with both health and aesthetic quality.

The ADWG is the authoritative reference of what constitutes safe, good quality water, and aligns with the Victorian's Safe Drinking Water Regulatory Framework. The ADWG and Safe Drinking Water Regulations are consistent with the Act, and provide a basis for determining the quality of water to be supplied to consumers in all parts of Australia. These need to consider the diverse array of regional or local factors, and consider economic, political and cultural issues, including customer expectations and willingness and the ability to pay.

The ADWG are intended for use by the Australian community and all agencies with responsibilities associated with the supply of drinking water, including catchment and water resource managers, drinking water suppliers, water regulators and health authorities.

1.3 GWMWater Drinking Water Quality Policy

GWMWater is committed to managing its water supply to provide safe drinking water that meets the ADWG, other regulatory and consumer expectations. For this purpose, GWMWater has a drinking water quality policy (Figure 1-1) that provides the framework for managing the risks involved in harvesting, treating and distributing drinking water. GWMWater's drinking water quality policy was last updated January 2023 and is next due for review in 2026.

GWMWater is committed to managing its water supply effectively to provide a safe high quality drinking water that consistently meets the Australian Drinking Water Guidelines and consumer and other regulatory requirements.

To achieve this, in partnership with stakeholders and relevant agencies, GWMWater will:

- Manage water quality at all points along the delivery chain from catchment to the customers' tap.
- Use a risk based approach in which potential threats to water quality are identified and balanced.
- Integrate the needs and expectations of our customers, stakeholders, regulators and employees into our planning.
- Establish regular monitoring of the quality of drinking water and effective reporting mechanisms to provide relevant and timely information and promote confidence in the water supply and its management.
- Develop appropriate contingency planning and incident response capability.
- Participate in appropriate research and development activities to ensure continued understanding of drinking water quality issues and performance.
- Contribute to the debate on setting industry regulations and guidelines, and other standards relevant to public health and the water cycle.
- Continually improve our performance against corporate commitments and stakeholder expectations.

The organisation will implement and maintain a water quality management system consistent with the Australian Drinking Water Guidelines to effectively manage the risks to drinking water quality.

All GWMWater employees involved in the supply of drinking water are responsible for understanding, maintaining and continuously improving the water quality management system.

Mark Williams
Managing Director

Peter Vogel
Chairman

GWMWater

CMS/2747V1

Figure 1-1 - Statement for GWMWater's Drinking Water Quality Policy.

1.4 Characterisation of the System

GWMWater's operational area is shown in Figure 1-2. Key components of the water supply system include:

1. Headworks system, comprising the area in and around the Grampians Ranges and the Wimmera River. The main storages are Lake Bellfield, Taylors Lake, Lake Wartook and Rocklands Reservoir. The total catchment area is 400,000 hectares with a maximum reservoir operating capacity of 522,000 megalitres.
2. GWMWater provides water to the majority of towns through two extensive pipeline systems.
    a. The Wimmera Mallee Pipeline (WMP) system, as follows:
        i. Supply Systems 1,2,3,4,6 and the South West Loddon Pipeline, all originate from the Grampians headworks and consist of 9,270 kilometres of pipeline; and
        ii. Supply System 5, draws water from the Murray River and consists of approximately 860 kilometres of pipeline.
    b. The Northern Mallee Pipeline (NMP) system consisting of 3,390 kilometres of pipeline which draws water from the Murray River.
3. A total of 1,620 kilometres of pipeline classified as urban, servicing the 71 urban water supplies.
4. Thirty-two towns receive water that is classified as drinking water (Table 1-1).
5. The fully treated water is supplied by 15 water treatment plants owned and operated by GWMWater, and a further 4 water treatment plants operated under a Build, Own, Operate and Transfer (BOOT) agreement. These BOOT plants are located at Halls Gap, Ararat, Great Western and Stawell, and as of 23 June 2014 have been operated by Trility, an independent private sector owner and operator.
6. GWMWater also supplies regulated water to 39 towns (Table 1-2).
   These supplies are harvested from a range of sources, including surface water and groundwater. Regulated supplies have low-level or no treatment, and is not intended for human consumption, drinking or food preparation.

1.5 Source of Water

GWMWater sources water from a range of surface water catchments, rivers and groundwater aquifers across the region. The catchments located within National Parks and State Forest are co-managed with Parks Victoria and DEECA – Department of Energy, Environment and Climate Action. GWMWater also works in partnership with Catchment Management Authorities, Local Government, Goulburn Murray Water, Coliban Water, and Wannon Water to address issues affecting water quality in the catchments from where water is sourced.

The Safe Drinking Water Regulations 2015 require water suppliers to detail the methodology used to quantify microbial hazards in source waters. GWMWater conducted sanitary surveys and vulnerability assessments of raw water source based on the drinking water source assessment and treatment requirements. GWMWater has a Hazard Analysis and Critical Control Points (HACCP) Plan for operation of the water treatment plants and supply system it operates to ensure the delivery of safe drinking water. Sanitary surveys, vulnerability assessment and HACCP are continuously reviewed, audited and improved.

Table 1-1 and Table 1-2 provide a summary of the source waters by water supply for both drinking water and regulated water. The populations recorded in these tables are based on GWMWater's residential connections and from Australian Bureau of Statistics census data of the average household size at each location.

Figure 1-2 - GWMWater's Operational Area.

Table 1-1 - Water Source for Drinking Water Supplies (32 Localities).

Locality	Source Water	Water Storages	Treatment Plant	Population
Ararat	Surface water (Lake Fyans, Mt Cole & Langi Ghiran Reservoirs)	Copes Hill and Olivers Gully earthen storages (raw) 1 x lined steel tank (treated) 1 x concrete elevated tank (treated)	Ararat WTP	8180
Beulah	Grampians Headworks (WMP)	2 x lined steel tanks (treated)	Warracknabeal WTP	300
Birchip	Grampians Headworks (WMP)	1 x lined earthen storages (raw) 2 x lined steel tanks (treated)	Birchip WTP	810
Brim	Grampians Headworks (WMP)	2 x lined steel tanks (treated) 1 x fibreglass elevated tank (treated)	Warracknabeal WTP	110
Charlton	Grampians Headworks (WMP)	1 x lined earthen storages (raw) 2 x lined steel tanks (treated) 1 x lined steel elevated tank (treated)	Charlton WTP	1130
Dimboola	Grampians Headworks (WMP)	2 x lined earthen storages (raw) 2 x lined steel tanks (treated)	Dimboola WTP	1630
Donald	Grampians Headworks (WMP)	2 x lined steel tanks (treated) 1 x lined steel elevated tank (treated)	St Arnaud WTP	1500
Edenhope	Groundwater (bores)	Fed directly from bores (raw) 1 x concrete tank (treated) 1 x elevated tank (treated)	Edenhope WTP	900
Great Western	Surface water (Lake Fyans)	1 x earthen storage (raw) 1 x lined steel tanks (treated)	Great Western WTP	260
Halls Gap	Surface water (Lake Bellfield, Dairy Creek)	Lake Bellfield and Dairy Creek earthen storages (raw) 1 x concrete tank (treated)	Halls Gap WTP	920
Hopetoun	Grampians Headworks (WMP)	1 x lined earthen storages (raw) 1 x lined steel tank (treated)	Hopetoun WTP	650
Horsham	Surface (Lake Wartook) and back up bore water and (Laharum bores)	1 x earthen storage (raw) 1 x concrete tank (treated) 1 x concrete storage (treated) 1 x concrete elevated tank (treated)	Mt Zero WTP	17160
Jeparit	Grampians Headworks (WMP)	2 x lined steel tanks (treated)	Rainbow WTP	530
Lake Bolac	Surface water (Mt William Creek, Stony Creek, Masons Creek) & Groundwater (bores)	1 x lined steel tank (raw) 1 x lined steel tanks (treated) 2 x lined steel tanks (treated)	Willaura WTP	300
Manangatang	Surface water (Murray River via NMP)	1 x lined steel tank (raw) 1 x lined steel tank (treated) 1 x lined steel elevated tank (treated)	Manangatang WTP	290
Minyip	Grampians Headworks (WMP)	2 x lined steel tanks (treated)	Murtoa WTP	500
Murtoa	Grampians Headworks (WMP)	2 x lined earthen storages (raw) 1 x lined steel tank (treated) 1 x lined steel elevated tank (treated)	Murtoa WTP	900
Natimuk	Surface (Lake Wartook) and back up bore water and (Laharum bores)	1 x lined steel tank (treated)	Mt Zero WTP	480
Nhill	Grampians Headworks (WMP)	3 x lined steel tanks (treated)	Dimboola WTP	2270

Locality	Source Water	Water Storages	Treatment Plant	Population
		1x elevated tank (treated)		
Ouyen	Surface water (Murray River via NMP)	1 x earthen storages (raw) 1 x lined steel tank (clarified) 1 x lined steel tank (treated) 2 x lined steel elevated tank (treated)	Ouyen WTP	1200
Pomonal	Surface water (Lake Bellfield)	1 x concrete tank (treated)	Halls Gap WTP	290
Quambatook	Surface water (Goulburn & Loddon Rivers) via Normanville Pipeline	1 x earthen storage (raw) 1 x steel elevated tank (treated)	Quambatook WTP	240
Rainbow	Grampians Headworks (WMP)	2 x lined earthen storages (raw) 1 x lined steel tank (treated)	Rainbow WTP	640
Rupanyup	Grampians Headworks (WMP)	2 x lined steel tanks (treated)	Murtoa WTP	450
Sea Lake	Grampians Headworks (WMP)	2 x lined steel tanks (treated)	Warracknabeal WTP	750
St Arnaud	Grampians Headworks (WMP)	Volcano lined & St Arnaud earthen storage (raw) 3 x concrete tanks (treated)	St. Arnaud WTP	2420
Stawell	Surface water (Lake Fyans, Lake Bellfield, Fyans Creek)	3 x earthen storages (raw) 1 x lined steel tank (treated) 2 x elevated tanks (treated)	Stawell WTP	6480
Underbool	Surface water (Murray River via NMP)	1 x lined steel tank (raw) 1 x lined steel tank (treated) 1 x elevated tank (treated)	Underbool WTP	230
Warracknabeal	Grampians Headworks (WMP)	2 x lined earthen storages (raw) 2 x lined steel tank (treated) 1 x steel elevated tank (treated)	Warracknabeal WTP	2500
Willaura	Surface water (Mt William Creek, Stony Creek, Masons Creek) and Groundwater (bores)	2 x earthen storages at Willaura and Mt Pleasant (raw) 1 x lined steel tank (treated) 1 x lined steel tank (treated)	Willaura WTP	420
Woomelang	Grampians Headworks (WMP)	2 x lined steel tanks (treated) 1 x steel elevated tank (treated)	Warracknabeal WTP	200
Wycheproof	Grampians Headworks (WMP)	2 x lined steel tanks (treated) 1 x concrete elevated tank (treated)	Charlton WTP	710

WMP – Wimmera Mallee Pipeline **NMP – Northern Mallee Pipeline**

Table 1-2 - Water Source for Regulated Water Supplies (39 Localities).

Water Supply	Source Water	Water Storages	Population
Antwerp	Grampians Headworks (WMP)	2 x poly lined steel tanks	20
Apsley	Groundwater (bores)	1 x elevated steel tank	210
Berriwillock	Surface water (Murray River via NMP)	2 x earthen storages	170
Buangor	Surface water (McLeods Creek)	1 x earthen storage	90
Chillingollah	Surface water (Murray River via NMP)	1 x concrete tank	10
Chinkapook	Surface water (Murray River via NMP)	1 x concrete tank	30
Cowangie	Groundwater (bores)	1 x elevated tank	20
Culgoa	Surface water (Murray River via NMP)	1 x earthen storage	90
Dooen	Grampians Headworks (WMP)	2 x poly tanks	40
Elmhurst	Surface water (Hickmans Creek)	1 x earthen storage	200
Glenorchy	Grampians Headworks (WMP)	1 x steel tank 1 x elevated steel tanks	120
Goroke	Groundwater (bores)	1 x elevated steel tanks	310
Harrow	Groundwater (bores) & surface water (Glenelg River)	2 x poly lined steel tanks	160
Jung	Grampians Headworks (WMP)	2 x poly lined steel tanks 1 x elevated steel tank	100
Kaniva	Groundwater (bores)	1x elevated concrete tank	860
Kiata	Groundwater (bores)	2 x poly tanks 1 x elevated steel tank	40
Lalbert	Surface water (Murray River via NMP)	2 x poly lined steel tanks 1 x elevated steel tank	90
Lascelles	Grampians Headworks (WMP)	2 x lined steel tanks	60
Lillimur	Groundwater (bores)	1x elevated steel tank	50
Marnoo	Grampians Headworks (WMP)	1 x steel tank	110
Miram	Groundwater (bores)	1 x elevated steel tank	20
Moyston	Surface water (Mt William, Stony and Masons Creeks) and Groundwater (bores)	1 x earthen storage	220
Murrayville	Groundwater (bores)	1 x elevated tank	330
Nandaly	Surface water (Murray River via NMP)	1 x concrete tank	30
Nullawil	Surface water (Murray River via NMP)	2 x lined steel tanks	80
Patchewollock	Surface water (Murray River via NMP)	1 x concrete elevated tank	90
Pimpinio	Grampians Headworks (WMP)	2 x lined earthen storages 1 x elevated tank storage	90
Serviceton	Groundwater (bores)	1 x elevated steel tank	70
Speed	Surface water (Murray River via NMP)	1 x concrete tank	60
Streatham	Groundwater (bores)	1 x earthen storage	100
Tarranyurk	Grampians Headworks (WMP)	2 x lined steel tanks	10
Tempy	Surface water (Murray River via NMP)	1 x steel tank 1 x concrete tank	50
Ultima	Surface water (Murray River)	2 x poly lined steel tanks 1 x elevated steel tank	170
Waitchie	Surface water (Murray River via NMP)	1 x concrete tank	10
Walpeup	Surface water (Murray River via NMP)	2 x earthen storages	130
Watchem	Grampians Headworks (WMP)	2 x poly lined steel tanks	150
Westmere	Groundwater (bores)	1 x earthen storage	20
Wickliffe	Surface water (Mt William, Stony and Masons Creeks) and Groundwater (bores)	1 x earthen storage	70
Yaapeet	Grampians Headworks (WMP)	2 x poly lined steel tanks	70

WMP – Wimmera Mallee Pipeline **NMP – Northern Mallee Pipeline**

2 Quality Management System

2.1 Water Treatment

The water treatment processes utilised at the drinking water treatment plants are shown in Table 2-1.

Table 2-1 - Water Treatment Processes and Chemicals in Drinking Water Towns (32 Localities).

Water Sampling Localities	Treatment Processes	Chemicals that can be added
Ararat*^	Coagulation, flocculation, dissolved air flotation, filtration, chlorine disinfection, pH correction, fluoridation	Lime, potassium permanganate, powder activated carbon, aluminium sulphate (alum), polymer, chlorine, hydrofluorosilicic acid
Beulah	Receives water from Warracknabeal WTP, booster disinfection	Chlorine
Birchip*	Coagulation, flocculation, dissolved air flotation, filtration, chlorine disinfection, pH correction	Aluminium chlorohydrate (Megapac 23), sodium hydroxide, chlorine
Brim	Receives water from Warracknabeal WTP, booster disinfection	Chlorine
Charlton*	Coagulation, flocculation, dissolved air flotation, filtration, chlorine disinfection, pH correction	Aluminium chlorohydrate (Megapac 23), chlorine
Dimboola*	Coagulation, flocculation, dissolved air flotation, filtration, chlorine, disinfection, pH correction	Sodium hydroxide, aluminium chlorohydrate (Megapac 23), chlorine
Donald	Receives water from St Arnaud WTP, booster disinfection	Chlorine
Edenhope*	Coagulation, flocculation, dissolved air flotation, filtration, desalination, chlorine disinfection	Aluminium chlorohydrate (Megapac 23), chlorine
Great Western*^	Microfiltration, chlorine disinfection, pH correction	Sulphuric acid, aluminium chlorohydrate (Megapac 23), sodium hydroxide, chlorine
Halls Gap*^	Coagulation, flocculation, dissolved air flotation, filtration, chlorine disinfection, pH correction	Lime, aluminium sulphate (alum), polymer, chlorine
Hopetoun*	Coagulation, flocculation, dissolved air flotation, filtration, chlorine disinfection, pH correction	Aluminium chlorohydrate (Megapac 23), chlorine
Horsham*	Powdered activated carbon dosing, coagulation, flocculation, dissolved air flotation, filtration, chlorine disinfection, pH correction, fluoridation	Lime, aluminium chlorohydrate (Megapac 23), chlorine, carbon dioxide, hydrofluorosilicic acid
Jeparit	Receives water from Rainbow WTP, booster disinfection	Chlorine
Lake Bolac	Receives water from Willaura WTP	None at Lake Bolac

Water Sampling Localities	Treatment Processes	Chemicals that can be added
Manangatang*	Coagulation, flocculation, dissolved are floatation, multimedia filtration, microfiber filtration (2 µm), chlorine disinfection	Ultrion 44560 coagulant, chlorine
Minyip	Receives water from Murtoa WTP, booster disinfection	Chlorine
Murtoa*	Coagulation, flocculation, dissolved air flotation, filtration, pH correction, chlorine disinfection	Sodium hydroxide, Aluminium chlorohydrate (Megapac 23), chlorine
Natimuk	Receives water from Horsham WTP, booster disinfection	Chlorine
Nhill	Receives water from Dimboola WTP, booster disinfection	Chlorine
Ouyen*	Coagulation, flocculation, dissolved air flotation, Microfiltration, chlorine disinfection, UV disinfection	Aluminium chlorohydrate (Megapac 23), chlorine
Pomonal	Receives water from Halls Gap WTP, booster disinfection	Chlorine
Quambatook*	Coagulation, flocculation, dissolved air flotation, filtration, granular activated carbon filtration, pH correction, chlorine disinfection	Aluminium chlorohydrate (Megapac 23), hydrochloric acid, chlorine
Rainbow*	Coagulation, flocculation, dissolved air flotation, filtration, chlorine disinfection	Aluminium chlorohydrate (Megapac 23), chlorine
Rupanyup	Receives water from Murtoa WTP, booster disinfection	Chlorine
Sea Lake	Receives water from Warracknabeal WTP, booster disinfection	Chlorine
St Arnaud*	Coagulation, flocculation, dissolved air flotation, filtration, pH correction, chlorine disinfection	Aluminium chlorohydrate (Megapac 23), sodium hydroxide, chlorine
Stawell*^	Coagulation, flocculation, dissolved air flotation, filtration, chlorine disinfection, pH correction	Lime, aluminium sulphate (alum), polymer, chlorine
Underbool*	Clarified water from Ouyen, coagulation, flocculation, sand filters, pH correction, chlorine disinfection, UV disinfection	Ultrion 44560 coagulant, chlorine
Warracknabeal*	Coagulation, flocculation, dissolved air flotation, filtration, pH correction, chlorine disinfection	Lime, aluminium chlorohydrate (Megapac 23), chlorine
Willaura*	Coagulation, flocculation, dissolved air flotation, microfiltration, pH correction, disinfection by chloramination	Soda ash, calcite, aluminium chlorohydrate (Megapac 23), sodium hypochlorite, carbon dioxide, ammonia
Woomelang	Receives water from Warracknabeal WTP, booster disinfection	Chlorine
Wycheproof	Receives water from Charlton WTP, booster disinfection	Chlorine

^ *Operated by Trility under a BOOT Contract*
* *Localities with a Water Treatment Plant*

Table 2-2 - Water Treatment Processes and Chemicals in Regulated Towns.

Water Supply	Treatment Processes	Chemicals used in Treatment
Berriwillock	Coagulation	PolyDADMAC
Culgoa	Coagulation	PolyDADMAC
Glenorchy	Coagulation	PolyDADMAC
Jung	Coagulation, disinfection	PolyDADMAC, chlorine
Lalbert	Coagulation, disinfection	PolyDADMAC, chlorine
Marnoo	Coagulation	PolyDADMAC
Murrayville	Disinfection	Chlorine
Nullawil	Coagulation	PolyDADMAC
Ultima (up to January 2023)	Coagulation, disinfection	PolyDADMAC, chlorine
Ultima (from January 2023)	Received water treated at Swan Hill WTP by: coagulation, powdered activated carbon, clarification, media filtration, pH adjustment, chlorine disinfection, fluoridation.	Caustic soda, powdered activated carbon, aluminium chlorohydrate (Megapac 23), polymer, chlorine, fluoride.
Walpeup	Disinfection	Chlorine
Watchem	Coagulation, disinfection	PolyDADMAC, sodium hypochlorite, hydrochloric acid

2.2 Water Treatment Changes

In December 2022, a dissolved air flotation (DAF) system was commissioned at Ouyen to treat Murray River source water. The Murray River was experiencing poor water quality from floodwaters at the time. The Murray River water is sourced from the Wemen pump station to the Ouyen storages. Water is then pumped from the Ouyen storages to the DAF tank and dosed just prior with Megapac 23 coagulant. The DAF treated water is then stored in a clarified water tank that supplies rural stock and domestic customers; regulated towns of Walpeup, Patchewollock, Tempy, Speed and Nandaly; and the Ouyen and Underbool water treatment plants (WTPs). Likewise, a DAF was installed to pre-treat the Murray River raw water fed to the Manangatang WTP.

The DAF treatment process significantly improves the quality of water to rural and regulated town customers. This is particularly important for Murray River supplies, to protect against high turbidity and colour events. Pre-treatment by DAF also gives a much more effective WTP system for both dissolved organic and turbidity removal. This leads to public health benefit in better pathogen removal and higher quality of treated water against both health and aesthetic targets. From an operational point of view the ability of the WTPs to cope under water quality events from the Murray River are also greatly enhanced, improving the reliability of drinking water supply.

Ultra-violet (UV) disinfection was added to Ouyen and Underbool WTPs in March 2023 to meet the health based removal targets for these systems. The Murray River is categorised as an unprotected catchment meaning it has an increased pathogen risk, requiring a higher level of treatment. Installation of UV disinfection provides an additional barrier to

pathogens along with the existing filtration and chlorine disinfection barriers. This helps to ensure continued delivery of safe drinking water to customers.

2.3 Water Treatment Issues

Issues related to water quality that occurred in 2022/2023 include:

- Trihalomethanes exceedance in Natimuk in January 2023 (Section 18 notification).
- Trichloroacetic acid exceedance in Ouyen in October 2022 (Section 18 notification).
- Trichloroacetic acid exceedance in Great Western in January and February 2023 (Section 18 notifications).
- *E. coli* detected in Manangatang in November 2022 (Section 22 report).
- *E. coli* detected in Ararat in November 2022 (Section 22 report).
- Low chlorine event in Horsham in January 2023 (Section 22 report).
- Sample results returning *E. coli* in water trailers at Lalbert, Nullawil and Walpeup (Section 22 reports).

These issues are discussed further in the Section 10 Emergency, Incident and Event Management.

3 Drinking Water Quality Results

For the 2022/2023 year, the sampling frequency and drinking water quality standards for *Escherichia coli*¸ trihalomethanes and turbidity were as specified in Schedule 2 under the Regulations (Table 3-1).

Table 3-1 – Summary of sampling and 2022/2023 results to meet Schedule 2 under the Regulations.

Parameter	Sampling frequency	Benchmark compliance standard	All Standards met	Comments
Escherichia coli (*E. coli*)	Weekly	No *Escherichia coli* per 100 mL of drinking water, with the exception of any false positive samples.	Yes	All localities were compliant for the period. Refer to Section 3.1 for details.
Trihalomethanes (THM)	Monthly	Must not exceed 0.25 mg/L.	No	The locality of Natimuk was not compliant with a section 18s notification made. Refer to Section 3.2 for details.
Turbidity	Weekly	95th percentile of results for samples in any 12 months must be ≤ 5.0 NTU.	Yes	All localities were compliant for the period. Refer to Section 3.3 for details.

The water sampling program is based on ADWG recommendations, specific risks, historical data and operational changes, from catchment to tap. The water sampling points are located within a water sampling locality and are designed to ensure that the samples collected are representative of the supply system. Samples are sent to a National Association of Testing Authorities (NATA) accredited laboratory for analysis. If a sample result is at the lower limit of detection the conservative approach outlined in Guidance – Drinking Water Quality Standards of adopting the detection limit without the less than qualifier is used in this report.

The sampling program is reviewed periodically and as risk changes to align with changes in the risk profile of each locality. The review of the sampling program involves risk assessing each parameter based on the frequency that it is expected to exceed limits at that location and the consequence of the parameter exceeding that limit. This is conducted over all regulated and drinking water systems from catchment to tap, and a conclusion made on the frequency of sampling required to appropriately manage identified risks. The current sampling program was implemented in July 2021, with any changes noted in Table 3-2.

Regulation 6 of the Regulations states that a water sampling locality is:

- An area supplied with drinking water.
- A discrete area of similar water quality – generally water entering the area is supplied from a common source.
- Inclusive of all consumers supplied with drinking water of similar water quality.
- Able to be described by its boundaries.

Table 3-2 – Changes in water quality sampling frequency (2021/2022 compared with 2022/2023).

Parameter(s)	Town(s)	Change	Reason
Hardness and alkalinity	Edenhope	Annual to quarterly.	High detection of hardness in previous reporting period.

3.1 Escherichia coli (*E. coli*)

The health impacts and epidemiology of thermotolerant coliforms, and specifically *E. coli,* are described in detail in the ADWG fact sheet. *E. coli* is used as a specific indicator of faecal contamination and hence is a measure used to determine the drinking water safety. *E. coli* should not be detected in a sample of drinking water. If detected, immediate action is taken.

As required by the Regulations, at least one sample of drinking water is collected each week from each water sampling locality, with more samples per week for towns with population over 5000 recommended by the ADWG. All samples of drinking water collected in any 12 months period must contain no *E. coli* per 100 mL, with the exception of any false positive sample. In the case that *E. coli* is detected, an investigation is conducted in accordance with regulation 14 to determine whether the result was representative of the drinking water in the relevant locality. A false positive is considered to have occurred where the water supplier can demonstrate that treatment and control systems were in place, and the detection is more likely be from an external factor such as laboratory or sampling error.

3.1.1 Results

E. coli sampling and analysis was undertaken at two sites weekly for the larger potable towns of Ararat, Horsham and Stawell, and weekly for all other smaller potable towns.

The weekly samples from Edenhope, Horsham and Natimuk were missed on 12 January 2023 due to the courier not delivering sample bottles to the laboratory in the required time. Refer to Section 5 Analysis of Results for further details.

A sample from the locality of Manangatang recorded 1 *E. coli*/100 mL on the 7 November 2022. The Department of Health (DH) was provided with a Section 22 report immediately and following investigation it was found the likely cause of the *E. coli* result was from sampling from a contaminated tap. There were no contributing factors to cause the *E. coli* result in accordance with (c)(i)(ii)(iii) or (iv) in Schedule 2 of the Regulations, thus the *E. coli* event was a false positive. Please refer to Section 10 Emergency, Incident and Event Management for further details.

All other samples met the standard for the reporting period (Table 3-3).

Table 3-3 – Results for Escherichia coli in Drinking Water: 1 July 2022 – 30 June 2023. All samples of drinking water collected in any 12 months period must contain no E. coli/100 mL, with the exception of any false positive samples.

Sampling Locality	Sampling Frequency	No. of Samples	Maximum (*Escherichia coli*/100 mL)	No. of samples where standard was not met (S 18)
Ararat*	Weekly (2)	104	0	0
Beulah	Weekly	52	0	0
Birchip	Weekly	52	0	0
Brim	Weekly	52	0	0
Charlton	Weekly	52	0	0
Dimboola	Weekly	52	0	0
Donald	Weekly	52	0	0
Edenhope	Weekly	51	0	0
Great Western	Weekly	52	0	0
Halls Gap	Weekly	52	0	0
Hopetoun	Weekly	52	0	0
Horsham*	Weekly (2)	102	0	0
Jeparit	Weekly	52	0	0
Lake Bolac	Weekly	52	0	0
Manangatang	Weekly	52	1	0^
Minyip	Weekly	52	0	0
Murtoa	Weekly	52	0	0
Natimuk	Weekly	51	0	0
Nhill	Weekly	52	0	0
Ouyen	Weekly	52	0	0
Pomonal	Weekly	52	0	0
Quambatook	Weekly	52	0	0
Rainbow	Weekly	52	0	0
Rupanyup	Weekly	52	0	0
Sea Lake	Weekly	52	0	0
St. Arnaud	Weekly	52	0	0
Stawell*	Weekly (2)	104	0	0
Underbool	Weekly	52	0	0
Warracknabeal	Weekly	52	0	0
Willaura	Weekly	52	0	0
Woomelang	Weekly	52	0	0
Wycheproof	Weekly	52	0	0

** Due to the population size of these towns two samples are taken.*
^The E. coli reading was found to be false positive.

3.2 Trihalomethanes (THMs)

Trihalomethanes (THMs) are a disinfection by-product present in drinking water, principally as the result of a reaction between organic and inorganic material in the water with chlorine, and to a lesser extent chloramine.

Based on health considerations, the concentration of THMs, either individually or in total, in drinking water should not exceed 0.25 mg/L.

3.2.1 Results

THM sampling and analysis was undertaken on a minimum monthly basis for all drinking water supplies.

There was an exceedance of trihalomethanes above the 0.25 mg/L limit of the Regulations in the locality of Natimuk on 5 January 2023 of 0.29 mg/L. This was rapidly resolved by decreasing the chlorine dosing rate at Natimuk PS, flushing of the relevant section of the reticulation, with resamples returning results below the regulated limit. At these levels trihalomethanes are only a long term health factor under prolonged exposure, with the ADWG stating that occasional fluctuations up to 1 mg/L are unlikely to pose a significant health risk. Hence, this one off event of detections of trihalomethanes in a low range above the regulated limit is not expected to be of health concern. GWMWater continues to operate the upstream Horsham WTP and Natimuk PS booster chlorination within levels that minimise trihalomethane formation while continuing to provide adequate chlorine residual to protect public health risk from pathogens. Please refer to Section 10 Emergency, Incident and Event Management for further details.

All other localities met the standard for this reporting period (Table 3-4).

Table 3-4 – Results for Trihalomethanes in Drinking Water: 1 July 2022 – 30 June 2023. The concentration of THMs must not exceed 0.25 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat*	Monthly (2)	24	0.130	0.080	0
Beulah	Monthly	12	0.099	0.065	0
Birchip	Monthly	12	0.057	0.033	0
Brim	Monthly	12	0.091	0.075	0
Charlton	Monthly	12	0.096	0.068	0
Dimboola	Monthly	12	0.070	0.046	0
Donald	Monthly	12	0.097	0.071	0
Edenhope	Monthly	12	0.150	0.094	0
Great Western	Monthly	12	0.250	0.154	0
Halls Gap	Monthly	12	0.097	0.055	0
Hopetoun	Monthly	12	0.074	0.043	0
Horsham*	Monthly (2)	24	0.170	0.104	0
Jeparit	Monthly	12	0.100	0.063	0
Lake Bolac	Monthly	12	0.018	0.007	0
Manangatang	Monthly	12	0.220	0.100	0
Minyip	Monthly	12	0.065	0.056	0
Murtoa	Monthly	12	0.093	0.066	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Natimuk	Monthly	12	0.290	0.146	1
Nhill	Monthly	12	0.067	0.054	0
Ouyen	Monthly	12	0.240	0.144	0
Pomonal	Monthly	12	0.089	0.071	0
Quambatook	Monthly	12	0.230	0.169	0
Rainbow	Monthly	12	0.063	0.045	0
Rupanyup	Monthly	12	0.078	0.066	0
Sea Lake	Monthly	12	0.140	0.093	0
St. Arnaud	Monthly	12	0.078	0.056	0
Stawell*	Monthly (2)	24	0.088	0.064	0
Underbool	Monthly	12	0.120	0.095	0
Warracknabeal	Monthly	12	0.120	0.081	0
Willaura	Monthly	12	0.017	0.008	0
Woomelang	Monthly	12	0.120	0.082	0
Wycheproof	Monthly	12	0.079	0.065	0

** Due to the population size of these towns two samples are taken every month.*

3.3 Turbidity

Turbidity is caused by the presence of very fine suspended matter, such as clay, silt, colloidal particles, plankton and other microscopic organisms in water. High turbidity can result in a water sample having a 'muddy' or 'milky' appearance.

Turbidity is a measurement of the light scattering property of water, and the degree of scattering is dependent on the amount, size and composition of the suspended matter.

The ADWG fact sheet contains a detailed account of turbidity and its implications for water supply. The Regulations require that the 95th percentile of results for samples in any 12-month period must not exceed 5 Nephelometric Turbidity Units (NTU). The ADWG also recommends turbidity should not exceed 5 NTU for aesthetic purposes.

3.3.1 Results

Turbidity sampling and analysis is undertaken as a minimum, on a weekly basis for all drinking water supplies.

The weekly samples from Edenhope, Horsham and Natimuk were missed 12 January 2023 due to the courier not delivering sample bottles to the laboratory in the required time. Refer to Section 5 Analysis of Results for further details.

All sites met the standard for turbidity for the reporting period (Table 3-5).

Table 3-5 – Results for turbidity in Drinking Water: 1 July 2022 – 30 June 2023. The 95th percentile of results for samples in any 12 month period must be less than or equal to 5.0 NTU.

Sampling Locality	Sampling Frequency	No. of Samples	Max (NTU)	Max 95th percentile in any 12 months (NTU)	No. of 95th percentile of results in any 12 months above standard (S 18)
Ararat*	Weekly (2)	104	0.3	0.3	0
Beulah	Weekly	52	1.4	0.2	0
Birchip	Weekly	52	0.2	0.2	0
Brim	Weekly	52	0.6	0.5	0
Charlton	Weekly	52	1.0	0.4	0
Dimboola	Weekly	52	0.2	0.2	0
Donald	Weekly	52	0.2	0.2	0
Edenhope	Weekly	51	0.6	0.5	0
Great Western	Weekly	52	1.0	0.2	0
Halls Gap	Weekly	52	4.5	0.3	0
Hopetoun	Weekly	52	0.6	0.4	0
Horsham*	Weekly (2)	102	0.2	0.3	0
Jeparit	Weekly	52	0.6	0.4	0
Lake Bolac	Weekly	52	0.2	0.2	0
Manangatang	Weekly	52	0.7	0.4	0
Minyip	Weekly	52	0.3	0.3	0
Murtoa	Weekly	52	1.4	1.0	0
Natimuk	Weekly	51	0.9	0.9	0
Nhill	Weekly	52	0.2	0.2	0
Ouyen	Weekly	52	0.4	0.1	0
Pomonal	Weekly	52	3.5	1.4	0
Quambatook	Weekly	52	0.2	0.2	0
Rainbow	Weekly	52	0.9	0.4	0
Rupanyup	Weekly	52	0.3	0.3	0
Sea Lake	Weekly	52	0.3	0.2	0
St. Arnaud	Weekly	52	0.4	0.4	0
Stawell*	Weekly (2)	104	1.9	0.2	0
Underbool	Weekly	52	0.4	0.1	0
Warracknabeal	Weekly	52	0.3	0.1	0
Willaura	Weekly	52	2.4	0.5	0
Woomelang	Weekly	52	2.5	0.5	0
Wycheproof	Weekly	52	0.6	0.6	0

** Due to the population size of these towns two samples are taken every week.*

3.4 Other chemicals, pathogens, algal toxins or substance that may pose a risk to human health

Regulation 12(b) requires the water supplier to ensure that the drinking water supplied to customers does not contain any chemical, toxin, pathogen or other substance at the levels that may pose a risk to human health. The ADWG fact sheets contain a detailed account of other water quality standards and their implications for water supply.

3.4.1 Algal toxins, pesticides and radiological parameters

The sampling of Algal toxins, pesticides and radiological parameters is risk-based. All tests of pesticides, algal toxins or radiological parameters in raw water storages and reservoirs for drinking water supplies were well within ADWG values.

3.4.2 Chlorine

Chlorine is used extensively as a disinfectant for drinking water supplies. The fact sheets in the ADWG provide a detailed account of the health impacts and other considerations relating to chlorine.

In addition to chlorine sampling in the reticulation, chlorine contact times are calculated for each drinking water town to ensure the water delivered to customers has sufficient disinfection. Critical alarms are adjusted at the WTP to meet this chlorine contact time and customer aesthetic expectations. Based on health considerations, the guideline value for chlorine in drinking water is 5 mg/L, the ADWG also gives general guidance that chlorine should be at least 0.2 mg/L at the end of the reticulation system. GWMWater aims to meet this guidance by providing adequate chlorine dose at the WTP.

3.4.2.1 Results

Free chlorine was measured in localities treated by chlorination, and total chlorine was measured in localities treated by chloramination systems. All results met the standard for the reporting period.

Table 3-6 - Concentrations of chlorine in Drinking Water for 1 July 2022 – 30 June 2023.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat*	Weekly (2)	104	1.04	0.62	0
Beulah	Weekly	52	1.74	1.23	0
Birchip	Weekly	52	1.91	1.29	0
Brim	Weekly	52	1.00	0.73	0
Charlton	Weekly	52	1.23	0.57	0
Dimboola	Weekly	52	1.25	0.99	0
Donald	Weekly	52	1.30	0.77	0
Edenhope	Weekly	52	1.10	0.75	0
Great Western	Weekly	52	1.15	0.33	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Halls Gap	Weekly	52	1.75	1.01	0
Hopetoun	Weekly	52	1.86	1.09	0
Horsham*	Weekly (2)	104	1.40	0.88	0
Jeparit	Weekly	52	1.65	0.81	0
Lake Bolac (Total Chlorine)	Weekly	52	2.20	1.48	0
Manangatang	Weekly	52	1.76	0.92	0
Minyip	Weekly	52	2.00	0.81	0
Murtoa	Weekly	52	1.10	0.74	0
Natimuk	Weekly	52	1.40	0.82	0
Nhill	Weekly	52	1.20	0.75	0
Ouyen	Weekly	52	1.65	0.76	0
Pomonal	Weekly	52	1.10	0.56	0
Quambatook	Weekly	52	1.61	0.94	0
Rainbow	Weekly	52	1.73	1.10	0
Rupanyup	Weekly	52	1.32	0.87	0
Sea Lake	Weekly	52	1.58	1.05	0
St. Arnaud	Weekly	52	1.30	0.98	0
Stawell*	Weekly (2)	104	2.01	0.55	0
Underbool	Weekly	52	1.82	1.16	0
Warracknabeal	Weekly	52	1.00	0.77	0
Willaura (Total Chlorine)	Weekly	52	2.20	1.64	0
Woomelang	Weekly	52	1.34	0.92	0
Wycheproof	Weekly	52	1.49	0.95	0

** Due to the population size of these towns two samples are taken every sampling visit.*

3.4.3 Fluoride

Fluoride is added to some water supplies to help protect teeth against dental decay. Based on health considerations, the concentration of fluoride in fluoridated drinking water supplies should not exceed 1.5 mg/L and Under s. 5 (3) of the *Health (Fluoridation) Act 1973*, fluoride added to drinking water must not result in an average optimum concentration of 1 mg/L. A detailed description of fluoride and its implications in a water supply can also be found by reference to the ADWG.

GWMWater has three fluoridated water supplies, including Ararat, Horsham and Natimuk. Fluoridation was installed at the Horsham WTP in November 2006 and Ararat WTP in August 2016. Natimuk receives treated water from Horsham.

3.4.3.1 Results

The sampling of fluoride is based on ADWG recommendations, the Code of practice for fluoridation of drinking water supplies, risks, historical data and any operational changes.

No water supplies exceeded the ADWG health-based guideline value for fluoride, and the average fluoride concentration delivered did not exceed the 1 mg/L (0.1 mg/L over the optimum target of 0.9 mg/L) designated by the *Health (Fluoridation) Act 1973* (Table 3-7).

The weekly samples from Horsham and Natimuk were missed 12 January 2023 due to the courier not delivering sample bottles to the laboratory in the required time. Refer to Section 5 Analysis of Results for further details.

The average fluoride concentration in Horsham (0.78 mg/L) and Natimuk (0.77 mg/L) for 2022/2023 improved compared with the 2021/2022 reporting period averages for Horsham (0.61 mg/L) and Natimuk (0.58 mg/L), and was still less than the optimum target of 0.9 mg/L. GWMWater's second stage of fluoride improvements is to be undertaken in future which is expected to make the optimum fluoride concentration more achievable.

Table 3-7 - Fluoride Results in Drinking Water for 1 July 2022 – 30 June 2023. The total concentration of fluoride should not exceed 1.5 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	Target optimum concentration (mg/L)	No. of samples where standard was not met (S 18)
Ararat*	Weekly (2)	104	0.99	0.89	0.9	0
Horsham*	Weekly (2)	102	0.90	0.78	0.9	0
Natimuk	Weekly	51	0.85	0.77	0.9	0

** Due to the population size of these towns two samples are taken every sampling visit.*

3.4.4 Chloroacetic acids

Chloroacetic acids (monochloroacetic acid, dichloroacetic acid and trichloroacetic acid) are produced in drinking water as disinfection by-products (DBPs) of the reaction between chlorine and naturally occurring humic and fulvic acids. The fact sheets in ADWG provide a detailed account of the health impacts and other considerations relating to chloroacetic acids.

3.4.4.1 Results

The sampling of these parameters is based on ADWG recommendations, risks, historical data and any operational changes. There were four missed samples for chloroacetic acids from the Great Western locality during this reporting period. This was due to an error where between August 2022 and December 2023 the sampling and analysis of chloroacetic acids was scheduled on a quarterly rather than the monthly basis as was determined by the risk based sampling program. GWMWater wrote to DH in February 2023 in this regard and the scheduling frequency has since been updated to be monthly.

There was exceedance of trichloroacetic acid above the 0.10 mg/L ADWG limit in the locality of Ouyen on 3 October 2022 of 0.11 mg/L. There was an exceedance of trichloroacetic acid in the locality of Great Western on 3 January 2023 of 0.21 mg/L, and during the same event on 6 February 2023 of 0.12 mg/L while improvements were still taking effect. Other sampled disinfection by-products, of chloroacetic acid, dichloroacetic acid and trihalomethanes were all below ADWG for these localities for the year. A s.18 notification was provided to DH for both localities, with further details available in Section 10 Emergency, Incident and Event Management.

Table 3-8 - Concentrations of Monochloroacetic Acid in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of monochloroacetic acid should not exceed 0.15 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)
			Max	Average	
Great Western	Monthly	8	0.005	0.005	0
Ouyen	Quarterly	4	0.005	0.005	0

Table 3-9 - Concentrations of Dichloroacetic Acids in Drinking Water of 1 July 2022 – 30 June 2023. The concentration of dichloroacetic acid should not exceed 0.1 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)
			Max	Average	
Great Western	Monthly	8	0.055	0.022	0
Ouyen	Quarterly	4	0.043	0.036	0

Table 3-10 - Concentrations of Trichloroacetic Acids in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of trichloroacetic acid should not exceed 0.1 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)
			Max	Average	
Great Western	Monthly	8	0.210	0.089	2
Ouyen	Quarterly	4	0.110	0.073	1

3.4.5 Ammonia, Nitrite, Nitrate and NDMA

Ammonia: Based on aesthetic considerations, ammonia in drinking water should not exceed 0.5 mg-NH_3/L. Presence of ammonia can increase nitrification (nitrite and nitrate formation).

Nitrite: Based on health considerations, the concentration of nitrite in drinking water should not exceed 3 mg-NO_2/L, equivalent to 0.913 mg N/L. Nitrite can be formed by nitrifying bacteria in reticulations of chloramination systems.

Nitrate: Based on health considerations, the concentration of nitrate in drinking water should not exceed 50 mg-NO_3/L, equivalent to 11.3 mg/L.

NDMA: Based on health considerations NDMA in drinking water should not exceed 0.0001 mg/L. NDMA forms when nitrates and nitrites are present and cross react with amines and can be a by-product of chloramination.

A detailed description of ammonia, nitrite, nitrate and NDMA and its implications in a water supply can be found by reference to the ADWG.

3.4.5.1 Results

Ammonia, Nitrite, Nitrate and NDMA were measured in the chloramination system of Willaura and Lake Bolac. The concentration of ammonia in both Willaura and Lake Bolac (Table 3-11) was above the ADWG aesthetic guideline value of 0.5 mg/L which is based on minimising corrosion in copper pipes and fittings. However, all results in these localities were below the ADWG stated odour threshold for ammonia in water of 1.5 mg/L; and there were no aesthetic water quality customer complaints for either Willaura or Lake Bolac. All the results for nitrite (Table 3-12), nitrate (Table 3-13) and NDMA (Table 3-14) met the standard for this reporting period.

Table 3-11 - Concentrations of Ammonia in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of Nitrite should not exceed 0.5 mg-NH_3/L (0.41 mg N/L).

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg N/L)	Average (mg N/L)	No of samples where standard was not met
Lake Bolac	Monthly	12	0.82	0.58	12
Willaura	Monthly	12	0.74	0.57	12

Table 3-12 - Concentrations of Nitrite in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of Nitrite should not exceed 3 mg-NO_2/L (0.913 mg N/L).

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg N/L)	Average (mg N/L)	No of samples where standard was not met (S 18)
Lake Bolac	Monthly	12	0.028	0.016	0
Willaura	Monthly	12	0.002	0.002	0

Table 3-13 - Concentrations of Nitrate in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of Nitrate should not exceed 50 mg-NO_3/L (11.3 mg N/L).

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg N/L)	Average (mg N/L)	No of samples where standard was not met (S 18)
Lake Bolac	Monthly	12	0.081	0.052	0
Willaura	Monthly	12	0.080	0.043	0

Table 3-14 - Concentrations of NDMA in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of NDMA should not exceed 0.0001 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No of samples where standard was not met (S 18)
Lake Bolac	Quarterly	4	0.000006	0.000005	0
Willaura	Quarterly	4	0.000007	0.000005	0

3.4.6 Arsenic

The concentration of arsenic should not exceed 0.01 mg/L in drinking water based on health consideration. Arsenic is naturally occurring element, which can be introduced into

water through dissolution of minerals and ore from industrial effluent and atmospheric deposition.

A detailed description of arsenic and its implications in a water supply can be found by reference to the ADWG.

3.4.6.1 Results

The sampling of arsenic is based on ADWG recommendations, risks, historical data and any operational changes. All samples for arsenic met the standard for the reporting period (Table 3-15).

Table 3-15 - Concentrations of Arsenic in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of Arsenic should not exceed 0.01 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Edenhope	Monthly	12	0.003	0.002	0
Murtoa	Quarterly	4	0.001	0.001	0
Nhill	Quarterly	4	0.001	0.001	0

3.4.7 Lead

Lead can be present in drinking water as a result of dissolution from natural sources, or from household plumbing systems containing lead. Lead concentrations in drinking water can be reduced by conventional methods of water treatment using coagulants or lime softening.

Based on health considerations, the guideline value of lead in drinking water should not exceed 0.01 mg/L. The fact sheets in the ADWG provide a detailed account of the health impacts and other considerations relating to lead.

3.4.7.1 Results

The sampling of lead is based on ADWG recommendations, risks and historical data. All samples for lead met the standard for reporting period (Table 3-16).

Table 3-16 - Concentrations of Lead in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of lead should not exceed 0.01 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat*	Quarterly (2)	8	0.002	0.001	0
Beulah	Quarterly	4	0.002	0.001	0
Birchip	Quarterly	4	0.003	0.002	0
Brim	Quarterly	4	0.001	0.001	0
Charlton	Quarterly	4	0.002	0.001	0
Dimboola	Quarterly	4	0.001	0.001	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Donald	Quarterly	4	0.001	0.001	0
Edenhope	Quarterly	4	0.001	0.001	0
Great Western	Quarterly	4	0.001	0.001	0
Halls Gap	Quarterly	4	0.001	0.001	0
Hopetoun	Quarterly	4	0.002	0.001	0
Horsham*	Quarterly (2)	8	0.001	0.001	0
Jeparit	Quarterly	4	0.002	0.001	0
Lake Bolac	Quarterly	4	0.001	0.001	0
Manangatang	Quarterly	4	0.006	0.002	0
Minyip	Quarterly	4	0.001	0.001	0
Murtoa	Quarterly	4	0.001	0.001	0
Natimuk	Quarterly	4	0.001	0.001	0
Nhill	Quarterly	4	0.001	0.001	0
Ouyen	Quarterly	4	0.001	0.001	0
Pomonal	Quarterly	4	0.001	0.001	0
Quambatook	Quarterly	4	0.001	0.001	0
Rainbow	Quarterly	4	0.002	0.001	0
Rupanyup	Quarterly	4	0.001	0.001	0
Sea Lake	Quarterly	4	0.001	0.001	0
St. Arnaud	Quarterly	4	0.001	0.001	0
Stawell*	Quarterly (2)	8	0.001	0.001	0
Underbool	Quarterly	4	0.001	0.001	0
Warracknabeal	Quarterly	4	0.001	0.001	0
Willaura	Quarterly	4	0.003	0.002	0
Woomelang	Quarterly	4	0.002	0.001	0
Wycheproof	Quarterly	4	0.003	0.002	0

** Due to the population size of these towns two samples are taken every sampling visit.*

3.4.8 Other metals

A suite of metals, scheduled on an annual basis, is sampled in the Stawell reticulation due to the presence of mining at the town. The standards recommended by the ADWG for these metals are listed in Table 3-17. Whether the ADWG standard is based on Health considerations or Aesthetic factors is also included. Each of these metals has a fact sheet in the ADWG that can be referred to for detailed information and their relevance in drinking water systems.

3.4.8.1 Results

All metals sampled in the annual metals suite at Stawell met the standard for the reporting period (Table 3-17).

Table 3-17 - Concentrations of Metals in Stawell Drinking Water for 1 July 2022 – 30 June 2023.

Sampling Locality	Sampling Frequency	No. of Samples	Max Result (mg/L)	Standard type	Standard (mg/L)	No. of samples where standard was not met (S 18)
Aluminium	Annual	2	0.04	Aesthetic	0.2	0
Antimony	Annual	2	0.001	Health	0.003	0
Arsenic	Annual	2	0.001	Health	0.01	0
Barium	Annual	2	0.019	Health	2	0
Beryllium	Annual	2	0.001	Health	0.06	0
Boron	Annual	2	0.02	Health	4	0
Cadmium	Annual	2	0.0002	Health	0.002	0
Chromium	Annual	2	0.001	Health	0.05	0
Cobalt	Annual	2	0.001	N/A	N/A	0
Copper	Annual	2	0.009	Aesthetic Health	1 2	0
Iron	Annual	2	0.04	Aesthetic	0.3	0
Lead	Annual	2	0.001	Health	0.01	0
Manganese	Annual	2	0.002	Aesthetic Health	0.1 0.5	0
Mercury	Annual	2	0.0001	Health	0.001	0
Molybdenum	Annual	2	0.001	Health	0.05	0
Nickel	Annual	2	0.001	Health	0.02	0
Selenium	Annual	2	0.001	Health	0.01	0
Silver	Annual	2	0.001	Health	0.1	0
Strontium	Annual	2	0.035	N/A	N/A	0
Thallium	Annual	2	0.001	N/A	N/A	0
Tin	Annual	2	0.001	None	None	0
Titanium	Annual	2	0.001	N/A	N/A	0
Vanadium	Annual	2	0.001	N/A	N/A	0
Zinc	Annual	2	0.003	Aesthetic	3	0

** Due to the population size of Stawell two samples are taken every sampling visit.*

4 Aesthetic Parameters

Individual monitoring results for 2022/2023 that exceed the aesthetic guideline value set out in ADWG are highlighted in the tables in this section.

4.1 pH

The aesthetic parameter, pH is a measure of the hydrogen ion concentration of water. It is measured on a logarithmic scale from 0 to 14. A pH of seven is neutral, while a pH greater than seven is alkaline, and a pH less than seven is acidic.

The ADWG suggests that, based on the need to reduce corrosion and encrustation in pipework, drinking water should have a pH value between pH 6.5 and pH 8.5.

4.1.1 Results

Sampling and laboratory analysis for pH during the reporting period was undertaken on a weekly basis for all drinking water towns (Table 4-1).

The weekly samples from Edenhope, Horsham and Natimuk were missed 12 January 2023 due to the courier not delivering sample bottles to the laboratory in the required time. Refer to Section 5 Analysis of Results for further details.

There were 4.8% of results across all samples that did not satisfy the aesthetic guideline values set out in the ADWG. The pH varies in the reticulation due to reaction with the pipeline, particularly when water usage is low leading to greater water age. The average pH for each town was within the expected ADWG range, and continuous monitoring at the WTPs showed no deviations in critical control limits of pH.

Table 4-1 - pH of Drinking Water for 1 July 2022 – 30 June 2023. pH value should be between pH 6.5 and pH 8.5.

Sampling Locality	Sampling Frequency	No. of Samples	Max pH	Min pH	Average pH
Ararat*	Weekly	104	7.77	6.90	7.29
Beulah	Weekly	52	7.84	6.18	7.04
Birchip	Weekly	52	8.67	6.01	6.76
Brim	Weekly	52	8.60	6.90	7.40
Charlton	Weekly	52	8.90	6.80	7.53
Dimboola	Weekly	52	8.00	6.80	7.12
Donald	Weekly	52	9.20	6.70	7.75
Edenhope	Weekly	51	8.20	6.80	7.60
Great Western	Weekly	52	8.35	6.90	7.44
Halls Gap	Weekly	52	7.70	6.24	7.14
Hopetoun	Weekly	52	8.95	5.81	7.00
Horsham*	Weekly	102	7.70	6.67	7.06
Jeparit	Weekly	52	9.88	6.30	7.26

Sampling Locality	Sampling Frequency	No. of Samples	Max pH	Min pH	Average pH
Lake Bolac	Weekly	52	9.50	7.00	8.16
Manangatang	Weekly	52	7.80	6.28	7.09
Minyip	Weekly	52	9.47	6.90	7.26
Murtoa	Weekly	52	8.00	6.80	7.30
Natimuk	Weekly	51	8.40	6.69	7.03
Nhill	Weekly	52	7.60	6.71	7.16
Ouyen	Weekly	52	8.08	6.54	7.54
Pomonal	Weekly	52	7.80	6.73	7.17
Quambatook	Weekly	52	8.27	6.52	7.62
Rainbow	Weekly	52	9.10	6.04	6.85
Rupanyup	Weekly	52	7.90	6.52	7.08
Sea Lake	Weekly	52	8.50	6.18	7.24
St Arnaud	Weekly	52	8.58	6.75	7.40
Stawell*	Weekly	104	8.00	6.75	7.31
Underbool	Weekly	52	8.10	6.63	7.67
Warracknabeal	Weekly	52	9.20	6.90	7.52
Willaura	Weekly	52	8.10	6.80	7.32
Woomelang	Weekly	52	8.61	5.82	7.24
Wycheproof	Weekly	52	8.68	6.48	7.10

** Due to the population size of these towns two samples are taken every sampling visit.*

4.2 Aluminium

Aluminium chlorohydrate (Megapac 23) is a coagulant used in water treatment to remove turbidity, natural organic matter (including colour), microorganisms and many inorganic chemicals. The coagulant is aluminium based, however, under normal operation, no aluminium is contained in the final drinking water.

As stated in the ADWG, based on aesthetic problems caused by post-flocculation, the concentration of acid-soluble aluminium in drinking water should not exceed 0.2 mg/L. Water agencies are strongly encouraged to keep acid-soluble aluminium concentrations as low as possible, preferably below 0.1 mg/L. There are no health-based guideline values set for aluminium at this time.

4.2.1 Results

The sampling of acid-soluble aluminium is based on ADWG recommendations, risks and historical data. All samples for acid-soluble aluminium met the standard for the reporting period (Table 4-2).

Table 4-2 – Aluminium acid-soluble in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of Aluminium acid-soluble should not exceed 0.2 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met
Ararat*	Monthly (2)	24	0.09	0.07	0
Beulah	Monthly	12	0.03	0.02	0
Birchip	Monthly	12	0.03	0.01	0
Brim	Monthly	12	0.03	0.02	0
Charlton	Monthly	12	0.12	0.03	0
Dimboola	Monthly	12	0.04	0.02	0
Donald	Monthly	12	0.04	0.02	0
Edenhope	Monthly	12	0.01	0.01	0
Great Western	Monthly	12	0.02	0.02	0
Halls Gap	Monthly	12	0.02	0.02	0
Hopetoun	Monthly	12	0.06	0.02	0
Horsham*	Monthly (2)	24	0.05	0.03	0
Jeparit	Monthly	12	0.05	0.02	0
Lake Bolac	Monthly	12	0.07	0.02	0
Manangatang	Monthly	12	0.02	0.01	0
Minyip	Monthly	12	0.03	0.02	0
Murtoa	Monthly	12	0.05	0.02	0
Natimuk	Monthly	12	0.08	0.04	0
Nhill	Monthly	12	0.03	0.02	0
Ouyen	Monthly	12	0.04	0.02	0
Pomonal	Monthly	12	0.05	0.02	0
Quambatook	Monthly	12	0.03	0.02	0
Rainbow	Monthly	12	0.08	0.02	0
Rupanyup	Monthly	12	0.03	0.01	0
Sea Lake	Monthly	12	0.04	0.02	0
St. Arnaud	Monthly	12	0.03	0.02	0
Stawell*	Monthly (2)	24	0.05	0.04	0
Underbool	Monthly	12	0.17	0.05	0
Warracknabeal	Monthly	12	0.07	0.04	0
Willaura	Monthly	12	0.11	0.02	0
Woomelang	Monthly	12	0.07	0.02	0
Wycheproof	Monthly	12	0.03	0.01	0

** Due to the population size of these towns two samples are taken every sampling visit.*

4.3 Hardness

Hardness is the sum of calcium and magnesium ions. Alkalinity is the sum of carbonate, bicarbonate and hydroxide content. High total hardness may be a problem for supplies reliant on groundwater. Surface waters can generally be expected to have acceptable values.

ADWG suggest that to minimise build-up of scale in hot water systems total hardness in drinking water should not exceed 200 mg $CaCO_3$/L. The ADWG discusses ramifications of hardness and what constitutes hard and soft water. Alkalinity has no independent ADWG guideline value.

4.3.1 Results

Hardness and alkalinity sampling and analysis was conducted annually for all drinking water towns. Edenhope is supplied from groundwater bores, which commonly have higher hardness than surface waters. While this has no health implications, this can increase the level of scale and deposit build-up in customer's systems, and can also increase the amount of soap and detergent required for cleaning. All samples for hardness met the standard for the reporting period (Table 4-3).

Table 4-3 – Average hardness and alkalinity of Drinking Water for 1 July 2022 – 30 June 2023. GWMWater internal performance benchmark that the average hardness should be less than 200 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max Hardness (mg $CaCO_3$/L)	Max Alkalinity (mg $CaCO_3$/L)
Ararat*	Annually (2)	2	45	27
Beulah	Annually	1	14	6
Birchip	Annually	1	17	8
Brim	Annually	1	19	10
Charlton	Annually	1	22	13
Dimboola	Annually	1	15	11
Donald	Annually	1	20	14
Edenhope	Quarterly	4	200	150
Great Western	Annually	1	31	27
Halls Gap	Annually	1	27	8
Hopetoun	Annually	1	20	11
Horsham*	Annually (2)	2	23	8
Jeparit	Annually	1	21	12
Lake Bolac	Annually	1	20	22
Manangatang	Annually	1	17	21
Minyip	Annually	1	16	9
Murtoa	Annually	1	15	10
Natimuk	Annually	1	24	11
Nhill	Annually	1	15	10
Ouyen	Annually	1	47	55
Pomonal	Annually	1	29	7
Quambatook	Annually	1	150	130

Sampling Locality	Sampling Frequency	No. of Samples	Max Hardness (mg $CaCO_3$/L)	Max Alkalinity (mg $CaCO_3$/L)
Rainbow	Annually	1	16	8
Rupanyup	Annually	1	16	10
Sea Lake	Annually	1	15	6
St Arnaud	Annually	1	17	12
Stawell*	Annually (2)	2	40	22
Underbool	Annually	1	72	87
Warracknabeal	Annually	1	19	10
Willaura	Annually	1	15	15
Woomelang	Annually	1	17	8
Wycheproof	Annually	1	17	7

** Due to the population size of these towns two samples are taken every sampling visit. The average result is given for these towns.*

4.4 Electrical Conductivity

Electrical Conductivity (EC) is caused by inorganic salts and small amounts of organic matter that are dissolved in water. Electrical conductivity mostly comprises sodium, potassium, calcium, magnesium, chloride, sulphate, bicarbonate, carbonate, silica, organic matter, fluoride, iron, manganese, nitrate (and nitrite) and phosphate.

High EC values may be associated with excessive scaling in pipes, fittings and household appliances.

The ADWG sets a guideline values for Total Dissolved Solids (TDS) of 600 mg/L and approximates that the TDS is 0.64 times the electrical conductivity value. As it is more cost effective to monitor electrical conductivity than total dissolved solids, the analysis for compliance is based on electrical conductivity. The ADWG value for TDS is equivalent to an electrical conductivity of 940 µS/cm.

4.4.1 Results

Sampling and field analysis for electrical conductivity was undertaken on a monthly basis. All samples for electrical conductivity met the standard for the reporting period (Table 4-4).

Table 4-4 - Electrical Conductivity (EC) of Drinking Water for 1 July 2022 – 30 June 2023. EC in drinking water should be less than 940 µS/cm.

Sampling Locality	Sampling Frequency	No. of Samples	Max (µS/cm)	Average (µS/cm)
Ararat*	Monthly (2)	24	216	170
Beulah	Monthly	12	152	112
Birchip	Monthly	12	197	106
Brim	Monthly	12	110	93
Charlton	Monthly	12	110	95
Dimboola	Monthly	12	105	85
Donald	Monthly	12	115	95

Sampling Locality	Sampling Frequency	No. of Samples	Max (µS/cm)	Average (µS/cm)
Edenhope	Monthly	12	825	703
Great Western	Monthly	12	232	171
Halls Gap	Monthly	12	159	113
Hopetoun	Monthly	12	208	112
Horsham*	Monthly (2)	24	150	114
Jeparit	Monthly	12	197	114
Lake Bolac	Monthly	12	135	106
Manangatang	Monthly	12	224	139
Minyip	Monthly	12	105	89
Murtoa	Monthly	12	105	88
Natimuk	Monthly	12	175	122
Nhill	Monthly	12	110	90
Ouyen	Monthly	12	280	194
Pomonal	Monthly	12	141	113
Quambatook	Monthly	12	770	619
Rainbow	Monthly	12	136	108
Rupanyup	Monthly	12	105	90
Sea Lake	Monthly	12	149	111
St Arnaud	Monthly	12	115	95
Stawell*	Monthly (2)	24	263	181
Underbool	Monthly	12	344	253
Warracknabeal	Monthly	12	110	90
Willaura	Monthly	12	125	101
Woomelang	Monthly	12	141	114
Wycheproof	Monthly	12	154	107

** Due to the population size of these towns two samples are taken every sampling visit.*

4.5 Iron

At concentrations exceeding 0.3 mg/L, iron imparts an undesirable taste to water and stains plumbing fixtures and laundry. Some micro-organisms can concentrate iron and give rise to taste, odour and turbidity problems in distribution systems.

Based on aesthetic considerations the ADWG suggests that the concentration of iron in drinking water should not exceed 0.3 mg/L. A detailed description of iron and its implications in a water supply can be found by reference to the ADWG.

4.5.1 Results

The sampling of iron is based on ADWG recommendations, risks, and historical data. All samples for iron met the standard for the reporting period (Table 4-5).

Table 4-5 - Iron in Drinking Water for 1 July 2022 – 30 June 2023. The concentration of iron in drinking water should not exceed 0.3 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)
Murtoa	Quarterly	4	0.050	0.040
Nhill	Quarterly	4	0.010	0.010

5 Analysis of Results

5.1 Meeting Regulatory Sampling Requirements

There were four missed samples for chloroacetic acids from the Great Western locality during this reporting period. This was due to an error where between August 2022 and December 2023 the sampling and analysis of chloroacetic acids was scheduled on a quarterly rather than the monthly basis as determined by the risk based sampling program. GWMWater wrote to DH regarding the missed samples and the scheduling frequency was updated to be monthly.

There was a set of weekly samples missed for Edenhope, Horsham (at two reticulation sampling locations), and Natimuk on Thursday 12 January 2023. Parameters missed for each town were for *E. coli*, coliforms, plate count, turbidity, pH, with Fluoride also missed for Horsham and Natimuk. These samples were missed as GWMWater relies on overnight delivery for samples to be able to arrive at the laboratory in Melbourne. The samples took longer than the maximum holding time to arrive due to a failure by the delivery company. GWMWater were informed of the missed samples when the samples were delivered Monday 16 January 2023, four days after the samples were taken. GWMWater moved sampling of these localities forward within the following week and took samples at additional locations at each locality. GWMWater reminded the laboratory to check all compliance samples that have been received prior to the end of the week and is in process of developing a process with the delivery company where successful delivery of samples can be checked by GWMWater before the end of each week.

There was one case of a compliance reticulation sampling tap being sampled on consecutive occasions for the locality of Beulah. On 20 September 2022 the relief Sampler, filling in for the regular Sampler, took the incorrect esky full of sample bottles and sampled from the location that was due to be taken the following week. The sample being taken one week in advance meant that the sample location was repeated, as this location had already been sampled the previous week. No other cases of repeated samples occurred. Reminder on the importance of meeting the sampling requirements of the Safe Drinking Water Regulations has been presented to all relevant staff.

5.2 Water Quality

Analysis of all water quality sample information, data and results of drinking water supplied for this reporting period (2022/2023) with the last two reporting periods, 2021/2022 and 2020/2021 is summarised in Table 5-1.

As discussed in Section 10 Emergency, Incident and Event Management, there were several instances of disinfection by-product formation leading to a decrease in quality performance for trihalomethanes and trichloroacetic acids. The difference compared with previous reporting periods was a result of decrease in raw water quality, particularly an increase in organic content of the water, due to heavy rains and flooding in 2022. While GWMWater managed each event to minimise impact on customers, further improvements could be

made to system infrastructure to improve management of water quality events. GWMWater has already completed several of these works to improve the ability to cope with variation in raw water quality, particularly from the Murray River, through installation of dissolved air flotation pre-treatment. In 2022/2023, 4.8% of all pH samples exceeded the 6.5-8.5 range recommended in the ADWG. This was comparable to the previous year of 5.1% of samples that exceeded the recommended aesthetic range. The average pH in the reticulation of all localities was within the ADWG limits. Reaction with the reticulation pipes leads to variation in pH. There were no customer complaints that could be linked to pH at any locality.

The concentration of ammonia in both Willaura and Lake Bolac was above the ADWG aesthetic guideline value of 0.5 mg-NH_3/L for all monthly samples taken for the year. This ADWG value is based on minimising corrosion in copper pipes and fittings. All results in these localities were below the ADWG stated odour threshold for ammonia in water of 1.5 mg-NH_3/L, and there were no customer complaints due to the aesthetics of the water at either Willaura or Lake Bolac.

Table 5-1 - Comparison of analysis of water quality results of drinking water supplied from 2020/2021 to 2022/2023.

Parameters	2020/2021		2021/2022		2022/2023	
	Localities supplied drinking water that met standard (%)	Customers supplied drinking water that met standard (%)	Localities supplied drinking water that met standard (%)	Customers supplied drinking water that met standard (%)	Localities supplied drinking water that met standard (%)	Customers supplied drinking water that met standard (%)
Escherichia coli	100	100	96.9	97.2	100	100
Trihalomethanes	100	100	100	100	96.9	99.1
Turbidity	100	100	100	100	100	100
Chlorine	100	100	100	100	100	100
Fluoride	100	100	100	100	100	100
Monochloroacetic acid	100	100	100	100	100	100
Dichloroacetic acid	100	100	100	100	100	100
Trichloroacetic acid	100	100	100	100	93.8	97.4
Ammonia	N/A	N/A	93.8	98.5	93.8	98.7
Nitrite	100	100	100	100	100	100
Nitrate	100	100	100	100	100	100
NDMA	100	100	100	100	100	100
Arsenic	100	100	100	100	100	100
Lead	100	100	100	100	100	100
Other metals	N/A	N/A	100	100	100	100
pH*	53.1	79.8	34.4	42.6	59.4	81.4
Aluminium acid-soluble	96.9	98.6	96.9	99.7	100	100

Hardness	100	100	96.9	98.2	100	100
Electrical conductivity	100	100	100	100	100	100
Iron	100	100	100	100	100	100

* pH counted as not meeting targeted standard for the locality if multiple (≥2) exceedances occurred.
N/A: If not analysed that year

6 Complaints

6.1 Complaints and Responses

GWMWater's Customer Complaints and Disputes Policy recognises the customer's rights, including the right to complain. GWMWater systematically records all complaints in a register and investigates them to determine the cause and significance. Complaints response vary depending on the nature of the complaint but can include further customer consultation and corrective actions such flushing. Operational changes or capital improvements which optimise treated water quality may be implemented in response to customer complaints.

Table 6-1 and Table 6-2 summarises the complaints received during the reporting period for both drinking water and regulated water supplies, respectively.

Table 6-3 and Table 6-4 provide a detailed breakdown of the total number of complaints received from customers supplied with drinking and regulated water, respectively.

Table 6-1 – Drinking Water Quality Complaints comparison between 2020/2021 to 2022/2023.

Type of Complaint	Number of complaints			Comparison with previous reporting periods
	2020/2021	2021/2022	2022/2023	
Discoloured	59	35	37	Similar level of complaints.
Taste/Odour	27	10	9	Similar level of complaints.
Other	2	6	3	The number of complaints was half that of the previous year, and did not relate to any water quality issue in particular.
Total	88	51	49	4% decrease. No major aesthetic water quality incidents occurred in the year.

Table 6-2 – Regulated Water Quality Complaints comparison between 2020/2021 to 2022/2023.*

Type of Complaint	Number of complaints			Comparison with previous reporting periods
	2020/2021	2021/2022	2022/2023	
Discoloured	30	51	28	45% decrease.
Odour	19	23	10	56% decrease.
Other	5	2	4	There are typically only scattered complaints categorised as other.
Total	54	76	42	45% Decrease. Previous year had a quality event at Elmhurst, back in line with normal level of complaints.

** Regulated water is water that is not intended for drinking.*

6.2 Analysis of Issues

Over the 2022/2023 year the total number of customer complaints for drinking water was lower than the previous reporting periods. Ararat received 16 complaints this year, forming 32% of all urban drinking water quality complaints. The level of complaints in Ararat is back within the same range of 2020/2021 which had 19 dirty water complaints, compared with 8 complaints in 2021/2022. Complaints in Ararat are typically for dirty, coloured or air

in water. Ararat has multiple pressure zones and also contains aging reticulation assets. Combined, this can lead to deterioration in water quality, particularly if there is a change in system flow such as from works on reticulation mains. GWMWater has a renewals program for replacement of aging assets such as drinking water reticulation mains and valves. Otherwise there were no noticeable changes in complaints for any drinking water towns. Stawell (6 dirty water complaints) had no major issues however there are several dead ends in the reticulations that can accumulate sediments, for which flushing is undertaken.

Over the 2022/2023 year the total number of customer complaints for regulated water supply decreased significantly compared with the previous reporting period. The majority of complaints came from Ultima (9 complaints) and Culgoa (6 complaints) due to a deterioration in the Murray River water quality following flooding. During the process to upgrade to drinking water Ultima has since been switched to supply from Swan Hill WTP. The status of Ultima is expected to be changed to drinking water in the 2023/2024 reporting period. Culgoa has also been flagged for an upgrade to drinking water within the next 5 years.

Installation of a DAF (Dissolved Air Flotation) on the Murray River Wemen system protected the town of Walpeup, Patchewollock, Tempy, Speed and Nandaly from the dirty water that resulted from the flooding, with none of these towns having a water quality complaint for the 2022/2023 year. Planed installation of a DAF on the Murray River Nyah and Piangil rural pump stations is also expected to greatly improve the water quality for towns of Chinkapook, Chillingollah and Waitchie, and minimise the impact of water quality events on the Murray River.

Of other regulated towns, Kaniva (5 complaints) and Moyston (3 complaints) received a greater proportion of complaints compared with other towns and are also planned for drinking water upgrades. Streatham (4 complaints) and Glenorchy (4 complaints) regularly experience periods of poor water quality. Air scouring of Glenorchy and Streatham's reticulation networks are carried out on a 5-yearly schedule, with a 12-monthly flushing cycle. GWMWater is assessing priorities for water quality improvements for customers in our smaller towns. These will be considered as part of the overall water quality management objectives.

Table 6-3 - Water Quality Complaints for Drinking Water Towns.

Locality	Population	Number of Complaints			
		Colour	T&O^	Other	Total
Ararat	8180	13	1	2	16
Beulah	300				
Birchip	810				
Brim	110				
Charlton	1130				
Dimboola	1630	1			1
Donald	1500				
Edenhope	900				
Great Western	260				
Halls Gap	920	3			3
Hopetoun	650				
Horsham	17160	2	2		4
Jeparit	530				
Lake Bolac	300				
Manangatang	290		1		1
Minyip	500				
Murtoa	900				
Natimuk	480	1			1
Nhill	2270	3	1		4
Ouyen	1200		2		2
Pomonal	290				
Quambatook	240				
Rainbow	640				
Rupanyup	450				
Sea Lake	750				
St Arnaud	2420	3	1		4
Stawell	6480	6	1	1	8
Underbool	230				
Warracknabeal	2500	3			3
Willaura	420				
Woomelang	200				
Wycheproof	710	2			2
Total	55340	**37**	**9**	**3**	**49**

^ *Taste and Odour (T & O).*

Table 6-4 - Water Quality Complaints for Regulated Supplies.

Locality	Population	Number of Complaints			
		Colour	Odour	Other	Total
Antwerp	20				
Apsley	210				
Berriwillock	170	1			1
Buangor	90	1			1
Chillingollah	10				
Chinkapook	30				
Cowangie	20				
Culgoa	90		5	1	6
Dooen	40				
Elmhurst	200		1		1
Glenorchy	120	4			4
Goroke	310				
Harrow	160				
Jung	100			1	1
Kaniva	860	3	2		5
Kiata	40				
Lalbert	90	2	1		3
Lascelles	60				
Lillimur	50				
Marnoo	110				
Miram	20				
Moyston	220	2		1	3
Murrayville	330				
Nandaly	30				
Nullawil	80	2			2
Patchewollock	90				
Pimpinio	90	1			1
Serviceton	70				
Speed	60				
Streatham	100	2	1	1	4
Tarranyurk	10				
Tempy	50				
Ultima	170	9			9
Waitchie	10				
Walpeup	130				
Watchem	150	1			1
Westmere	20				
Wickliffe	70				
Yaapeet	70				
Total	4550	**28**	**10**	**4**	42

7 Risk Management Plan Audit

A risk management plan audit was conducted by Viridis Consultants Pty Ltd in February 2023 in accordance with s. 11 of the *Safe Drinking Water Act 2003*. The period audited was from 1 January 2021 to 31 December 2022. Under s. 9 of the Act, the auditor determined that GWMWater:

- complied with the obligations imposed by section 7 (1) of the *Safe Drinking Water Act 2003*, and
- complied with the obligations imposed by section 8 (1) of the *Safe Drinking Water Act 2003*.

There were 12 opportunities for improvements identified in the audit which are summarised in Table 7-1.

Table 7-1 - Summary of audit actions and status.

OPPORTUNITY FOR IMPROVEMENT	PROPOSED ACTIONS	Estimated Completion
Outline clearly the risk management activities/assessments/plans and strategies which are being implemented in the role as the Storage Manager, in relation to supply of water to a water supplier (e.g. Coliban Water and Wannon Water). This can be as a section in the Ware Quality Management System and should reference the various risk management measures, monitoring and communication protocols, as relevant (but not limited to these). Consider any linkages and overlaps with GWMWater's Storage Manager role under the Water Act.	Allocate and define the storage manager role in line with the Act.	March 2024
Document the step to verify accuracy of the process flow diagrams/schematics during reviews of the site specific risk assessments and management plans, including the process for it (e.g. discussion with operators or field verification and signing off).	Outline in CMS/2166 Water Quality Management System the site specific risk management process. Add additional relevant staff to the CMS document review process of the site specific risk management plans.	March 2024
Maintain attendance records for the risk team involved in risk assessments and risk assessment workshops to demonstrate that the composition reflects section 2.1 of the Water Quality Management System.	Review the participants and process of their involvement in risk assessments. This includes using the Site Management Plan process for consultation with operating staff at the front end of the risk assessments and then using the CMS document review process to include relevant additional staff in the site specific RMPs. Document in CMS/2166 Water Quality Management System.	March 2024
Undertake refresher training for staff conducting treated water tank inspections on key aspects to be cautious of in relation to rainwater/vermin ingress potential.	Put a training pack together. Deliver to Regional meetings and link an instruction or the training presentation to the existing scheduled work orders. Include training on a	March 2024

OPPORTUNITY FOR IMPROVEMENT	PROPOSED ACTIONS	Estimated Completion
	list of regular key activity refreshers for Service Delivery staff.	
Review the requirement for filter inspection frequency at every 12 months against the risk assessment done for missing a filter inspection (CMS 3024). Clarify need/justification for variations, as needed, in relevant documents (e.g. WTP Maintenance Plan, Filter Inspection Work Instruction).	Update CMS/32343 Filter Inspection Work Instruction and CMS/3558 Water Treatment Plant Maintenance Plan to reflect risk assessed frequency of inspections. Provide training on updated procedure. Update the work order schedule for filter inspection frequency.	December 2023
Document the competency and/or training requirements for internal auditors of the Water Quality Management System.	Review training requirements for internal audits. Update CMS/3301 Drinking water internal audit procedure based on determined training requirements.	December 2023
Review reference and use of 'Specification of water sampling localities and water sampling points - July 2006 published by DHHS - July 2006' in water sampling program documents (e.g. Selection of Water Sampling Sites Procedure, Water Quality Sampling Tap Site Locations spreadsheet, WQMS). This 2006 guidance note has been superseded by "Appendix A - Water Sampling Program 2015".	Update reference in CMS/2743 Selection of Water Sampling Sites Procedure. Complete an assessment of the number of sampling location requirements in drinking water reticulations based on updated procedure.	December 2023
Review the Water and Wastewater Quality Sample Scheduling Procedure to include the actions/steps to undertake when an issue is identified with the monthly checks on compliance against the sampling schedule.	In CMS/3679 Water and Wastewater Quality Sample Scheduling Procedure, document the current process which includes conducting a risk assessment and notifying DH if necessary.	October 2023
Discuss with the operators on record keeping requirements in relation to the pH and specific gravity testing undertaken onsite upon receipt of the coagulant.	Provide refresher of requirements for coagulant receival as per CMS/2672 Work Instruction - Water Treatment Chemical Delivery. Include this in a list of regular key activity refreshers for Water Treatment staff.	December 2023
Review the Chemical Introduction Risk Assessment Form. AS4020 certification is for products and materials, chemicals may be better assessed against the ADWG Chapter 8 guidance. Maintain AS4020 checks for products and materials.	Update the reference in CMS/2004 Chemical Introduction Risk Assessment Form.	January 2024
Review how the recent Chapter 5 of the ADWG Microbial Quality of Drinking Water may be considered within the "Methodology for the Quantification of Microbiological Hazards in Drinking Water Supplies work instruction" and update the work instruction accordingly as relevant.	Review CMS/3182 Methodology for the Quantification of Microbiological Hazards in Drinking Water Supplies work instruction to incorporate any relevant information from the updated ADWG.	March 2024
Document the process undertaken to periodically verify land-use changes that	GWMWater has an existing process of referral review under the Planning Act. Add steps to	March 2024

OPPORTUNITY FOR IMPROVEMENT	PROPOSED ACTIONS	Estimated Completion
can impact on the sanitary survey and vulnerability assessment outcomes.	ensure water quality risks are considered in this process. Clearly document how information for any land use changes are fed into the Sanitary Survey.	

Table 7-2 – Remaining opportunities for improvement from previous audit covering 28 March 2018 to 26 August 2020.

OFI	ACTIONS	STATUS
Track all risk reduction measures through from identification to completion. Identify a target completion date and a status for the required actions.	A tracking process is being implemented through TechnologyOne to track risk reduction measures.	GWMWater track risk reduction measures through regular review of external and internal audit actions, site management plan and identified high risks. A full module for managing risk in TechnologyOne is being commissioned.

Risk Management Plan Audit Certificate
Safe Drinking Water Regulations 2015

Certificate Number: 191
Audit period: 1 January 2021 – 31 December 2022

To:
Anne Rudge
Manager Regulation and Assurance
Grampians Wimmera Mallee Water (GWMWater)
11 McLachlan Street
HORSHAM VIC 3400

Australian Business Number (ABN): 35 584 588 263

I, Tasleem Hasan, after conducting a risk management plan audit of the water supplied by GWMWater, am of the opinion that GWMWater:

- *has* complied with the obligations imposed by section 7(1) of the *Safe Drinking Water Act 2003* during the audit period.
- *has* complied with the obligations imposed by section 8(1) of the *Safe Drinking Water Act 2003* during the audit period.

Tasleem Hasan
T.Hasan
18/04/2023

VIRIDIS AUDITORS

Figure 7-1 Risk Management Plan Audit Certificate for period 1 January 2021 to 31 December 2022.

8 Undertakings under Section 30 of the Act

There were no undertakings during the reporting period.

9 Regulated Water

Regulated water is water that is not intended for drinking, but which could reasonably be mistaken as drinking water. This could be the case when such water is, for example, delivered to households through a piped reticulation system.

Section 6 of the *Safe Drinking Water Act 2003* allows the Minister for Health to declare certain water as regulated. The Minister for Health declared all rural water pipelines, other than the WMP, as regulated supplies in the Victorian Government Gazette No. S 36 on Monday 23 February 2009.

GWMWater must manage risks in relation to water that is not intended for drinking, as part of its normal business practices. GWMWater is required to:

- Prepare a Risk Management Plan for the regulated water.
- Ensure the Risk Management Plan contains the matters specified in Regulation 8 of the Safe Drinking Water Regulations.
- Have the Plan audited by an approved auditor.
- Take all reasonable steps to minimise the likelihood of the water being mistaken as drinking water.
- Include a summary of the management activities for regulated water supply in the Annual Report.

GWMWater had a total of 39 towns supplied with water classified as 'regulated water' under Section 6 of the Act during the reporting period. The regulated water supplies are listed in Table 1-2.

Under Section 25 of the *Safe Drinking Water Act 2003*, water suppliers are required to report on the steps taken to make the public aware of regulated water (non-drinking water). GWMWater informs their customers in towns with a regulated water supply are advised of the water quality through:

a) 'Do not drink the water' symbol notices on their water bills, - four bills per annum.
b) Issue 'Untreated Water Supply' newsletters annually.
c) Provide 'Do not drink the water' signage/stickers to Local Government to place on publicly accessible taps in each town.
d) Provide information on GWMWater's website.

10 Emergency, Incident and Event Management

Water quality incidents are notifiable to Department of Health (DH) under Section 18 and 22 of the *Safe Drinking Water Act 2003*. Section 22 reports give DH an early warning notification of any known or suspected contamination, whereas Section 18 notifications are given when the water quality standard has not been met. For the 2022/2023 year, in regards to drinking water localities GWMWater:

- provided DH with four notifications for section 18 of the *Safe Drinking Water Act 2003*, and
- provided DH with three notifications for section 22 of the *Safe Drinking Water Act 2003*.

In addition, there were three section 22 notifications provided to DH from drinking water trailers stationed in regulated towns that were not related to any drinking water locality.

10.1 Natimuk Trihalomethanes– section 18 notification

There was an exceedance of trihalomethanes above the 0.25 mg/L limit of the Regulations in the locality of Natimuk on 5 January 2023 of 0.29 mg/L. GWMWater provided DH with a Section 18 notification in response.

The increase in trihalomethanes (a disinfection by-product that results from reaction of chlorine with organics) was primarily a consequence of booster chlorination at Natimuk PS being dosed above ideal levels. A contributing factor was elevated raw water colour (indicative of dissolved organics material) at the Horsham WTP that supplies Natimuk. Horsham WTP coagulant dosing and dissolved air flotation and filtration (DAFF) operation was regularly adjusted to optimise colour removal, with only minor increase in filtered water colour occurring.

The levels of trihalomethane could be rapidly reduced by decreasing the chlorine dosing rate at Natimuk PS back within ideal levels and flushing of the relevant section of the reticulation. Samples taken post corrective actions showed trihalomethanes had returned below the regulated limit. Trihalomethanes are only a long term health factor under prolonged exposure, with the ADWG stating that occasional fluctuations up to 1 mg/L are unlikely to pose a significant health risk. Hence, this one off event of detections of trihalomethanes in a low range above the regulated limit is not expected to be of health concern. GWMWater continues to operate the upstream Horsham WTP and the Natimuk PS booster chlorination within levels that minimise trihalomethane formation while continuing to provide adequate chlorine residual to protect public health risk from pathogens. This is managed by application of Critical Control Points, which include target and action levels for the chlorine dosing and online chlorine measurement.

10.2 Ouyen Trichloroacetic acid – section 18 report

There was an exceedance of the disinfection by-product trichloroacetic acid slightly above the 0.10 mg/L ADWG limit in the locality of Ouyen on 3 October 2022 of 0.11 mg/L. GWMWater provided DH with a Section 18 notification in response.

The Murray River that supplies Ouyen WTP had high colour (indicative of dissolved organic material) due to flooding that had occurred in 2022. Ouyen WTP is a membrane plant that struggles to remove colour. The increase in colour led to greater disinfection by-product formation when chlorine was added.

Ouyen has two large raw water storages, and GWMWater swapped storages 27 October 2022 which would have helped as the colour in one storage was slightly lower than the other. At the beginning of December 2022 GWMWater installed a dissolved air flotation plant to pre-treat the water entering the Ouyen WTP. The DAF has proven to significantly reduce the colour of the water, and so the risk of elevated disinfection by-products occurring at Ouyen has been substantially reduced.

10.3 Great Western Trichloroacetic acid – two section 18 notifications

There was an exceedance of the disinfection by-product trichloroacetic acid above the 0.10 mg/L ADWG limit in the locality of Great Western on 3 January 2023 of 0.21 mg/L and during the same event while improvements were still taking effect on 6 February 2023 of 0.12 mg/L. GWMWater has provided DH with a Section 18 notification for each of these non-compliant samples. Other sampled disinfection by-products, of chloroacetic acid, dichloroacetic acid and trihalomethanes were all below the ADWG limits for the year.

The elevation of trichloroacetic was caused by high rainfall in the second half of 2022 causing an increase in raw water dissolved organic carbon, as indicated by colour sampling. The Great Western WTP is not efficient at removing dissolved organics hence this decrease in raw water quality led to an increase in disinfection by-product formation.

Following the trichloroacetic acid result, corrective actions were undertaken of increased coagulant dosing, aeration of the raw water storage, regular flushing of the reticulation, and regular sampling of multiple locations in the supply system. The ongoing incident response samples showed continued elevated trichloroacetic acid until 6 February 2023 while improvement measures took effect. After this time trichloroacetic acid was below the ADWG, showing the actions taken as well as a natural reduction in source raw water colour had resolved the disinfection by-product issue.

10.4 Manangatang detection of *Escherichia. coli* – section 22 report

A reading of 1 *E. coli*/100 mL was recorded in the Manangatang locality on the 7 November 2022. GWMWater provided DH with a Section 22 report in response. Corrective actions were taken of a comprehensive sampling and flushing program, and an investigation carried out in accordance with regulation 14 of the Safe Drinking Water Regulations 2015 to determine risk to public health.

The key findings from the incident response were:

- There was chlorine residual in the incident water quality sample, and no other issues with reticulation water quality.
- All samples taken in response to the *E. coli* detection, including re-sample of the incident sample tap, had good chlorine residual and had no microorganisms detected.
- There were no issues at the treatment plant, and no tanks or no potential points of contamination were found in the system.
- The sample tap appeared to be contaminated with bird droppings.

The investigation concluded there were no contributing factors in accordance with (c)(i)(ii)(iii) or (iv) in Schedule 2 to cause the *E. coli* results. The likely cause of the *E. coli* result was from sampling from a contaminated tap, thus the *E. coli* event was a false positive. All drinking water sampling points in Manangatang have been replaced with dedicated GWMWater sampling taps to reduce the risk of receiving non-representative sample results.

10.5 Ararat detection of *Escherichia. coli* – section 22 report

The Ararat Clear Water Storage (CWS) does not form part of GWMWater's compliance sampling program, however samples are taken from this location by the Build-Own-Operate-Transfer (BOOT) company Trility that operates the Ararat WTP. A sample collected on 2 November 2022 from the Ararat CWS returned a result of 1 *E. coli*/100 mL. GWMWater provided DH with a Section 22 report in response.

The BOOT company underwent an investigation in conjunction with GWMWater, with the key-findings being:

- There was chlorine residual in the incident water quality sample and re-sample of the CWS returned no *E. coli*.
- There were no detected issues with reticulation water quality.
- There were no issues at the treatment plant, and no potential points of contamination entry were found.
- The sample was taken in heavy rain from an outdoor tap with an overhanging tree.

The investigation concluded there were no contributing factors in accordance with (c)(i)(ii)(iii) or (iv) in Schedule 2 to cause the *E. coli* results. The likely cause of the *E. coli* result was from sample contamination; thus the *E. coli* event was a false positive. The sampling tap at Ararat is to be re-located into a shed to reduce the risk of receiving non-representative sample results.

10.6 Horsham low chlorine event – section 22 report

Low chlorine entered the Horsham reticulation 7:10 pm to 11:15 pm 4 January 2023. Water from Horsham is also transferred to Natimuk which has booster chlorination. GWMWater provided DH with a Section 22 report in regards to the locality of Horsham in response.

GWMWater initiated incident response and an investigation which concluded that chlorine contact time from Horsham WTP had still been met, meaning the event was not a loss of disinfection treatment barrier. Sampling on 5 January 2023 found that free chlorine was present throughout the reticulation and no *E. coli* was detected.

The cause of the low chlorine was a faulty chlorine scale at Horsham WTP incorrectly reading that there was adequate chlorine in the drums. In addition, chlorine alarms just prior to entry to town did not trigger a critical alarm due to the alarm being latched in a reset state. Works have been conducted to ensure that critical control points on all pump stations cannot be left in a latched reset state, the chlorine scales have also been replaced, and improved monitoring for the chlorine dosing system at Horsham WTP is currently being implemented.

10.7 Water trailers detection of *E. coli* – three section 22 reports

GWMWater stations water trailers at the regulated towns of Jung, Lalbert, Nullawil, Ultima, Walpeup and Watchem, providing the communities with a point that they can refill bottles to receive drinking water. The water trailers are sampled weekly and the water within the trailers replaces on at least a fortnightly basis.

From the weekly sampling, on 27 October 2022 the water trailers stationed at Lalbert and Nullawil had a detection of 3 *E. coli*/100 mL and 4 *E. coli*/100 mL respectively, the water trailer stationed at Walpeup had a detection of 1 *E. coli*/100 mL on 16 November 2022.

In response to each detection of *E. coli* GWMWater immediately removed the water trailer from the towns, took additional samples from each water trailer, drained, inspected and cleaned the water trailers, and re-filled the water trailers with fresh water before returning the trailers to the respective town that they are stationed at.

For the Lalbert and Nullawil water trailers a likely cause of the *E. coli* detection was from being sampled during heavy rain. Inspection also found that rain water could drip into the Nullawil trailer through a deteriorated screw on the trailer lid. There were no issues from the Walpeup trailer that could reasonably be suspected to have contributed to the presence of *E. coli*, and thus the *E. coli* detection was likely a false positive. In response to the *E. coli* detection, GWMWater has reviewed operation of the trailers and the frequency that the trailers are cleaned and inspected.

11 Water Storage Manager

In addition to being a water supplier for the purposes of the Safe Drinking Water Regulations 2015, GWMWater is also a water storage manager. This arises when a water corporation owns reservoirs or major headworks assets that supply water to multiple users, including other water corporations. Other water corporations may in turn use the water to supply drinking water to various localities.

GWMWater is a Water Storage Manager for some of the water used by Wannon Water and Coliban Water. To address GWMWater's obligations as a water storage manager a Memorandum of Understanding (MoU) exists between GWMWater and both these corporations.

GWMWater has developed a risk management framework for the headworks storages under its control and meet with Coliban Water and Wannon Water on an annual basis. The management role includes water quality monitoring for a suite of predetermined parameters with all analysis being conducted by a NATA accredited laboratory. These results are made available to the other water corporations as needed, who have access to monitoring data conducted by GWMWater in its role of water storage manager.

In management of reservoirs in the Wimmera catchment, GWMWater liaise with the Wimmera CMA, and liaise with the Glenelg Hopkins CMA for management of Rocklands and Moora Moora Reservoirs.

Table 11-1 – Summary of water supply systems and relevant GWMWater infrastructure.

Catchments	Source Water	Raw water storage area	Treatment*	Treatment Plant	Water Receivers
Lake Bellfield	Supply System 4, Wimmera Mallee Pipeline	N/A	N/A	N/A	Coliban Water
Waranga Western Channel	Waranga Basin	N/A	N/A	N/A	Coliban Water
Willaura Headwork (Mt William and Stoney Creek or bore field)	Glenthompson Pipeline	N/A	N/A	N/A	Wannon Water
Rocklands Reservoir	Pipeline	N/A	N/A	N/A	Wannon Water

* The water storage manager does not apply any drinking water treatment processes before supplying its water.

11.1 Coliban Water

GWMWater provides raw water to Coliban Water, which subsequently treats the water and supplies it to the localities of Wedderburn, Bridgewater, Inglewood, Borung, Korong Vale and Wychitella (Figure 11-1). In winter this water is sourced predominately from Supply System 4 of the WMP, which is fed from the Grampians Headworks, primarily Lake Bellfield. Between November and April the raw water supply to Coliban Water can be

switched to the Waranga Basin via the Waranga Western Channel. The supply was from the Grampians Headworks at all times during the 2022/2023 period as there was sufficient capacity from Lake Bellfield and better water quality.

The catchment of Lake Bellfield is in the Grampians National Park, and is a moderately protected surface water (category 3). Taylors Lake provides an emergency back-up source of supply to the WMP if Lake Bellfield water is unsuitable. The catchment of Taylors Lake includes inflow from the Grampians National Park and land utilised for farming. Taylors Lake can also receive water transfers from other reservoirs within the Grampians Headworks. Taylors Lake and the Waranga Basin are considered to be a poorly protected catchment (category 4).

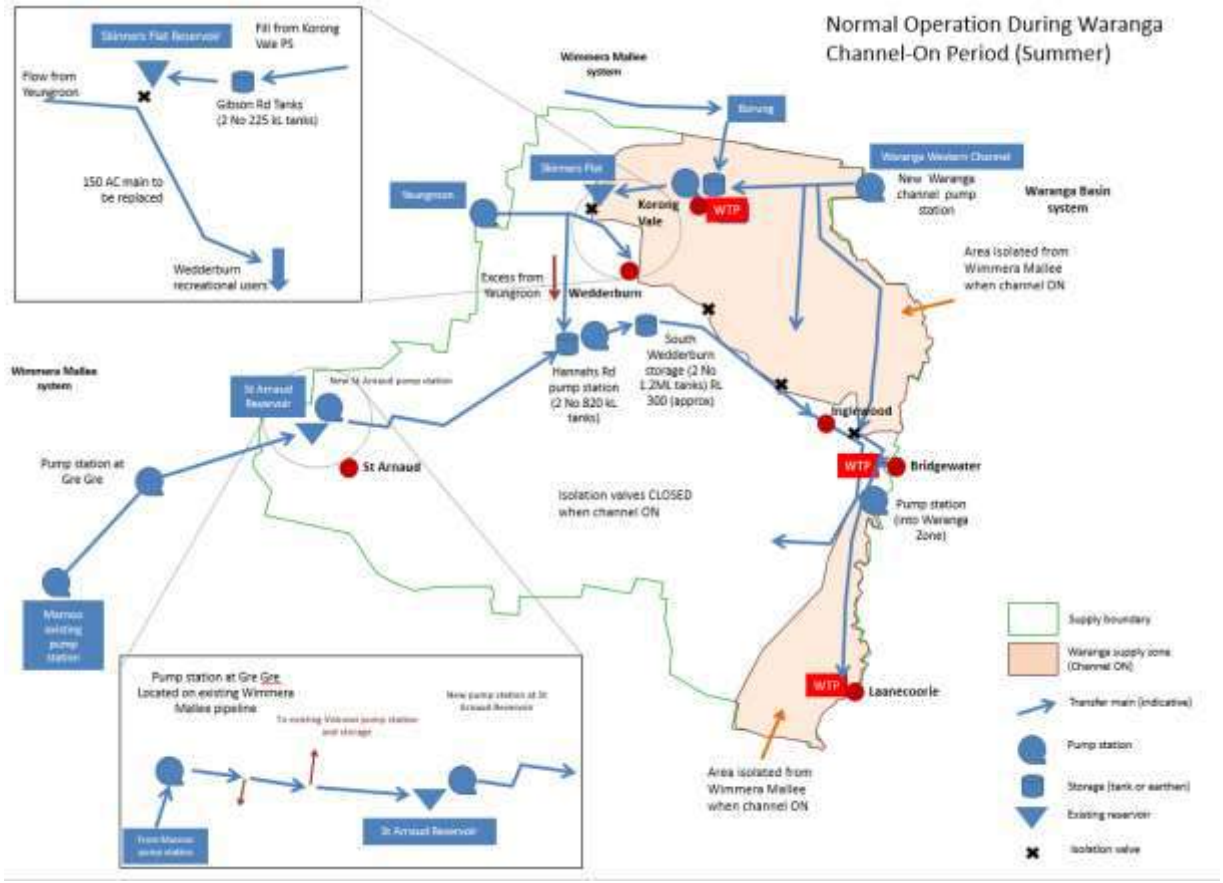

Figure 11-1 - Schematic showing supplies to Coliban Water from Bellfield and Waranga Western Channel (during summer).

11.2 Wannon Water

GWMWater delivers untreated water from the Willaura Headworks (Mt William and Stoney Creek) to Wannon Water through the Glenthompson Pipeline (Figure 11-2). Between the months of June and December, water supplied to Glenthompson is primarily from surface water diversion from unregulated waterways in the Grampians National Park. Groundwater bores supply water between January to May.

The bore water is considered a protected catchment (category 1), while the creeks deliver water from a moderately protected catchment (category 2). The overall catchment classification is category 2.

The water for Hamilton and Balmoral is taken directly from Rocklands Reservoir. Rocklands Reservoir is located between the Grampians National Park and Black Range State Park. The majority of the catchment is native forest; however, the storage is poorly protected (category 4).

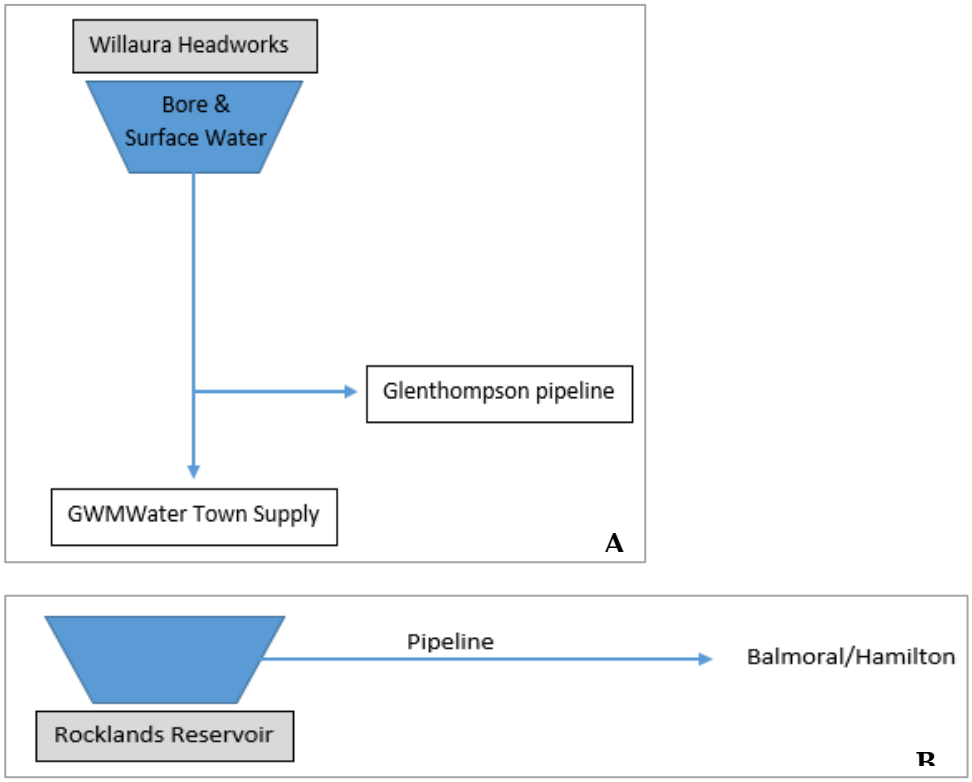

Figure 11-2 - Simplified schematic diagram showing supplies to Wannon Water from Willaura Headworks (A), and Rocklands Reservoir (B).

11.3 Water Storage Manager: Emergency, Incident and Event Management

The supply to Coliban Water was supplied through the Wimmera Mallee Pipeline from Lake Bellfield and not taken from the West Waranga Channel at any point for the year.

No incidents occurred for the Lake Bellfield supplied water.

No incidents occurred for the Rocklands Reservoir supplied water.

No incidents occurred for the Willaura Headworks supplied water.

12 Glossary of Terms

Terms and abbreviations used in this report have been collated into a Glossary to provide clarity.

Term/Abbreviation	Description
ADWG, 2011:	The Australian Drinking Water Guidelines provide a framework for the management of drinking water supplies designed to ensure safety at the point of use.
Alum:	Aluminium sulphate as used as a coagulant in the water treatment process.
BGA:	Blue Green Algae.
BOOT:	Build, Own, Operate and Transfer. A form of commercial contract associated with the provision of treated water at privately-owned water treatment plants.
Bore:	Conduit for extracting groundwater from an aquifer to the surface for use in a town water supply.
CCP:	Critical Control Point in the Risk Management Plan.
Chlorination:	Process of adding chlorine to water as a disinfectant.
Coagulation:	The clumping together of solids so they can more easily be settled out or filtered out of water. A chemical called aluminium sulphate (alum) or aluminium chlorohydrate (Megapac 23) is generally used to aid coagulation in water treatment.
Concentration:	A measure of how much of a given substance there is mixed with another substance (in this case water), usually expressed as a weight to volume, e.g. milligrams per litre (mg/L).
CWS:	Clear Water Storage.
DEEECA:	Department of Energy, Environment and Climate Action
DH:	Department of Health.
DBP:	Disinfection by-product – a reaction of natural organic material with the disinfectant medium producing by-products via reaction.
Disinfection-only	Water supplies that have disinfection as their only form of treatment.
Dissolution:	A form of chemical weathering in which water molecules, sometimes in combination with acid or another compound in the environment, attract and remove oppositely charged ions or ion groups from a mineral or rock.
Distribution system:	The system of pipes delivering water from the water treatment plant to the reticulation system.
Drinking water:	Legislatively defined as water intended for human consumption or associated with purposes for human consumption. Also known as a potable supply.
EC:	Electrical conductivity as measured in micro Siemens per centimetre (µS/cm).
Flocculation:	The water treatment process after coagulation that uses gentle stirring to cause suspended particles to form larger, aggregated masses (floc). The aggregates are removed from the water by a separation process (e.g. sedimentation, flotation, or filtration).
Fluoridation:	The act of adding fluoride to a water supply in accordance with the *Health (Fluoridation) Act 1973*.
Fully-treated water	Water supplies that have coagulation and filtration processes in addition to

supplies:	disinfection.
GWMWater:	Grampians Wimmera Mallee Water Corporation (trading as GWMWater).
Hardness:	Caused by the presence of calcium and magnesium ions in water and can contribute to scale build up in pipes and appliances.
HU:	Scientific units for true colour measurements – Hazen Units.
kL:	Kilolitre (1,000 L).
L:	Litre
Megapac 23:	Aluminium chlorohydrate as used as a coagulant in the water treatment process.
mg/L:	Scientific units for the concentration of a parameter given as milligrams per litre. Also known as parts per million (ppm).
ML:	Megalitre (1,000,000 L).
NATA:	National Association of Testing Authorities, Australia. National Accredited Testing Authority.
NMP:	Northern Mallee Pipeline drawing its water from the Murray River.
Notifications:	Pursuant to Sections 18 and 22 of the *Safe Drinking Water Act,* 2003.
NTU:	Scientific units for turbidity measurements – Nephelometric Turbidity Units.
Orgs/100 mL:	Organisms per 100 mL. A measure of the number of *E. coli*.
pH:	The measure of the concentration of hydrogen ions in a sample related to a logarithmic scale between 1 (acidic) and 14 (basic).
PS:	Pump Station.
Regulated water:	Water not intended for human consumption, but that could easily be mistaken as such. Also known as non-potable supply. This term is defined in the *Safe Drinking Water Act,* 2003.
Reticulation system:	The system of pipes delivering water to the customers tap from the entry point of the system.
RMP:	Risk Management Plan pursuant to the *Safe Drinking Water Act 2003*.
Safe Drinking Water Act, 2003:	Legislative framework for assuring drinking water quality in Victoria.
Safe Drinking Water Regulations, 2015:	Regulations made subsequent to the *Safe Drinking Water Act 2003* that give effect to key aspects of the Act.
Sampling:	The process of collecting a representative amount of water to analyse and compare against the ADWG Standards.
T&O:	Taste and odour.
THMs:	Trihalomethanes – disinfection by-products formed when using chlorine as a disinfectant. Take the form of trichloromethane, bromodichloromethane, dibromochloromethane and tribromomethane.
Undertakings:	Legally binding commitment made pursuant to Section 30 of the *Safe Drinking Water Act,* 2003.
WMP:	Wimmera Mallee Pipeline.
WTP:	Water treatment plant.
95th Percentile:	The value for which 95 percent of the time the data is below.

13 References

a) **Australian Drinking Water Guidelines 2011**, National Health and Medical Research Council, Canberra, 2011

b) ***Safe Drinking Water Act 2003*** (Act No. 46/2003), 11 June 2003, Parliament of Victoria.

c) **Safe Drinking Water Regulations 2015** (S/R No. 88/2015), 18 July 2015, Parliament of Victoria.

d) ***Health (Fluoridation) Act 1973***, (Act No. 8506/1973), 1 July 1973, Parliament of Victoria.

e) **Code of Practice for fluoridation of drinking water supplies**, Second edition, Department of Health and Human Services, Victoria, 2018.

f) **Guidance – Drinking Water Quality Standards,** Department of Health and Human Services, Victoria, 2015.