GIPPSLAND WATER

Gippsland Water 2016-17 Annual Report on Drinking Water Quality

Gippsland Water

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1 INTRODUCTION

1.1 CHARACTERISATION OF THE SYSTEM

The Central Gippsland Region Water Corporation, trading as Gippsland Water, was constituted on 21 December 1994 under the *Water Act 1989*.

Gippsland Water is the second largest regional water corporation in Victoria in terms of revenue earned and is the largest in terms of the total volume of water supplied and wastewater collected. It manages:

- 15 water treatment plants (WTP);
- 14 wastewater treatment plants (WWTP);
- Gippsland Water Factory;
- Two ocean outfalls;
- Soil and Organic Recycling Facility (SORF); and
- Agribusiness.

Gippsland Water provides water and wastewater services to customers in the central Gippsland region of Victoria. Its geographic region stretches from Drouin in the west to Loch Sport in the east, and from Mirboo North in the south to Rawson and Briagolong in the north.

Gippsland Water manages five business streams, one of which is the provision of water services. Its region consists of:

- 42 towns; and
- approximately 70,000 properties connected to the 16 drinking water supply systems.

These towns are grouped into 35 localities for the purposes of monitoring and reporting in accordance with the Safe Drinking Water Regulations 2015 (SDWR).

Gippsland Water is committed to providing responsible asset management, quality management, incident management and operational audit of the reticulated urban water supply system to ensure that customer service levels are achieved according to its Customer Charter targets and the *Safe Drinking Water Act 2003 (SDWA)*.

A major objective for the corporation is to achieve and maintain community confidence in the safety, reliability and quality of their water supply.

To ensure customers are provided with safe drinking water, Gippsland Water maintains a "*risk based*" drinking water quality management system, which covers the entire water supply system from the catchment to customers' taps. The system entails:

- detailed water quality risk identification processes;
- audited control measures to manage risks;
- verification systems, including an independent water quality monitoring program; and
- continuous improvement project to increase system capability, manage risk and improve customer experiences

Our mission

We will manage the resources in our care in a manner that secures social, environmental and economic benefits to our customers, stakeholders and the Gippsland region.

Our vision

Efficient water and wastewater services for a healthy community and environment.

2 DRINKING WATER QUALITY MANAGEMENT FRAMEWORK

The regulatory environment in which Gippsland Water operates is to provide safe drinking water at **all** times. Safe drinking water is water that does not cause illness in those who consume it. To achieve this, the water must be free of pathogens and harmful chemicals.

Guidance regarding the structure of this report has been provided by the Department of Health and Human Services (DHHS) in accordance with the *Safe Drinking Water Act 2003* and the current Drinking Water Regulation Guidance Note, June 2017.

Drinking water supplied by Gippsland Water must meet the obligations under the *Safe Drinking Water Act 2003* and the *Safe Drinking Water Regulations 2015*. The Australian Drinking Water Guidelines 2011 (ADWG) are used as a benchmark for safe drinking water. The guidelines provide a framework for good management of drinking water supplies that if implemented, will ensure safety at the point of use

The ADWG include two types of guideline values:

- a health related guideline value, which is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to health of the consumer over a lifetime of consumption; and
- an aesthetic guideline value, which is the concentration or measure of a water quality characteristic that is associated with acceptability of water to the consumer, such as appearance, taste and odour.

The regulatory environment that provides guidance in the production of safe drinking water consists of:

- ***Victorian Safe Drinking Water Act 2003 (SDWA)***

The Victorian State Government passed the ***Safe Drinking Water Act*** in June 2003. This Act provides details of further requirements for Victorian water corporations.

The purpose of the *Safe Drinking Water Act (2003)* is to make provision for the supply of safe drinking water. In outline this Act:

- requires water suppliers and water storage managers to prepare and implement plans to manage risks in relation to drinking water and some types of non-potable water;
- provides for the auditing of those plans by approved auditors;
- requires water suppliers to ensure that the drinking water they supply meets quality standards specified by the regulations;
- requires water suppliers to disclose to the public information concerning the quality of drinking water;
- provides for the variation, after community consultation, of water quality standards that relate only to aesthetic factors;

- requires the reporting of known or suspected contamination of drinking water to the Secretary to the Department of Health and Human Services; and
- empowers the Secretary to enforce this Act.

o *Victorian Safe Drinking Water Regulations 2015 (SDWR 2015)*

The Victorian State Government passed the **Safe Drinking Water Regulations** in July 2005. This act provides details of further requirements for Victorian Water Corporations. The Safe Drinking Water Regulations (2015) came into operation on 18 July 2015 with the Safe Drinking Water Regulations 2005 being revoked.

The purpose of the Safe Drinking Water Regulations (2015) is to make provision for the supply of safe drinking water. In outline this Act:

- sets out the further matters to be addressed in risk management plans and the risks to be specified in risk management plans;
- describes the documents that are to be available for inspection in the risk management plan audit;
- prescribes the form of audit certificates to be given to the person who has commissioned a risk management plan audit at the completion of the audit;
- sets out the risk management plan auditor approval criteria;
- sets out the drinking water standards;
- sets out the requirements relating to the frequency of collection of samples of water quality analysis;
- empowers the Secretary to:
  (i) divide areas supplied by water suppliers into water sampling localities;
  (ii) specify locations within a water sampling locality at which samples of water are to be collected;
  (iii) vary the frequency of collection for samples of water in certain circumstances;
- requires all samples of water collected to be analysed by an accredited laboratory and a summary of results of the analysis to be given to the secretary;
- specifies the issues relating to the quality of drinking water, in an annual report in respect of every financial year to be given to the Secretary by a water supplier and water storage manager; and
- set out details to be included in an annual report to the Secretary.

o *Australian Drinking Water Guidelines 2011 (ADWG)*

The purpose of the Australian Drinking Water Guidelines 2011 is to 'provide the authoritative reference for use within Australia's administrative and legislative framework to ensure the accountability of drinking water suppliers. The ADWG are not mandatory, legally enforceable standards.

The guidelines set the framework for the management of drinking water quality known as the 12 elements.

Gippsland Water has adopted the 12 elements of the ADWG 2011 that comprise:

1. Commitment to Drinking Water Quality Management.
2. Assessment of the Drinking Water Supply System.
3. Preventive Measures for Drinking Water Quality Management.
4. Operational Procedures and Process Control.
5. Verification of Drinking Water Quality.
6. Management of Incidents and Emergencies.
7. Employee Awareness and Training.
8. Community Involvement and Awareness.
9. Research and Development.
10. Documentation and Reporting.
11. Evaluation and Audit.
12. Review and Continual Improvement

- ***Health (Fluoridation) Act 1973***

The *Health (Fluoridation) Act 1973* ('the Act') regulates the safe and effective addition of fluoride into drinking water supplies in Victoria.

Under the *Act,* the Secretary to the Department of Health and Human Services has the power to direct water supply authorities to commence water fluoridation.

- **Code of Practice for Fluoridation of Drinking Water Supplies 2009**

The Department of Health and Human Services released the **Code of Practice for Fluoridation of Drinking Water Supplies** in March 2009.

This code provides details of further requirements for Victorian water corporations.

The objective of the code is to provide for safe and effective addition of fluoride into the drinking water supply.

This will be achieved by specifying:

(a) the optimum fluoride levels for drinking water supplies and the design control limits for fluoridation plants;
(b) the minimum requirements for the safe and effective addition of fluoride chemicals to drinking water supplies, covering the design and operation of a fluoridation plant; and
(c) monitoring and reporting requirements for the proposed fluoridation scheme.

The code also includes works undertaken on fluoridation plants and integrates the practices with the SDWA through:

(a) the inclusion of water fluoridation into the corporations' risk management plan under the SDWA; and
(b) integration and compliance with the auditing, notification and reporting requirements of the SDWA.

The code also describes the gap analysis and subsequent works program associated with water fluoridation plant by:

a) the regulatory frame work including the procedure to fluoridate;
b) safety in design;
c) requirements for the design and control of fluoridation facilities; and
d) requirement for plant operation including monitoring, training or personnel, occupational health and safety, security and environmental protection.

o Health Based Targets (HBT)

The National Health and Medical Research Council (NHMRC) released a discussion paper in 2009 on introducing a health-based target (HBT) for microbial water quality in the Australian Drinking Water Guidelines (ADWG). In December 2011, Water Services Association of Australia's (WSAA) Water Quality Network considered the HBT proposition at their annual meeting. Outcomes from that meeting formed the basis of a subsequent WSAA submission to National Health and Medical Research Council (NHMRC).

The WSAA Drinking Water Source Assessment and Treatment Requirements Manual for the Application of Health-Based Treatment Targets Release No 2 September 2015 was adopted by Gippsland Water to assess the microbiological risk associated with its catchments and treatment processes in place (log removal requirements) to manage these risks.

The HBT comprises four parts:

(a) ***Source water assessment*** (microbial risk).
(b) ***Water treatment plant process assessment*** (The water treatment assessment involves assigning estimates of pathogen reduction to the treatment processes deployed at a source).
(c) ***Water safety assessment*** (comparing the log reduction required from the source assessment with the log reduction values claimable from the water treatment assessment).
(d) ***Water Safety Improvement Plan*** (The water safety improvement plan involves planning improvements to improve water safety. Where the HBT is not achieved, the water supplier should undertake improvements).

2 DRINKING WATER QUALITY POLICY

WATER QUALITY

GIPPSLAND WATER'S DRINKING WATER QUALITY POLICY

We are committed to managing our "catchment to tap water supply systems" to provide safe drinking for our customers at all times.

We will demonstrate compliance with the current Safe Drinking Water Regulations, Safe Drinking Water Act and subordinate regulations.

We will openly and transparently report to customers, employees, the Board and external parties on our drinking water quality activities and performance.

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3 DRINKING WATER SUPPLY SYSTEMS

Figure 1: Overview of water supply service area managed by Gippsland Water

3.1.1 Source of water

Gippsland Water operated 15 water treatment systems supplying 35 water sampling localities and 42 towns in 2016-17. The water for these systems is sourced from a variety of water supplies including stream off-takes, reservoirs, and groundwater (bore water). The table below provides information on where the raw water is sourced for each water sampling locality, identifies the raw water storage (if one exists prior to each water treatment plant) and details the water treatment processes used to produce safe drinking water.

Table 1: Gippsland Water locality water source and water treatment process

Locality	Estimated Population Serviced[1]	Source water	Raw Water Storage	Water Treatment Plant	Treatment process										Sludge Thickening Dewatering	Added substances					
						Clarification		Filtration		Disinfection				Other							
					Coagulation & Flocculation	Sedimentation / Clarification	Dissolved Air Flotation	Granular Media Filter	Membrane	Chlorine Gas	Chloramination	Sodium Hypochlorite	Calcium Hypochlorite	Activated Carbon (PAC / GAC)[4]		Lime / Soda Ash	Alum Based Coagulants	Iron Based Coagulants	Potassium Permanganate	Polymers	Sodium Fluoride / Hydrofluorosilicic Acid
Maffra	5,530	Macalister River	N/A	Maffra	X	X		X		X		Stratford and Boisdale		X		Soda Ash	Alum/PACI-23* (High Turbidity)			LT22	Sodium Fluoride[5]
Stratford	2,260																				
Boisdale	80																				
Briagolong	790	Bore (Freestone Creek Aquifer)	N/A	Briagolong	X			X				X				Soda Ash		Polymerised Ferric Sulphate		1115 & 1160	

- 1 = The listed populations are for the water sampling localities calculated using 2006 census data to calculate the number of persons per dwelling per locality and then multiplying it with Gippsland Water's 2016-17 figures for number of connections. Figures have also been rounded to the nearest 10.
- 3 = The water supplied to Darnum changed from the Warragul system to the Moe system in March 2012.
- 4 = PAC/GAC used as required to treat for taste and odour compounds.
- 5 = The Hydrofluorosilicic acid (Fluoride) dosing system was not operational during the reporting period. The systems has been replaced with a sodium fluoride dosing system.
- * = PACl-23 used as required to treat high turbidity raw water.
- X_1 = Plant capability for activated carbon dosing (not currently in use).

Table 1 (cont.): Gippsland Water locality water source and water treatment process

Locality	Estimated Population Serviced[1]	Source water	Storage	Water Treatment Plant	Treatment process										Sludge Thickening Dewatering	Added substances					
						Clarification		Filtration		Disinfection				Other							
					Coagulation & Flocculation	Sedimentation / Clarification	Dissolved Air Flotation	Granular Media Filter	Membrane	Chlorine Gas	Chloramination	Sodium Hypochlorite	Calcium Hypochlorite	Activated Carbon (PAC / GAC)[4]		Lime / Soda Ash	Alum Based Coagulants	Iron Based Coagulants	Potassium Permanganate	Polymers	Sodium Fluoride / Hydrofluorosilicic Acid
Morwell	16,620	Tyers River	Moondarra	Morwell	X	X		X		X		Morwell, Churchill, Jumbuk, Hazelwood Nth, Boolarra	Traralgon South			Soda Ash	Alum			LT20	Sodium Fluoride
Boolarra	650																				
Churchill	5,630																				
Yinnar	1,200																				
Jumbuk	360																				
Traralgon South/Hazelwood North	2,010																				
Tyers/Glengarry	2,280	Tyers River	Moondarra	Tyers (Plant 1)	X			X				Tyers, Rosedale & Toongabbie			X	Soda Ash	Alum			1115 & 1160	
Rosedale	1,810																				
Toongabbie	1,020			Tyers (Plant 2)	X		X	X	X												
Cowwarr	270																				
Traralgon	30,950	Tyers River	Moondarra	Traralgon	X		X	X		X						Soda Ash	Alum			LT20	Sodium Fluoride

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- 3 = The water supplied to Darnum changed from the Warragul system to the Moe system in March 2012.
- 4 = PAC/GAC used as required to treat for taste and odour compounds.
- 5 = The Fluoride dosing system was not operational during the reporting period.
- * = PACl-23 used as required to treat high turbidity raw water.
- X_1 = Plant capability for activated carbon dosing (not currently in use).

Table 1 (cont.): Gippsland Water locality water source and water treatment process

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					Coagulation & Flocculation	Sedimentation / Clarification	Dissolved Air Flotation	Granular Media Filter	Membrane	Chlorine Gas	Chloramination	Sodium Hypochlorite	Calcium Hypochlorite	Activated Carbon (PAC / GAC)[4]		Lime / Soda Ash	Alum Based Coagulants	Iron Based Coagulants	Potassium Permanganate	Polymers	Sodium Fluoride / Hydrofluorosilicic Acid
Warragul[3] (including Nilma, Drouin East)	18,390	Pederson Weir (Tarago River) Tarago Reservoir - (supplementary supply)	Tarago Reservoir (supplementary supply)	Warragul	X		X	X		X		Warragul South & Drouin		X_1	X	Lime	Alum			LT20	Sodium Fluoride
Warragul South	160																				
Drouin	13,140																				
Rokeby/Buln Buln	470																				
Coongulla/ Glenmaggie	260	Macalister River	Lake Glenmaggie	Coongulla	X			X				X		X	X	Soda Ash	Alum 90			1160, 1115	
Rawson	330	Trigger Creek	Amours Basins	Rawson	X		X	X				Rawson WTP, Parkers Corner			X	Soda Ash		PFS (Polymerised Ferric Sulphate)		1160	
Erica	340																				
Heyfield	2,060	Thomson River	Heyfield raw water storage	Heyfield	X			X		X				X	X	Soda Ash		PFS (Polymerised Ferric Sulphate)		1115, 1160	

- 1 = The listed populations are for the water sampling localities calculated using 2006 census data to calculate the number of persons per dwelling per locality and then multiplying it with Gippsland Water's 2016-17 figures for number of connections. Figures have also been rounded to the nearest 10.
- 3 = The water supplied to Darnum changed from the Warragul system to the Moe system in March 2012.
- 4 = PAC/GAC used as required to treat for taste and odour compounds.
- 5 = The Fluoride dosing system was not operational during the reporting period.
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Table 1 (cont.): Gippsland Water locality water source and water treatment process

Locality	Estimated Population Serviced[1]	Source water	Storage	Water Treatment Plant	Treatment process										Sludge Thickening Dewatering	Added Substances						
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					Coagulation & Flocculation	Sedimentation / Clarification	Dissolved Air Flotation	Granular Media Filter	Membrane	Chlorine Gas	Chloramination	Sodium Hypochlorite	Calcium Hypochlorite	Activated Carbon (PAC / GAC)[4]		Lime / Soda Ash	Alum Based Coagulants	Iron Based Coagulants	Potassium Permanganate	Polymers	Sodium Fluoride / Hydrofluorosilicic Acid	Calgon
Mirboo North	1,970	Little Morwell River	N/A	Mirboo North	X	X	X	X				X			X	Soda Ash	PASS			LT20		
Moe	11,660	Tanjil River and Narracan Creek	N/A	Moe	X	X		X		X		Newborough, Yallourn North, Trafalgar, Yarragon & Darnum			X	Soda Ash	Alum			LT20	Sodium Fluoride	X
Newborough	7,400																					
Yallourn North	1,620																					
Trafalgar	3,770																					
Yarragon	1,640																					
Darnum[3]	470																					
Neerim South	1,340	Tarago River	Tarago Reservoir	Neerim South	X		X	X			X (Noojee System)	X (Neerim South)			X	Soda Ash		PFS (Polymerised Ferric Sulphate)		1115, 1160		X
Noojee	330																					
Sale/Wurruk	17,880	Bore (Boisdale Aquifer)	N/A	Sale				X		X						Lime			X		Sodium Fluoride	

- 1 = The listed populations are for the water sampling localities calculated using 2006 census data to calculate the number of persons per dwelling per locality and then multiplying it with Gippsland Water's 2016-17 figures for number of connections. Figures have also been rounded to the nearest 10.
- 3 = The water supplied to Darnum changed from the Warragul system to the Moe system in March 2012. Darnum is not a designated locality under the SDWR.
- 4 = PAC/GAC used as required to treat for taste and odour compounds.
- 5 = The Fluoride dosing system was not operational during the reporting period.
- * = PACl-23 used as required to treat high turbidity raw water.
- X_1 = Plant capability for activated carbon dosing (not currently in use).

Table 1 (cont.): Gippsland Water locality water source and water treatment process

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Seaspray	230	Merrimans Creek	Seaspray raw water storage	Seaspray	X			X				X		X	X	Soda Ash	Alum 90			1115, 1160		
Thorpdale (water carting from Moe locality)	210	Tanjil River and Narracan Creek (September 2015 - ongoing)	N/A	Moe	X	X		X		X		Newborough, Yallourn North, Trafalgar, Yarragon & Darnum			X	Soda Ash	Alum			LT20	Sodium Fluoride	X
Willow Grove	350	Tanjil River	Blue Rock Lake	Willow Grove	X			X			X				X	Soda Ash	Alum			1115, 1160		

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- X_1 = Plant capability for activated carbon dosing (not currently in use).

3.2 WATER QUALITY MANAGEMENT SYSTEM

Gippsland Water utilises the ADWG Framework principles in its Water Quality Management System for the supply of safe drinking water. The ADWG Framework is based on 12 elements (refer to Section 2).

The 12 elements of the Water Quality Management System must be met, and the key processes undertaken to meet these requirements include:

3.2.1 Hazard and risk identification

To determine the key risk to a water supply to enable control measures to be implemented, Gippsland Water undertakes an extensive hazard assessment process from the catchment to the end user involving management, operational staff, system operators and key stakeholders.

The risks identified during this process are reviewed regularly to identify changes to risks, new risks, or when processes and system changes occur.

3.2.2 Control measures

Control measures are established to reduce the key risk or likelihood of the risk occurring. The intent is to manage or reduce the risk to an acceptable level. Within Gippsland Water's Water Quality Management System, this consists of;

- Critical Control Points (CCPs) that are alarmed and have the ability to stop processes before a water quality failure occurs. The CCPs are documented and apply to critical process steps in the treatment process;
- maintenance programs that include preventative maintenance of critical assets used in the treatment process and control systems such as dosing systems, monitoring instrumentation for key assets and system-based maintenance such as mains flushing, air scouring, tank and basin cleaning as well as asset maintenance and replacement programs; and
- trained and competent water treatment technicians manage the operation and maintenance of water treatment plants and water supply systems. All technicians undertake industry based training to ensure a high level of knowledge of treatment processes and associated risks. Gippsland Water technicians are trained in accordance with the Department of Health and Human Services and Victorian Water Industry Association's Framework for Water Treatment Operator Competencies (2010) requirements to Certificate 3 and Certificate 4 level in water industry operations.

3.2.3 Verification and monitoring

Verification and monitoring is used to confirm and authenticate the performance of water treatment processes and water supply systems to ensure compliance with SDWR 2015 standards and ADWG health related and aesthetic guideline values. Verification and monitoring at Gippsland Water includes:

- Supervisory control and data acquisition systems (SCADA) at:
  - Individual water treatment plants;
  - secondary disinfection systems; and

    - water supply treated water tanks, storages and pump stations.
- System-wide telemetry and alarms 24 hours a day, 7 days a week;
    - Critical Control Point (CCP) alert and critical process alarms;
- Water treatment and water quality Technicians on-call 24 hours a day, 7 days a week for system monitoring and alarm verification and response;
- a drinking water quality monitoring program covering the catchment, water treatment plant process and water supply system testing and undertaken by an independent National Association of Testing Authorities (NATA) accredited laboratory that include:
    - Pathogenic microorganisms;
    - inorganic chemicals, including inorganic disinfection by-products;
    - organic chemicals, including pesticides, pesticide residues and organic disinfection by-products;
    - radiological parameters; and
    - algal toxins (as required when algal events occur).
- A water treatment chemical quality assurance program undertaken by an independent laboratory that includes certificates of analysis prior to receipt of chemicals for use;
- calibration programs of on-line and benchtop critical instruments used for process control and alert and critical alarm processes by independent service providers; and
- customer feedback captured through Gippsland Water's water quality complaint resolution procedure.

3.2.4 System auditing

Internal and external auditing programs have been established to assess compliance of the Water Quality Management System. This includes auditing;

- Water treatment plant records, systems and processes;
- water supply system infrastructure (water mains repairs, treated water storage tanks and basins);
- challenging testing CCP alert and critical alarms; and
- behavioural audits to verify compliance with control, verification and monitoring requirements.

3.3 WATER TREATMENT PROCESSES

The source waters for Gippsland Water's 16 water supply systems are treated prior to distribution with the objective of providing safe drinking water at all times. The treatment varies for each water supply system with the specific treatment process dependent on the quality and risks of the source water.

Table 1 identifies the regular treatment process for each of the water localities and lists the added substances and any periodic treatment activities. The treatment process used depends on the source and quality of the water to be treated. The corporation uses the following treatment processes to produce safe drinking water.

3.3.1 Coagulation / flocculation

Coagulation is a process to remove very fine suspended particles often associated with turbidity, colour or colloidal matter in water. These particles have a negative charge that causes them to repel each other and stay suspended in water. The addition of a suitable 'coagulant' of iron and/or aluminium salt with a positive charge neutralises or destabilises the negative charge enabling the fine particles to join together to form larger particles. The flocculation (floc) process involves stirring the water gently after the coagulant has been added. This allows the particles to come into contact, and eventually causes it to stick together and form floc. This process removes the fine particles, dirt and colour present in the water.

Chemicals used for coagulation/flocculation at the water treatment plants include aluminium sulphate, ferric sulphate and poly-aluminium silicate sulphate solution (PASS).

3.3.2 Clarification / sedimentation

The clarification or sedimentation of the floc particles formed during the coagulation/flocculation process is usually carried out under still conditions (e.g. in the sedimentation tank or clarifier). A sedimentation tank relies on gravity to separate the floc from the water, which is heavy and falls to the bottom of the tank – leaving the 'cleaner' water on top. A clarifier uses a mechanical process to separate the floc, and the water is collected in troughs at the surface. Once the floc has been removed the clean water is sent to filters.

3.3.3 Membrane filtration

Membrane filtration is used to remove suspended solids and some colloidal matter from the source water. The water is pumped through the filter membrane trapping suspended solids in the process. The concentrate (material that does not pass through the membrane) is periodically removed to waste to prevent the blocking of the membrane filters.

3.3.4 Filtration

The clarified water is passed through a filter consisting of several types of graded filter media (sand, gravel and coal) to remove any remaining particles, floc or dissolved chemicals that may have passed through the clarification/sedimentation process.

Another method used utilises Dissolved Air Flotation and Filtration (DAFF) which relies on the injection of microscopic air particles into the water stream, causing the flocculated particles to float to the surface. These particles are then drawn off the surface and off the filtration tank and removed to waste. The clear water then is filtered, as above, through graded filter media.

Over time, the filters gradually become clogged with trapped particles. A filter backwash is carried out to clean the filters, returning it to optimum condition. Air and water is forced up through the filter nozzles to agitate the filter bed and remove any trapped particles. The final turbidity of water leaving the filters, during normal plant operation, is less than 0.1 NTU (Nephelometric Turbidity Units - unit of measure for turbidity).

The backwash water produced during the filter cleaning process is discharged to the sludge thickening system to separate solids from process water. To maximise water use, the separated

process water is then returned to the treatment plant and mixed with new raw water to recommence the treatment process.

3.3.5 Sequestration

Sequestration involves the addition of sequestering agents followed by chlorination which keeps dissolved iron and manganese from oxidising and precipitating.

3.3.6 Disinfection

Drinking water is disinfected to prevent the spread of waterborne pathogens that cause diseases such as dysentery, cholera, typhoid and gastroenteritis.

A low residual level of disinfection also ensures that the water remains disinfected once it leaves the water treatment plant until it arrives at the customer's tap.

In Gippsland Water's service area, chlorination is the most commonly used disinfectant because of its reliability and cost effectiveness. Chlorine is the most widely used disinfectant for drinking water supplies in the world. The other disinfection treatment processes used in our region is chloramination.

Chlorination

Chlorine is widely used throughout the world to disinfect drinking water and control disease-causing organisms. The type of chlorine used at our plants is either chlorine gas or sodium hypochlorite.

Chloramination

Chloramination is also used throughout the world as a means of disinfecting drinking water to control disease causing organisms. Small amounts of chlorine and ammonia are added to the water to form chloramines, providing a relatively long lasting process to safely disinfect water.

Secondary disinfection

Disinfectant residuals decrease as water passes throughout the distribution system and within storage tanks. Secondary water disinfection plants are used to maintain adequate disinfection levels within the distribution system.

Gippsland Water operates a number of chlorination secondary disinfection sites that are in place to ensure disinfection residuals are maintained throughout the distribution system by topping up chlorine levels to maintain a balance between adequate disinfection residuals and aesthetic water quality.

3.3.7 Added substances

Lime / Soda ash

To assist with the treatment process and to ensure the pH level in the raw water (before treatment chemicals are added) and filtered water (after treatment) is within the required ranges, lime or soda ash is added. Lime or soda ash is added to the raw water to adjust the pH to ensure the optimum level for chemical reactions to occur in the coagulation / flocculation process.

Lime or soda ash is also added to the water before it leaves the water treatment plant to maintain the pH in the desired range to optimise the effectiveness of disinfection chlorinated systems and to minimise the risk of corrosion and improve water taste.

Potassium permanganate

Potassium permanganate can be added to the water supply as required to reduce iron and manganese levels. When present in higher concentrations, these metals can cause staining of laundry and plumbing fixtures and contribute to 'dirty water' events.

Powdered activated carbon

Powdered activated carbon can be added to the water supply as required to remove compounds that contribute to taste and odour issues, usually associated with higher levels of certain algae in raw water.

Fluoridation

In accordance with DHHS requirements, Gippsland Water fluoridates the drinking water supplies at 6 of its 16 water treatment plants (Moe, Morwell, Maffra Traralgon, Sale, and Warragul). Any fluoride present in those systems that do not have fluoride dosing systems is due to naturally occurring sources. For information about the health issues associated with the water fluoridation program, contact the Department of Health and Human Services (DHHS) on 1800 651 723.

Calgon T

Calgon T can be added to the water supply as required as a sequestration agent to prevent the oxidation of trace levels of manganese in the water supply that can contribute to dirty water issues.

Distribution

After water is filtered and disinfected, it is relayed to customers through a vast network of tanks, basins, pumps and pipes. Gippsland Water uses positive pressure, gravity and backflow prevention to ensure safe drinking water. Positive pressure pushes contaminants away from the water supply system if leaks occur. The corporation requires high risk properties install a testable backflow prevention device before connecting to the water supply network.

4 SYSTEM ISSUES FOR 2016-17

During the 2016-17 monitoring period, the following issue occurred in the Gippsland Water - water supply system:

- Neerim South reticulation system – one positive *E.coli* result identified in the Neerim South system in November 2016. The DHHS subsequently confirmed that the result was not representative of the water supplied and met the criteria for being a false positive (as per SDWR 2015).

This event was reportable under Section 22 of the SDWA, and as such is detailed in Section 5 of this report.

5 QUALITY OF DRINKING WATER 2016-17

The SDWR require a water quality monitoring program to be undertaken to verify compliance or non-compliance of specified water quality parameters as listed in the regulations. The quality of water is measured across each of the 35 localities to determine that the water meets the specified quality standard. Over the reporting period, approximately 2,500 samples were collected for quality testing and over 28,000 tests performed. The following section provides a summary of the results against the water quality parameters monitored through the year at the required sampling frequency.

A brief explanation of the required water quality parameters is provided below. A more detailed explanation can be obtained from the ADWG prepared by the National Health and Medical Research Council (NHMRC).
(https://www.nhmrc.gov.au/_files_nhmrc/file/publications/nhmrc_adwg_6_version_3.4_final.pdf)

5.1 WATER QUALITY STANDARDS (SDWR 2015)

***Escherichia coli* (*E. coli*) –** *E. coli* is the most common thermo-tolerant coliform present in faeces and is regarded as the most specific indicator of recent faecal contamination from warm blooded animals. The presence of *E. coli* in the water supply can therefore indicate the potential for other pathogenic bacteria to be present. Results from samples taken within the locality that exceed the maximum level of this parameter are reported to DHHS, as required under Section 18 of the SDWA.

Trihalomethanes (THM) – Trihalomethanes are a category of by-products produced in drinking water, principally as a result of disinfection chemicals (chlorine) reacting with naturally occurring organic matter derived from the decay of aquatic and terrestrial vegetative matter, present in water supplies. Results from samples taken within the locality that exceed the maximum level of this parameter are reported to DHHS, as required under Section 18 of the SDWA.

Turbidity – Turbidity is caused by the presence of fine suspended matter such as clay, silt, colloidal particles, algae and other microscopic organisms in the water. In high levels, this matter gives the water the appearance of being dirty, muddy or milky. Turbidity is best removed by coagulation and filtration treatment processes. Results from samples taken within the locality that exceed the maximum level of this parameter are reported to DHHS, as required under Section 18 of the SDWA.

The Safe Drinking Water Regulations (2015) monitoring requirements are summarised in Table 2:

Table 2: Summary of the Safe Drinking Water Regulations 2015 (Schedule 2):

Parameter	SDWR (2015) Water Quality Standard
Escherichia coli	All samples of drinking water collected are found to contain no Escherichia coli per 100 millilitres, with the exception of any false positive sample.
Trihalomethanes	0.25 mg/L
Turbidity	The 95th percentile of results for samples in any 12 month period must be less than or equal to 5·0 Nephelometric Turbidity Units.

5.2 WATER QUALITY STANDARDS

Gippsland Water must ensure that all drinking water supplied to its localities complies with the quality standards specified under Part 3 of the SDWA (2003). As well as the above parameters that are required under Schedule 2 of the SDWR (2015), many other tests are conducted to ensure that the water supplied is safe to drink. These parameters are determined by assessing the risks to each system and monitoring to verify that these risks are being controlled effectively.

The quality standards applied for the additional parameters in most instances are derived from the ADWG.

5.3 EMERGENCY/INCIDENT MANAGEMENT

Gippsland Water has aligned its incident/emergency management approach to the Australasian Inter-service Incident Management Systems (AIIMS) as part of its SDWA and SDWR emergency and incident management processes.

Gippsland Water has audited and updated its All Hazards Incident Management Plan in June 2016 to comply with the requirements of Part 7a of the *Emergency Management Act (2013).*

5.4 INCIDENT AND POTENTIAL WATER QUALITY EVENTS

Section 18 of the SDWA states:

'A water supplier must notify the Secretary in writing if it becomes aware that the drinking water it is supplying to another person does not comply, or is not likely to comply, with any relevant water quality standard and must do so within 10 days after it becomes aware of the fact.

In 2016-17, the water quality events reported to the DHHS pursuant to section 18 of the SDWA are summarised below.

Table 3: Summary of notifications under Section 18

Water Sampling Locality Affected	Date and duration of incident	Location of incident	Nature of the incident	Drinking water supplies affected	Safe Drinking Water Regulations (Schedule 2) – Standard Not Met
There were no events reported to the DHHS pursuant to section 18.					

5.5 EMERGENCIES AND WATER QUALITY EVENTS

Section 22 of the SDWA states:

'(1) This section applies if an officer of a water supplier believes or suspects on reasonable grounds that the water supplied, or to be supplied for drinking purposes –

(a) may be the cause of illness; or
(b) may be the means by which an illness is being, has been or will be transmitted; or
(c) may contain any pathogens, substance, chemical or blue-green algae toxin, whether alone or in combination, at levels that may pose a risk to human health; or
(d) may cause widespread public complaint.

'(2) On forming that belief or suspicion, the officer must immediately report his or her belief or suspicion to the Secretary, and must make the report in the form required by the Secretary.'

During the 2016-17 reporting year, there was one reportable event that required notification to the Drinking Water Regulatory Unit of DHHS, under section 22 of the SDWA. This notification are summarised below.

Table 4: Summary of incidents and actions taken under Section 22

Water Sampling Locality Affected	Date and duration of incident	Location of incident	Nature of the incident	Drinking water supplies affected	Actions taken in response to the incident	Was the community notified
Neerim South	21 November 2016	Neerim South Water Reticulation	*E. coli* detected in drinking water (1 organism/ 100mL)	Neerim South Water Reticulation	DHHS Notification under section 22 SDWA. Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event. Additional disinfection undertaken at storage. All subsequent reticulation monitoring was compliant. The investigation report was submitted to DHHS, with the initial detection being determined to be a false positive, as per the *Safe Drinking Water Regulations (2015).* Refresher training of sampling staff undertaken.	No

5.6 OTHER EVENTS NOT REPORTABLE

There were no other events of note for the reporting period of 2016-17.

6 COMPLAINTS

6.1 WATER QUALITY COMPLAINTS

Gippsland Water is committed to providing safe drinking water to our customers at all times. Gippsland Water records all complaints relating to drinking water quality. The complaints are compared to the number of customers (per 100 customers) to enable comparisons with other water supplies and localities. A summary of customer complaints received by Gippsland Water relating to the quality of drinking water supplied is reported below.

Each water quality complaint received is responded to as per Figure 6 whereby the customer complaint is logged by Gippsland Water's Customer Service or after hours staff, and a Gippsland Water representative responds to the complaint and initiates any corrective actions as required.

The types of water quality complaints logged by Gippsland Water are classified as follows:

- Discoloured / Dirty water;
- Taste / Odour;
- Blue water;
- Air in water;
- Alleged illness.

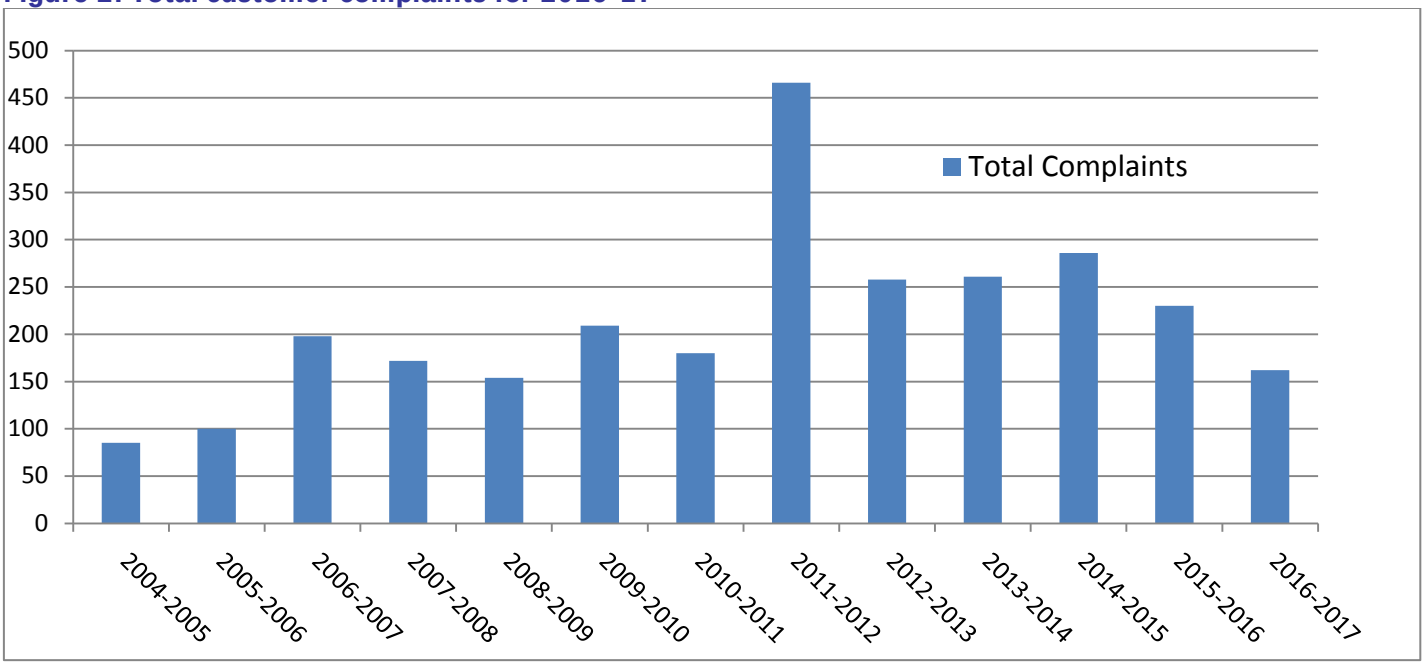
Gippsland Water records and reports on customer complaints relating to dirty water, taste and odour problems, suspected illness/health concerns, blue water, and appearance of air-filled or "white" water received from the tap.

Table 5: Water quality complaints per 100 customers supplied

Type of Complaint	2016-17		2015-16	2014-15	2013-14	2012-13
	No. of Complaints	Complaints per 100 customers	Complaints per 100 customers	Complaints per 100 customers	Complaints per 100 customers	Complaints per 100 customers
Discoloured water	81	0.124	0.185	0.239	0.215	0.224
Taste / Odour	54	0.083	0.112	0.115	0.106	0.104
Blue water	1	0.002	0.003	0.006	0.000	0.005
Air in water	17	0.026	0.026	0.064	0.058	0.058
Alleged illness	9	0.014	0.012	0.014	0.021	0.005
Total	162	0.248	0.339	0.439	0.400	0.396

The total number of complaints received by Gippsland Water during the 2016-17 reporting period was similar to the 2015-16 reporting period, although fewer complaints were recorded for discoloured water. The results are presented below by type and locality.

Figure 2: Total customer complaints for 2016-17



When calculating the number of complaints per 100 customers, there were no localities within Gippsland Water's supply district which exceeded four complaints per 100 customers, as represented in the figure below.

Figure 3: Customer complaints per 100 customers for 2016-17

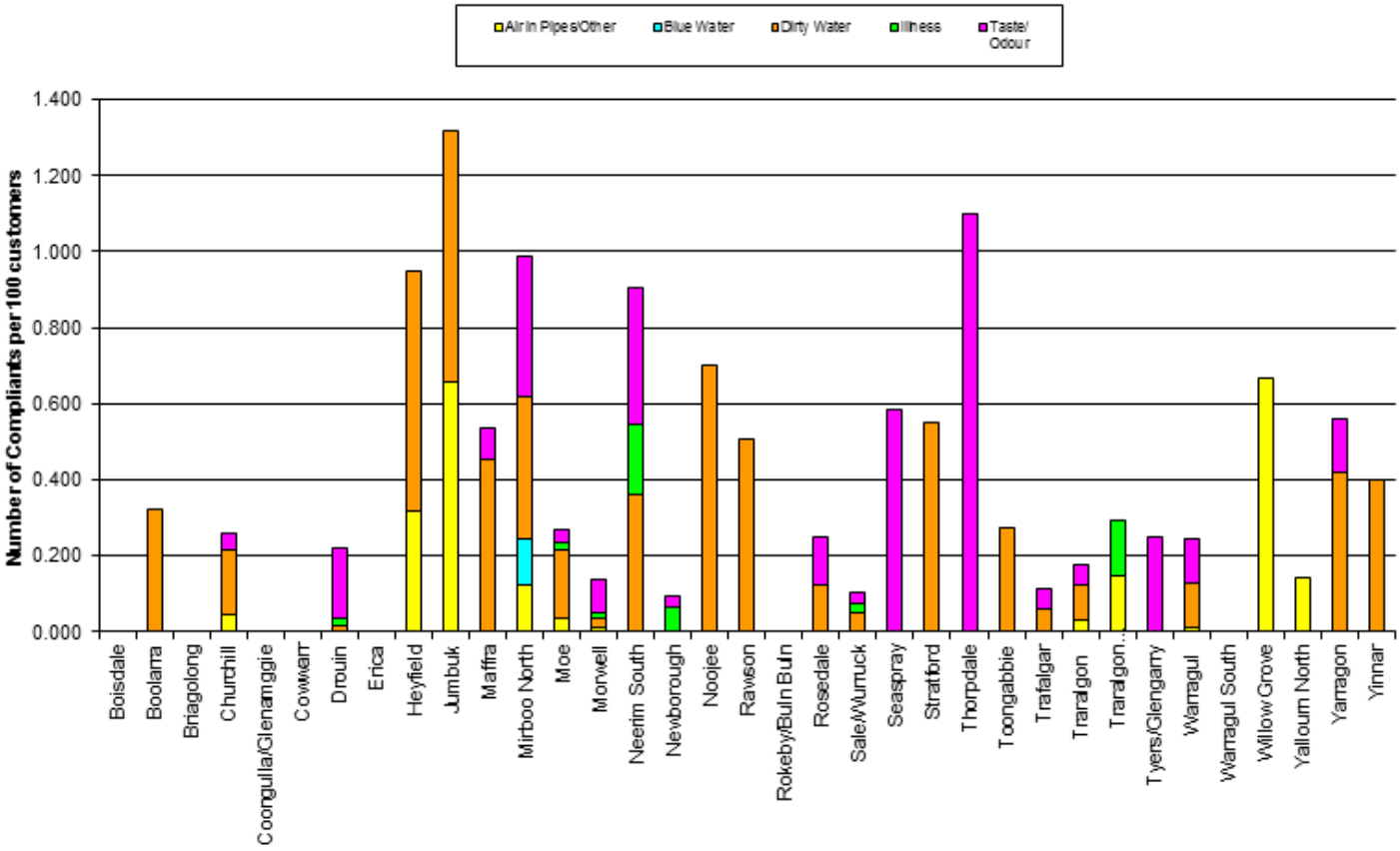


Figure 4: Customer water quality complaints by type 2016-17

The majority of customer complaints for the 2016-17 period related to discoloured/dirty water followed by taste and odour (Figure 5):

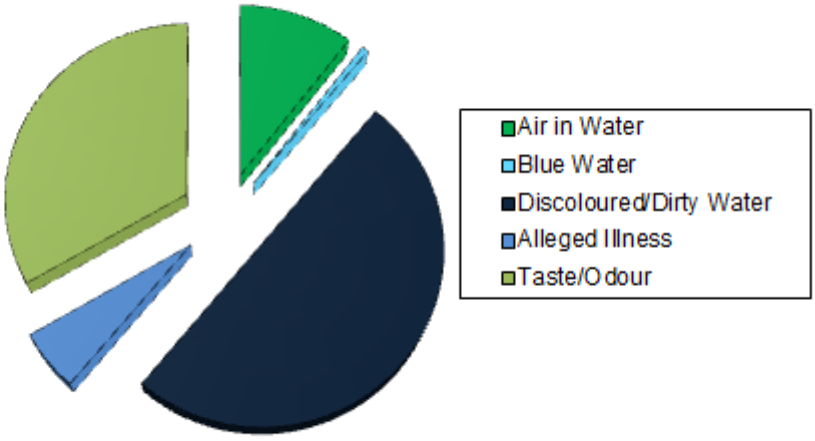


Table 6: Customer complaints summary for each sampling locality 2016-17

Water Quality Locality	Population (Customers = Number of Connections)	Total Complaints Received 2016-17	No. Complaints per 100 customers 2016-17
Boisdale	35	0	0.000
Boolarra	309	1	0.324
Briagolong	334	0	0.000
Churchill	2,309	6	0.260
Coongulla/Glenmaggie	407	0	0.000
Cowwarr	118	0	0.000
Drouin	5,501	12	0.218
Erica	140	0	0.000
Heyfield	948	9	0.949
Jumbuk	152	2	1.316
Maffra	2,420	13	0.537
Mirboo North	811	8	0.986
Moe	5,573	15	0.269
Morwell	8,003	11	0.137
Neerim South	551	5	0.907
Newborough	3,215	3	0.093
Noojee	143	1	0.699
Rawson	198	1	0.505
Rokeby / Buln Buln	205	0	0.000
Rosedale	799	2	0.250
Sale / Wurruk	7,840	8	0.102
Seaspray	343	2	0.583

Table 6: Customer complaints summary for each sampling locality 2016/17 (cont.)

Water Quality Locality	Population (Customers = Number of Connections)	Total Complaints Received 2016-17	No. Complaints per 100 customers 2016-17
Stratford	905	5	0.552
Thorpdale	91	1	1.099
Toongabbie	365	1	0.274
Trafalgar	1,741	2	0.115
Traralgon	13,154	23	0.175
Traralgon South / Hazelwood Nth	685	2	0.292
Tyers / Glengarry	796	2	0.251
Warragul	7,705	19	0.247
Warragul South	69	0	0.000
Willow Grove	150	1	0.667
Yallourn North	704	1	0.142
Yarragon	713	4	0.561
Yinnar	498	2	0.402

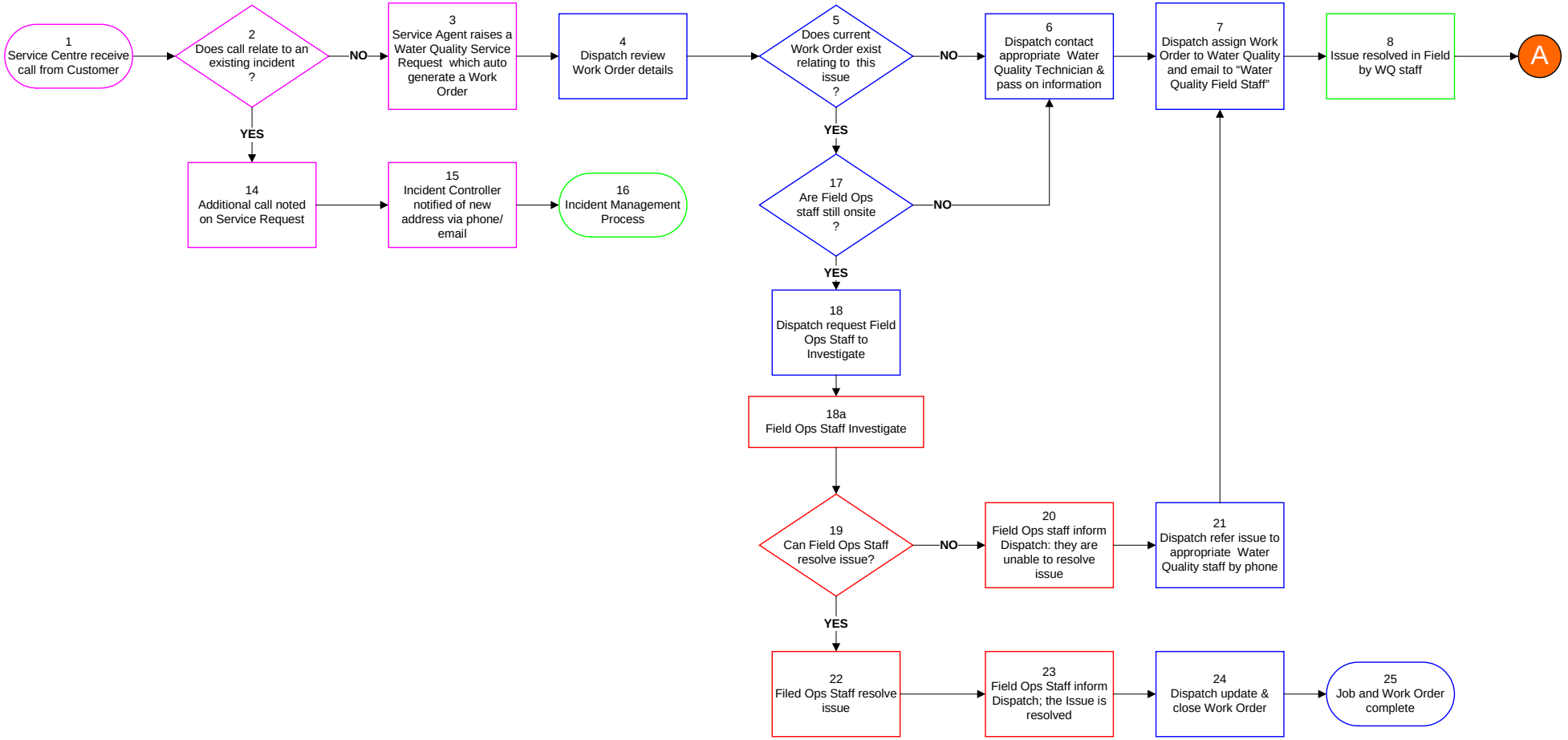
6.2 A SUMMARY OF THE CUSTOMER COMPLAINT PROCESS

Customer complaints are managed according to the following summary procedure:

- Customer complaints received by Gippsland Water's Customer Contact Centre are recorded in a database. Details include information of who, where, time and nature of complaint.
- The Water Quality Group investigates by visiting the site and contacting the customer if necessary to determine details of the water quality problem.
- For complaints associated with taste and odour, dirty water, and air in pipes, field measurements are performed, the reticulation system is typically flushed then field measurements are taken again to verify the problem has been corrected.
- Follow up contact may be made with the customer to determine if they are satisfied with the quality of service, or alternatively a standard Gippsland Water contact card is left with the customer. This also encourages customers to keep Gippsland Water informed of any reoccurrence of water quality problems.
- Details of actions undertaken are entered into a database to provide a record/history of the site, to document issues for maintenance programs, and to inform capital upgrade requirements where a history of system failures occurs.

This procedure is presented in more detail in the figure on the following page.

Figure 5: Water quality complaints resolution procedure



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7 RISK MANAGEMENT PLAN AUDIT

Gippsland Water's Water Quality Risk Management Plan has been operational since 2005 and adopts the 12 elements outlined in the ADWG and preventative risk management strategies outlined in the SDWA.

Gippsland Water's Water Quality Risk Management Plan was not audited by DHHS approved auditors for compliance with section 7(1) of the SDWA 2003 for compliance against the requirements of the Safe Drinking Water Regulations 2015 during the reporting period.

8 WATER QUALITY RESULTS FOR 2016-17

8.1 ESCHERICHIA COLI (E. COLI)

8.1.1 E. coli results

Compliance under the SDWR (2015) requires all samples of drinking water collected within a locality to contain no *E. coli* organism/100mL of drinking water. All Gippsland Water localities achieved compliance with this standard for the 2016-17 reporting period.

Table 8 below details all E.coli notifications for the reporting period 1 July 2016 to 30 June 2017 under the Safe Drinking Water Regulations (2015).

Table 7: *E. coli* detections for localities 2016-17

Locality	No. of investigations conducted (s.22)	No. of confirmed false positives	No. of investigations where standard not met (s.18)
Neerim South	1	1	0

Table 8: *E. coli* results for all localities for 2016-17

Locality	Frequency of Sampling	Number of samples	Maximum Detected (orgs/100mL)	No. of detections and investigations conducted (s.22)	No. of samples where standard was not met (s.18)
Boisdale	Weekly	104	0	0	0
Boolarra	Weekly	104	0	0	0
Briagolong	Weekly	104	0	0	0
Churchill	Weekly	168	0	0	0
Coongulla-Glenmaggie	Weekly	104	0	0	0
Cowwarr	Weekly	52	0	0	0
Drouin	Weekly	155	0	0	0
Erica	Weekly	52	0	0	0
Heyfield	Weekly	104	0	0	0
Jumbuk	Weekly	104	0	0	0
Maffra	Weekly	116	0	0	0
Mirboo North	Weekly	104	0	0	0
Moe	Weekly	156	0	0	0
Morwell	Weekly	231	0	0	0
Neerim South	Weekly	104	1	1	0
Newborough	Weekly	104	0	0	0
Noojee	Weekly	156	0	0	0
Rawson	Weekly	104	0	0	0
Rokeby-Buln Buln	Weekly	52	0	0	0
Rosedale	Weekly	104	0	0	0
Sale-Wurruk	Weekly	195	0	0	0
Seaspray	Weekly	104	0	0	0

Table 8: *E. coli* results for all localities for 2016-17 (cont.)

Locality	Frequency of Sampling	Number of samples	Maximum Detected (orgs/100mL)	No. of detections and investigations conducted (s.22)	No. of samples where standard was not met (s.18)
Stratford	Weekly	52	0	0	0
Thorpdale	Weekly	104	0	0	0
Toongabbie	Weekly	104	0	0	0
Trafalgar	Weekly	116	0	0	0
Traralgon	Weekly	156	0	0	0
Traralgon South-Hazelwood North	Weekly	52	0	0	0
Tyers-Glengarry	Weekly	104	0	0	0
Warragul	Weekly	201	0	0	0
Warragul South	Weekly	104	0	0	0
Willow Grove	Weekly	104	0	0	0
Yallourn North	Weekly	104	0	0	0
Yarragon	Weekly	104	0	0	0
Yinnar	Weekly	52	0	0	0

8.1.2 Actions taken in relation to non-compliance

One *E.coli* detection occurred within the Neerim South locality for a sample collected on 21 November 2016 (refer section 5.4, Table 4). DHHS was notified under section 22 SDWA.

The initial positive sample was collected from a customer tap sample point on 21 November 2016. Notification of the exceedance was received on 22 November 2016. Additional samples were collected from multiple sites throughout the reticulation on 22 November 2016, prior to an extensive flushing program being undertaken. All the pre flush samples collected showed no *E.coli* present.

After extensive flushing was undertaken throughout the reticulation network, additional samples were also collected on 22 November 2016 (post flush). All the post flush samples collected showed no *E.coli* present.

Sampling was again conducted on 23 November 2016 which also showed no *E.coli* present.

All subsequent reticulation monitoring was compliant.

A thorough investigation was undertaken and a report submitted to DHHS. The report was reviewed, with DHHS confirming that the positive result was not representative of the water supplied, and meeting the false positive criteria (as per SDWR 2015 - Schedule 2).

Refresher training of sampling techniques with staff has been undertaken.

8.2 CHLORINE BASED DISINFECTION BY-PRODUCT CHEMICALS

8.2.1 Trihalomethanes (THM) results

For compliance with the SDWR (2015), a sample result must not exceed 0.25 mg/L trihalomethanes. All Gippsland Water sites achieved 100% compliance with this standard for the 2016-17 reporting period.

Table 9: Trihalomethanes results for all localities for 2016-17

Locality	Frequency of sampling	No. of samples	No. of non-complying samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Monthly	12	0	0.062	0.036	Yes
Boolarra	Monthly	12	0	0.086	0.056	Yes
Briagolong	Monthly	12	0	0.010	0.002	Yes
Churchill	Monthly	12	0	0.069	0.028	Yes
Coongulla-Glenmaggie	Monthly	12	0	0.009	0.003	Yes
Cowwarr	Monthly	12	0	0.080	0.056	Yes
Drouin	Monthly	12	0	0.077	0.038	Yes
Erica	Monthly	12	0	0.042	0.019	Yes
Heyfield	Monthly	12	0	0.031	0.012	Yes
Jumbuk	Monthly	12	0	0.101	0.046	Yes
Maffra	Monthly	12	0	0.049	0.020	Yes
Mirboo North	Monthly	12	0	0.039	0.021	Yes
Moe	Monthly	12	0	0.044	0.019	Yes
Morwell	Monthly	12	0	0.042	0.017	Yes
Neerim South	Monthly	12	0	0.049	0.029	Yes
Newborough	Monthly	12	0	0.052	0.029	Yes
Noojee	Monthly	12	0	0.031	0.022	Yes
Rawson	Monthly	12	0	0.035	0.015	Yes
Rokeby-Buln Buln	Monthly	12	0	0.086	0.032	Yes
Rosedale	Monthly	12	0	0.112	0.048	Yes
Sale-Wurruk	Monthly	12	0	0.027	0.015	Yes
Seaspray	Weekly	194	0	0.169	0.082	Yes
Stratford	Monthly	12	0	0.051	0.021	Yes
Thorpdale	Monthly	12	0	0.079	0.048	Yes
Toongabbie	Monthly	12	0	0.064	0.046	Yes
Trafalgar	Monthly	12	0	0.044	0.030	Yes
Traralgon	Monthly	12	0	0.050	0.014	Yes
Traralgon South-Hazelwood North	Monthly	12	0	0.062	0.028	Yes
Tyers-Glengarry	Monthly	12	0	0.064	0.036	Yes
Warragul	Monthly	12	0	0.088	0.027	Yes
Warragul South	Monthly	12	0	0.099	0.049	Yes
Willow Grove	Monthly	12	0	0.003	<0.001	Yes
Yallourn North	Monthly	12	0	0.066	0.037	Yes
Yarragon	Monthly	12	0	0.052	0.035	Yes
Yinnar	Monthly	12	0	0.074	0.040	Yes

8.2.2 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.3 OZONE BASED DISINFECTION BY-PRODUCT CHEMICALS

Gippsland Water has no ozone dosing systems and therefore the ozone based chemical concentrations of bromate and formaldehyde have not been included in the routine testing program.

8.4 TURBIDITY

8.4.1 Turbidity results

For compliance with the SDWR (2015), the 95th percentile of results for samples of drinking water collected in any 12-month period, must be less than or equal to 5.0 NTU (Nephelometric Turbidity Unit). All Gippsland Water sites achieved 100% compliance with this standard for the 2016-17 reporting period.

Table 10: Turbidity results for all localities in 2016-17

Locality	Frequency of Sampling	Number of Samples	Maximum turbidity in a sample (NTU)	Maximum 95th Percentile of turbidity results in any 12 months (NTU)	No. of 95th Percentile of results in any 12 months above standard (s.18)	Complying (Yes/No)
Boisdale	Weekly	52	0.2	0.1	0	Yes
Boolarra	Weekly	52	0.4	0.3	0	Yes
Briagolong	Weekly	52	0.3	0.1	0	Yes
Churchill	Weekly	52	0.2	0.1	0	Yes
Coongulla/Glenmaggie	Weekly	52	0.5	0.5	0	Yes
Cowwarr	Weekly	52	0.5	0.2	0	Yes
Drouin	Weekly	52	0.3	0.2	0	Yes
Erica	Weekly	52	1.8	0.6	0	Yes
Heyfield	Weekly	52	0.4	0.3	0	Yes
Jumbuk	Weekly	52	0.2	0.2	0	Yes
Maffra	Weekly	52	0.1	0.1	0	Yes
Mirboo North	Weekly	52	0.6	0.1	0	Yes
Moe	Weekly	52	0.4	0.1	0	Yes
Morwell	Weekly	52	0.4	0.2	0	Yes
Neerim South	Weekly	52	0.2	0.2	0	Yes
Newborough	Weekly	52	0.2	0.1	0	Yes
Noojee	Weekly	52	0.4	0.3	0	Yes
Rawson	Weekly	52	0.4	0.2	0	Yes
Rokeby/Buln Buln	Weekly	52	0.4	0.2	0	Yes
Rosedale	Weekly	52	0.4	0.4	0	Yes
Sale/Wurruk	Weekly	52	0.4	0.1	0	Yes
Seaspray	Weekly	52	0.8	0.7	0	Yes
Stratford	Weekly	52	0.3	0.2	0	Yes
Thorpdale	Weekly	52	0.4	0.2	0	Yes
Toongabbie	Weekly	52	0.3	0.3	0	Yes
Trafalgar	Weekly	52	0.2	0.1	0	Yes
Traralgon	Weekly	52	0.5	0.2	0	Yes
Traralgon South/ Hazelwood North	Weekly	52	0.2	0.1	0	Yes
Tyers/Glengarry	Weekly	52	0.2	0.1	0	Yes
Warragul	Weekly	105	0.4	0.2	0	Yes
Warragul South	Weekly	52	0.3	0.2	0	Yes
Willow Grove	Weekly	52	0.2	0.2	0	Yes
Yallourn North	Weekly	52	0.1	0.1	0	Yes
Yarragon	Weekly	52	0.1	0.1	0	Yes
Yinnar	Weekly	52	0.6	0.2	0	Yes

*For calculation purposes, all results reported as <0.1 NTU were rounded to 0.1 NTU for calculating the maximum 95th percentile.

8.4.2 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.5 FLUORIDE

Fluoride testing has been performed in the water supply systems where fluoride is added to the water (Maffra, Warragul, Sale, Traralgon, Morwell and Moe).

Gippsland Water has sampled localities on a weekly basis even though some of the localities listed in table 11 require monthly samples according to section 5.1.4 of the Code of Practice for Fluoridation of Drinking Water Supplies (i.e. if a fluoride plant supplies five or more water sampling localities then the corporation must take a sample each month from a water sampling point in each water sampling locality supplied from those plant such that a sample is collected from the distribution system at least once per week).

8.5.1 Fluoride results

Based on health considerations, no single sample concentration of fluoride in drinking water should exceed 1.5 mg/L, and the average level of fluoride should not exceed 1.0 mg/L. All Gippsland Water sites achieved 100% compliance with this standard for the 2016-17 reporting period.

The obligation target is defined as the annual average concentration of fluoride being greater than 0.6 mg/L, the minimum concentration required to provide health benefits to communities. A number of sites failed to achieve this target due to significant maintenance activities during the reporting period where the dosing systems were inactive. These are discussed in detail below.

Table 11: Fluoride results for all fluoridated localities in 2016-17

Treatment Plant	Locality	Frequency of Sampling	Number of Samples	Operating Target	Max (mg/L)	Min (mg/L)	Overall Average[1] (mg/L)	Operating Average[2] (mg/L)	Comply[3] (Yes /No)	Meeting Obligations[4] (Yes/No)
Maffra*	Boisdale	Weekly	52	0.9	0.91	<0.05	0.56	0.85	Yes	No
	Maffra	Weekly	104	0.9	0.96	<0.05	0.60	0.85	Yes	Yes
	Stratford	Weekly	52	0.9	0.91	<0.05	0.57	0.84	Yes	No
Morwell	Churchill	Monthly	52	0.9	0.98	0.66	0.85	0.85	Yes	Yes
	Boolarra	Monthly	53	0.9	0.92	0.75	0.86	0.86	Yes	Yes
	Jumbuk	Monthly	52	0.9	0.93	0.74	0.86	0.86	Yes	Yes
	Morwell	Weekly	104	0.9	0.98	0.44	0.86	0.86	Yes	Yes
	Traralgon South/ Hazelwood North	Monthly	52	0.9	0.92	0.68	0.86	0.86	Yes	Yes
	Yinnar	Monthly	52	0.9	0.91	0.73	0.86	0.86	Yes	Yes
Moe[5]	Moe	Weekly	104	0.9	0.91	0.49	0.82	0.83	Yes	Yes
	Newborough	Monthly	52	0.9	0.89	0.72	0.83	0.83	Yes	Yes
	Trafalgar	Monthly	52	0.9	0.92	0.70	0.83	0.83	Yes	Yes
	Yallourn North	Monthly	52	0.9	0.88	0.74	0.83	0.83	Yes	Yes
	Thorpdale[6]	Monthly	52	0.9	0.90	0.72	0.82	0.82	Yes	Yes
	Yarragon	Monthly	52	0.9	0.89	0.70	0.83	0.83	Yes	Yes
Sale	Sale/Wurruk	Weekly	104	0.9	0.97	0.77	0.88	0.88	Yes	Yes
Traralgon*	Traralgon	Weekly	104	0.9	0.91	<0.05	0.80	0.82	Yes	Yes
Warragul	Drouin	Weekly	52	0.9	1.07	0.65	0.85	0.85	Yes	Yes
	Rokeby/Buln Buln	Weekly	52	0.9	1.13	0.64	0.86	0.86	Yes	Yes
	Warragul	Weekly	104	0.9	1.12	0.57	0.84	0.85	Yes	Yes
	Warragul South	Weekly	52	0.9	0.98	0.70	0.83	0.83	Yes	Yes

1 = The average value calculated based on all monitoring conducted over the 2016-17 reporting period, including when dosing did not occur.
2 = The average calculated excluding the times where dosing did not occur.
3 = Complying is defined as any sample not exceeding 1.5 mg/L, or the 12-month rolling average not exceeding 1.0 mg/L.
4 = Meeting obligation is defined as the annual average concentration of fluoride was greater than 0.6 mg/L excluding when dosing did not occur.
5 = Fluoride dosing at the Moe water treatment plant recommenced on 18th November 2014 and continued for the remainder of the reporting period.
6 = Water carting to Thorpdale from the Moe system (Trafalgar) commenced in September 2015.
* = Dosing did not occur during the reporting period.

8.5.2 Actions taken in relation to non-compliance

All systems achieved compliance against the standard (no single sample concentration of fluoride in drinking water should exceed 1.5 mg/L, and the average level of fluoride should not exceed 1.0 mg/L).

All systems except for Stratford and Boisdale achieved the overall obligation target of 0.6 mg/L for the reporting period. The Stratford and Boisdale localities are supplied from the Maffra system, which underwent maintenance works during part of the reporting period to improve operator safety and reliability.

8.5.3 Fluoride dosing systems performance and maintenance 2016-17

The Gippsland Water fluoride dosing systems upgrade program was completed during the 2016-17 year. Gippsland Water has now upgraded all fluoride dosing systems (from a dissolvable PVA bag process to a fully enclosed delivery system) to improve health and safety associated with the handling of to a sodium fluoride powder.

- Traralgon

The fluoride dosing system at the Traralgon Water Treatment Plant was operational for the duration of the reporting period.

- Maffra

The fluoride dosing system at the Maffra Water Treatment Plant recommenced operation on 18 October 2016 and was in operation for the remainder of the reporting period.

The fluoride dosing system ceased operation in February 2014 and was replaced due to issues of supply and containers of the fluorosilicic acid (FSA). Options regarding the continued use of FSA at this site were assessed, with a final decision to upgrade the site to the new fluorosafe system being taken.

In line with the Fluoride Code of Practice, an independent technical assessment prior to commissioning was undertaken and corrective actions implemented. This process has been undertaken in conjunction with, and coordinated by DHHS.

- Warragul

The fluoride dosing system at the Warragul Water Treatment Plant was operational during the reporting period.

As per the Fluoride Code of Practice (Section 7, Table 4), a notification was made to DHHS when the dosed fluoride level decreased below the lower action process limit (0.6 mg/L) for a period of greater than 72 hours. This occurred between 5:30am on 17 July 2016 until 4:00pm on 20 July 2016. This was caused by the late delivery of sodium fluoride from the chemical supplier. A new chemical ordering and invoicing system was being installed.

- Sale

The fluoride dosing system at the Sale Water Treatment Plant was operational during the reporting period.

As per the Fluoride Code of Practice (Section 7, Table 4), a notification was made to DHHS when the dosed fluoride level decreased below the lower action process limit (0.6 mg/L) for a period of greater than 72 hours. This occurred between 7:17pm on 25 January 2017 until 9:45am on 29 January 2017. This was caused by the late delivery of sodium fluoride from the chemical supplier. A new chemical ordering and invoicing system was being installed.

- Morwell

The fluoride dosing system at the Morwell Water Treatment Plant was operational during the reporting period.

- Moe

The fluoride dosing system at the Moe Water Treatment Plant was operational during the reporting period.

8.6 WATER TREATMENT PROJECTS AND PROGRAMS UNDERTAKEN

During the 2016-17 reporting period, Gippsland Water undertook a number of works, programs or projects to ensure that continual improvements were made to ensure the ongoing provision of safe drinking water to its customers. These included:

- treated water storage basins and tank condition assessments as part of the ongoing inspection, maintenance and cleaning program;
- ongoing water treatment plant filter upgrades and refurbishment program;
- installation and upgrades of remote disinfection sites;
- ongoing implementation of water reticulation mains air scouring program;
- ongoing replacement and upgrade of water quality on-line and field instrumentation; and
- minor upgrade works across multiple sites that included replacement of high lift pumps (to transfer treated water from water treatment plant to system storages), upgrades of diesel generator points at all water treatment plants for alternative emergency power supply, and improvements to chemical storage bund enclosures.

Figure 6: Maffra water supply locality project – Fluoridation system

Water treatment plant fluoridation system and controls system upgrade project for improved water treatment plant process control management, and health and safety outcomes .

Figure 7: Maffra water supply locality project – Activated carbon system

Water treatment plant upgrade to powder activated carbon system for water quality taste and odour water quality aesthetics management.

Figure 8: Heyfield water supply locality project – Activated carbon system

Heyfield Water Treatment Plant upgrade to powder activated carbon system for water quality taste and odour water quality aesthetics management.

Figure 9: Heyfield water supply locality project – Chemical dosing system

Heyfield Water Treatment Plant upgrade to chemical dosing system for improved water treatment plant performance and reliability.

Figure 10: Sale water supply locality project – pH correction

Sale Water Treatment Plant post treatment pH correction addition to complete Sale WTP upgrade project. Post treatment pH correction was added to process to improve water quality taste and disinfection across Sale the water supply system.

Figure 11: Thorpdale water supply locality project – Fill point upgrade

Thorpdale Water Treatment Plant decommissioned and an improved water carting fill point installed for greater water supply security.

Figure 12: Thorpdale Water Supply Locality Project – Disinfection System

Thorpdale water supply upgraded disinfection system for improved water quality and public health disinfection.

Figure 13: Traralgon Water Treatment Plant - Chemical storage facility

Traralgon Water Treatment Plant upgrade to chemical storage facility and bund.

Figure 14: Traralgon Water Treatment Plant – Outlet flow meter

Traralgon Water Treatment Plant replacement of outlet flow meter for improved chemical dosing performance.

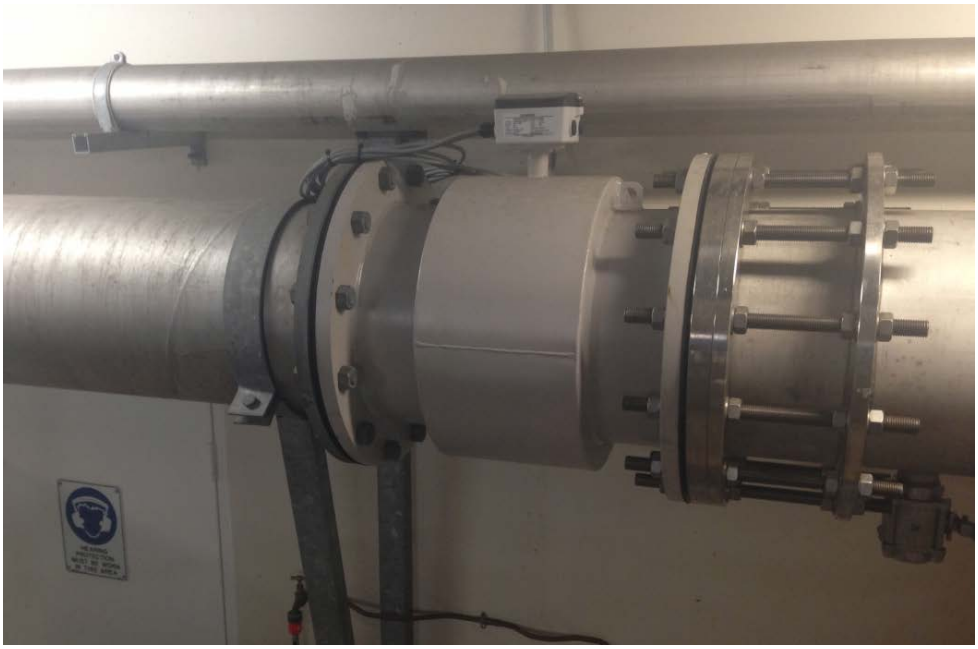
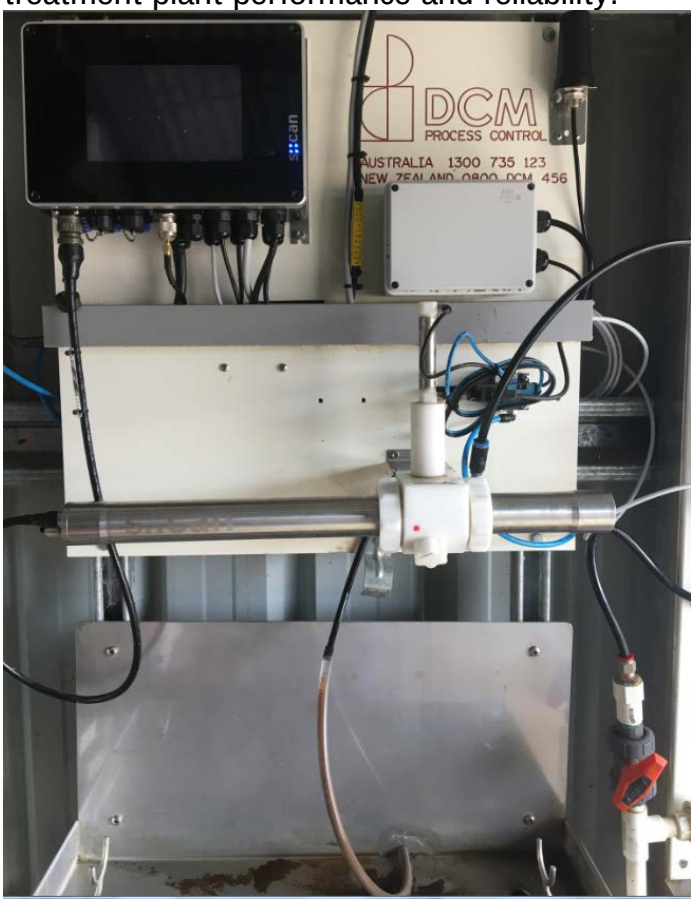


Figure 15: Moe Water Treatment Plant – S:scan control unit

Moe Water Treatment Plant – Commissioning of S:scan process control unit to improve water treatment plant performance and reliability.



8.7 OTHER ALGAE, PATHOGEN, CHEMICAL OR SUBSTANCE NOT SPECIFIED THAT MAY POSE A RISK TO HUMAN HEALTH

8.7.1 Overall results

During the reporting period, the corporation monitored for the following health-related aspects of the drinking water supplied to customer taps. Table 13 lists the parameters and the frequency of samples taken across all localities, comparing the results to the ADWG and the health-based guideline value.

Table 12: Other sampled parameter results for all localities in 2016-17

Parameter	Frequency of sampling	2016-17 No. of Samples	2016-17 Maximum Value Recorded for All Localities (mg/L)	2015-16 Maximum Value Recorded for All Localities (mg/L)	2014-15 Maximum Value Recorded for All Localities (mg/L)	Health Based Guideline value (mg/L)	Result
Nitrite	Weekly*/6 Monthly	443	0.7	0.4	0.0	< 3	All results below ADWG health guideline values
Mercury	Quarterly	300	<0.0001	<0.0001	<0.0001	< 0.001	
Chromium	Quarterly	156	<0.001	<0.001	<0.001	< 0.05	
Cadmium	Quarterly	156	<0.0002	<0.0002	<0.002	< 0.002	
Nitrate	Weekly*/Quarterly	300	1.5	1.4	1.4	< 50	
Nickel	Annually	51	0.006	0.004	0.003	< 0.02	
Arsenic	Annually/Quarterly	131	<0.001	<0.001	<0.001	< 0.01	
Cyanide	Annually	37	<0.002	<0.005	<0.001	< 0.08	
Selenium	Annually/Quarterly	131	<0.001	<0.001	<0.001	< 0.01	
Beryllium	Annually/6 Monthly	88	<0.001	<0.01	<0.001	< 0.06	
Chloryl Hydrate	Monthly	432	0.030	0.020	0.022	< 0.1	
2, 4-Dichlorophenoxy acetic acid	Monthly	432	<0.01	<0.01	<0.01	< 0.03	
Nitrosodimethylamine	Monthly**	24	0.000012	0.000008	0.000007	< 0.0001	
2,4,6-Trichlorophenol	Monthly***	424	<0.001	<0.001	<0.001	< 0.02	
2,4-Dichlorophenol	Monthly***	424	<0.001	<0.001	<0.001	< 0.2	
2- Chlorophenol	Monthly***	424	<0.001	<0.001	<0.001	< 0.3	
Pentachlorophenol	Monthly	432	<0.001	<0.001	<0.001	< 0.01	
Parameter	**Frequency of sampling**	**2016-17 No. of Samples**	**2016-17 Maximum Value Recorded for All Localities (mg/L)**	**2015-16 Maximum Value Recorded for All Localities (mg/L)**	**2014-15 Maximum Value Recorded for All Localities (mg/L)**	**Aesthetic Based Guideline value (mg/L)**	**Result**
Chloride	Annually/Quarterly	197	160	140	160	<250	All results below ADWG health guideline values
Zinc	Annually	73	0.010	0.025	0.021	<3	
Hardness ($CaCO_3$)	Annually/Quarterly	131	120	130	----	<200	
Total dissolved solids	Annually/Quarterly	133	340	360	230	<600	
Silica	Annually/Quarterly	127	16	15	8.1	<80	
Sulphate	Annually/Quarterly	22	23	45	34	<250	

*- Weekly monitoring undertaken on chloraminated systems

**- Monthly monitoring undertaken on chloraminated systems

***- Frequency Increased from quarterly to monthly during reporting period

Monitoring for other parameters such as radiological, pesticides, protozoan organisms is conducted routinely. A complete list of raw water parameters monitored is contained in Appendix 1. Additional monitoring is performed on a risk basis and as the need arises.

Blue Green Algae (BGA) monitoring is undertaken across Gippsland Water storages based on visual and water quality triggers. Major raw water supply/storages are routinely monitored for BGA as part of the routine catchment monitoring program.

For water storages not managed by Gippsland Water, the Water Storage Manager (Melbourne Water – Tarago, Southern Rural Water – Blue Rock and Lake Glenmaggie) undertakes monitoring and advised Gippsland Water of the results in accordance with their respective algae management plans.

Table 13: Routine BGA monitoring for raw water supplies in 2016-17 (samples per month collected)

Location	Jul '16	Aug '16	Sept '16	Oct '16	Nov '16	Dec '16	Jan '17	Feb '17	Mar '17	Apr '17	May '17	Jun '17
Maffra Weir	2	2	2	4	4	4	4	4	4	4	2	2
Heyfield Raw Water Storage	1	1	1	1	1	1	2	2	2	2	2	2
Thorpdale Raw Water Storage	No longer in use (drained)											
Neerim South Tarago Reservoir	1	1	1	1	1	1	1	1	1	1	1	1
Rawson Amours Basin							1	1	1	1	1	1
Seaspray Raw Water Storage	2	2	2	4	4	4	4	4	4	4	2	2
Blue Rock Lake (Southern Rural Water BGA Program)	1	1	1	2	2	2	2	2	2	1	1	1
Willow Grove WTP Inlet - Blue Rock	1	1	1	1	1	1	1	1	1	1	1	1
Lake Glenmaggie (Southern Rural Water BGA Program)	1	1	1	2	2	2	2	2	2	1	1	1
Coongulla WTP Inlet – Lake Glenmaggie	2	2	2	4	4	4	4	4	4	4	2	2
Tarago Reservoir (Melbourne Water BGA Program)	1	1	1	1	1	2	2	2	2	2	1	1
Warragul WTP Inlet – Tarago Reservoir	1	1	1	1	1	1	1	1	1	1	1	1
Moondarra Surface	1	1	1	1	1	1	1	1	1	1	1	1
Moondarra pipeline	1						1	1	1	1	1	1
Moondarra Upper reaches	*As required*											

During the reporting period, there were no algae or blue green algae blooms which impacted water treatment process.

8.7.2 Manganese

Manganese can be naturally present in raw water supplies as either a soluble or insoluble form. When concentrations exceed the aesthetic guideline of 0.1 mg/L, manganese can create unacceptable tastes in water, as well as stain fixtures and laundry. The ADWG guideline value is measured against the health guideline value of 0.5 mg/L in ADWG. Gippsland Water sites achieved 100% manganese ADWG guideline value.

Table 14: Manganese results for all localities in 2016-17

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)	Min (mg/L)	Drinking Water Quality Standard Met (ADWG) (Yes/No)
Boisdale	Monthly	12	0.001	<0.001	Yes
Boolarra	Weekly	64	0.002	<0.001	Yes
Briagolong	Weekly	64	0.002	<0.001	Yes
Churchill	Monthly	12	<0.001	<0.001	Yes
Coongulla/Glenmaggie	Weekly	64	0.001	<0.001	Yes
Cowwarr	Monthly	12	<0.001	<0.001	Yes
Drouin	Monthly	12	0.001	<0.001	Yes
Erica	Monthly	12	0.008	0.004	Yes
Heyfield	Weekly	64	0.016	0.002	Yes
Jumbuk	Monthly	12	<0.001	<0.001	Yes
Maffra	Weekly	64	0.047	<0.001	Yes
Mirboo North	Weekly	64	0.015	<0.001	Yes
Moe	Weekly	64	0.017	<0.001	Yes
Morwell	Weekly	64	0.010	<0.001	Yes
Neerim South	Weekly	64	0.023	0.007	Yes
Newborough	Monthly	12	0.002	<0.001	Yes
Noojee	Monthly	12	0.022	0.007	Yes
Rawson	Weekly	64	0.013	0.004	Yes
Rokeby/Buln Buln	Monthly	12	0.002	<0.001	Yes
Rosedale	Monthly	12	<0.001	<0.001	Yes
Sale/Wurruk	Weekly	64	0.004	<0.001	Yes
Seaspray	Weekly	64	0.011	0.005	Yes
Stratford	Monthly	12	0.002	<0.001	Yes
Thorpdale	Weekly	64	0.009	<0.001	Yes
Toongabbie	Monthly	12	<0.001	<0.001	Yes
Trafalgar	Weekly	64	0.003	<0.001	Yes
Traralgon	Weekly	64	0.009	<0.001	Yes
Traralgon South/Hazelwood North	Monthly	12	<0.001	<0.001	Yes
Tyers/Glengarry	Weekly	64	0.008	<0.001	Yes
Warragul	Weekly	115	0.007	<0.001	Yes
Warragul South	Monthly	12	0.002	<0.001	Yes
Willow Grove	Weekly	64	0.014	<0.001	Yes
Yallourn North	Monthly	12	0.001	<0.001	Yes
Yarragon	Weekly	64	0.002	<0.001	Yes
Yinnar	Monthly	12	0.001	<0.001	Yes

8.7.3 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.7.4 Lead

Lead can be present in drinking water as a result of dissolution from natural sources or from household plumbing. Based on health considerations in the ADWG guidelines, concentrations of lead in drinking water should not exceed 0.01 mg/L. Gippsland Water sites achieved 100% ADWG guideline value against lead guideline values for all customer tap sites.

Table 15: Lead results for all localities in 2016-17

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)	Min (mg/L)	Drinking Water Quality Standard Met (ADWG) (Yes/No)
Boisdale	Quarterly	4	<0.001	<0.001	Yes
Boolarra	Quarterly	4	<0.001	<0.001	Yes
Briagolong	Quarterly	4	<0.001	<0.001	Yes
Churchill	Quarterly	4	<0.001	<0.001	Yes
Coongulla/Glenmaggie	Quarterly	4	<0.001	<0.001	Yes
Cowwarr	Quarterly	4	<0.001	<0.001	Yes
Drouin	Quarterly	4	<0.001	<0.001	Yes
Erica	Quarterly	4	0.002	<0.001	Yes
Heyfield	Quarterly	4	<0.001	<0.001	Yes
Jumbuk	Quarterly	4	<0.001	<0.001	Yes
Maffra	Quarterly	4	<0.001	<0.001	Yes
Mirboo North	Quarterly	4	<0.001	<0.001	Yes
Moe	Quarterly	4	<0.001	<0.001	Yes
Morwell	Quarterly	4	<0.001	<0.001	Yes
Neerim South	Quarterly	4	<0.001	<0.001	Yes
Newborough	Quarterly	4	<0.001	<0.001	Yes
Noojee	Quarterly	4	<0.001	<0.001	Yes
Rawson	Quarterly	4	<0.001	<0.001	Yes
Rokeby/Buln Buln	Quarterly	4	<0.001	<0.001	Yes
Rosedale	Quarterly	4	<0.001	<0.001	Yes
Sale/Wurruk	Quarterly	4	<0.001	<0.001	Yes
Seaspray	Quarterly	4	<0.001	<0.001	Yes
Stratford	Quarterly	4	<0.001	<0.001	Yes
Thorpdale	Quarterly	4	<0.001	<0.001	Yes
Toongabbie	Quarterly	4	<0.001	<0.001	Yes
Trafalgar	Quarterly	4	<0.001	<0.001	Yes
Traralgon	Quarterly	4	<0.001	<0.001	Yes
Traralgon South/Hazelwood North	Quarterly	4	<0.001	<0.001	Yes
Tyers/Glengarry	Quarterly	4	<0.001	<0.001	Yes
Warragul	Monthly/Quarterly	16	<0.001	<0.001	Yes
Warragul South	Quarterly	4	<0.001	<0.001	Yes
Willow Grove	Quarterly	4	<0.001	<0.001	Yes
Yallourn North	Quarterly	4	<0.001	<0.001	Yes
Yarragon	Quarterly	4	<0.001	<0.001	Yes
Yinnar	Quarterly	4	<0.001	<0.001	Yes

8.7.5 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.7.6 Copper

Copper is present in raw water supplies at very low concentrations. Copper can be found in higher concentrations in drinking water as a result of corrosion of copper pipes and fittings. Based on health considerations in the ADWG guideline, concentrations of copper in drinking water should not exceed 2 mg/L. The aesthetic guideline value is 1 mg/L. Gippsland Water sites achieved 100% ADWG guideline value against both copper guideline values.

Table 16: Copper results for all localities in 2016-17

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)	Min (mg/L)	Drinking Water Quality Standard Met (ADWG) (Yes/No)
Boisdale	Quarterly	4	0.007	0.004	Yes
Boolarra	Quarterly	4	0.004	0.002	Yes
Briagolong	Quarterly	4	0.13	0.004	Yes
Churchill	Quarterly	4	0.007	0.003	Yes
Coongulla/Glenmaggie	Quarterly	4	0.004	0.001	Yes
Cowwarr	Quarterly	4	0.015	<0.001	Yes
Drouin	Quarterly	4	0.034	0.014	Yes
Erica	Quarterly	4	0.044	0.006	Yes
Heyfield	Quarterly	4	0.042	0.011	Yes
Jumbuk	Quarterly	4	0.007	0.002	Yes
Maffra	Quarterly	4	0.095	0.004	Yes
Mirboo North	Quarterly	4	0.022	0.002	Yes
Moe	Quarterly	4	0.050	0.002	Yes
Morwell	Quarterly	4	0.015	0.001	Yes
Neerim South	Quarterly	4	0.043	0.013	Yes
Newborough	Quarterly	4	0.051	0.003	Yes
Noojee	Quarterly	4	0.012	0.007	Yes
Rawson	Quarterly	4	0.086	0.006	Yes
Rokeby/Buln Buln	Quarterly	4	0.013	0.002	Yes
Rosedale	Quarterly	4	0.038	0.003	Yes
Sale/Wurruk	Quarterly	4	0.015	0.004	Yes
Seaspray	Quarterly	4	0.043	0.013	Yes
Stratford	Quarterly	4	0.018	0.006	Yes
Thorpdale	Quarterly	4	0.006	<0.001	Yes
Toongabbie	Quarterly	4	0.026	0.009	Yes
Trafalgar	Quarterly	4	0.008	0.004	Yes
Traralgon	Quarterly	4	0.014	0.002	Yes
Traralgon South/Hazelwood North	Quarterly	4	0.004	0.003	Yes
Tyers/Glengarry	Quarterly	4	0.015	0.005	Yes
Warragul	Monthly/Quarterly	16	0.013	<0.001	Yes
Warragul South	Quarterly	4	0.022	<0.001	Yes
Willow Grove	Quarterly	4	0.028	0.002	Yes
Yallourn North	Quarterly	4	0.007	0.003	Yes
Yarragon	Quarterly	4	0.009	0.002	Yes
Yinnar	Quarterly	4	0.004	<0.001	Yes

8.7.7 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.8 AESTHETICS

8.8.1 pH results

In addition to the monitoring of parameters to determine compliance against the SDWA regulations, pH is routinely monitored in the reticulation system. The ADWG guidelines suggest that the drinking water be between pH 6.5 and pH 8.5. The pH results for all towns are provided below.

Table 17: pH results for all localities in 2016-17

Locality	Frequency of Sampling	No. of Samples	Max (units)	Min (units)	Average (units)
Boisdale	Weekly	52	7.8	7.4	7.6
Boolarra	Weekly	52	8.0	7.3	7.6
Briagolong	Weekly	52	7.4	6.9	7.1
Churchill	Weekly	52	8.7	7.1	7.4
Coongulla/Glenmaggie	Weekly	52	9.0	7.3	8.0
Cowwarr	Weekly	52	8.4	7.2	7.8
Drouin	Weekly	52	7.6	6.9	7.2
Erica	Weekly	52	8.3	7.0	7.4
Heyfield	Weekly	52	7.6	7.0	7.2
Jumbuk	Weekly	52	7.7	7.1	7.4
Maffra	Weekly	52	7.8	7.1	7.3
Mirboo North	Weekly	52	7.7	7.1	7.4
Moe	Weekly	52	7.8	7.0	7.2
Morwell	Weekly	52	7.9	6.8	7.3
Neerim South	Weekly	52	7.5	6.9	7.2
Newborough	Weekly	52	8.7	7.0	7.3
Noojee	Weekly	52	7.9	7.2	7.5
Rawson	Weekly	52	7.5	6.9	7.2
Rokeby/Buln Buln	Weekly	52	7.6	6.9	7.2
Rosedale	Weekly	52	9.1	7.3	8.1
Sale/Wurruk	Weekly	52	8.4	7.1	7.4
Seaspray	Weekly	52	7.7	6.8	7.2
Stratford	Weekly	52	7.8	7.2	7.5
Thorpdale	Weekly	52	8.8	7.6	8.1
Toongabbie	Weekly	52	7.4	7.1	7.3
Trafalgar	Weekly	52	7.5	7.2	7.3
Traralgon	Weekly	52	7.5	6.9	7.2
Traralgon South/Hazelwood North	Weekly	52	8.9	7.0	7.4
Tyers/Glengarry	Weekly	52	8.4	7.1	7.3
Warragul	Weekly	105	8.6	6.9	7.6
Warragul South	Weekly	52	8.4	7.0	7.3
Willow Grove	Weekly	52	8.4	7.1	7.6
Yallourn North	Weekly	52	7.5	7.1	7.4
Yarragon	Weekly	52	8.6	7.3	8.0
Yinnar	Weekly	52	7.8	7.2	7.4

8.8.2 Actions taken in relation to non-compliance

Some systems have experienced elevated pH results, as a result of long residence of water in the reticulation, cement-lined pipes in parts of the reticulation and reduced flushing programs due to permanent water saving rules in place. All average pH results were within the range of 6.5 to 8.5.

ADWG states that cement mortar lined pipes can significantly increase the pH and a value up to 9.2 may be tolerated provided monitoring indicates no deterioration in the microbiological quality.

8.8.3 Iron results

Iron can become apparent in taste in water at about 0.3 mg/L and above. High concentrations can give water a rust-brown appearance and cause staining of laundry and plumbing fittings. Based on aesthetic considerations the concentration in the ADWG guidelines of iron in drinking water should not exceed 0.3 mg/L, however no health-based guideline value has been set for iron. All sites achieved 100% ADWG guideline value against the aesthetic iron guideline value.

Table 18: Iron results for all localities in 2016-17

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)	Min (mg/L)	Drinking Water Quality Standard Met (ADWG) (Yes/No)
Boisdale	Monthly	13	0.01	<0.01	Yes
Boolarra	Weekly	65	0.10	0.02	Yes
Briagolong	Weekly	61	0.10	<0.01	Yes
Churchill	Monthly	13	0.03	<0.01	Yes
Coongulla/Glenmaggie	Weekly	65	0.04	<0.01	Yes
Cowwarr	Monthly	13	0.01	<0.01	Yes
Drouin	Monthly	13	0.02	<0.01	Yes
Erica	Monthly	12	0.25	0.03	Yes
Heyfield	Weekly	64	0.07	<0.01	Yes
Jumbuk	Monthly	13	0.06	<0.01	Yes
Maffra	Weekly	65	0.02	<0.01	Yes
Mirboo North	Weekly	64	0.01	<0.01	Yes
Moe	Weekly	65	0.08	<0.01	Yes
Morwell	Weekly	65	0.04	<0.01	Yes
Neerim South	Weekly	64	0.06	0.02	Yes
Newborough	Monthly	13	0.01	<0.01	Yes
Noojee	Monthly	12	0.10	0.03	Yes
Rawson	Weekly	64	0.25	0.02	Yes
Rokeby/Buln Buln	Monthly	13	0.03	<0.01	Yes
Rosedale	Monthly	12	0.05	<0.01	Yes
Sale/Wurruk	Weekly	64	0.02	<0.01	Yes
Seaspray	Weekly	64	0.29	0.01	Yes
Stratford	Monthly	13	0.03	<0.01	Yes
Thorpdale	Weekly	64	0.14	0.01	Yes
Toongabbie	Monthly	12	<0.01	<0.01	Yes
Trafalgar	Weekly	65	0.02	<0.01	Yes
Traralgon	Weekly	65	0.03	<0.01	Yes
Traralgon South/Hazelwood North	Monthly	13	0.01	<0.01	Yes
Tyers/Glengarry	Weekly	64	0.02	<0.01	Yes
Warragul	Weekly	117	0.12	<0.01	Yes
Warragul South	Monthly	13	0.02	<0.01	Yes
Willow Grove	Weekly	63	0.04	<0.01	Yes
Yallourn North	Monthly	13	0.02	<0.01	Yes
Yarragon	Weekly	65	0.01	<0.01	Yes
Yinnar	Monthly	13	0.07	<0.01	Yes

8.8.4 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.9 ANALYSIS OF RESULTS

Comparison to previous years

For the 2016-2017 reporting period, all samples analysed complied with the relevant water quality standards. The water quality standards required under the SDWR have been represented as trend data over three financial years. This information allows for a comparison of data for the major towns.

An analysis by the percentage of water sampling localities where the drinking water complied with each of the health based parameters, over three reporting periods, is shown below. The table also shows an analysis of the percentage of customers supplied with drinking water that complied with the standards.

Table 19: Compliance by locality and population

	Percentage by Locality			Percentage by Population		
Parameter	**2014-15**	**2015-16**	**2016-17**	**2014-15**	**2015-16**	**2016-17**
Aluminum	100%	100%	100%	100%	100%	100%
Chloroacetic Acid	100%	100%	100%	100%	100%	100%
Dichloroacetic Acid	100%	100%	100%	100%	100%	100%
E. coli	100%	97.1%	100%	100%	88.5%	100%
Trichloroacetic Acid	100%	100%	100%	100%	100%	100%
Trihalomethanes	100%	100%	100%	100%	100%	100%
Turbidity	100%	100%	100%	100%	100%	100%
Nitrite	100%	100%	100%	100%	100%	100%
Nitrate	100%	100%	100%	100%	100%	100%
Fluoride	100%	100%	100%	100%	100%	100%
Mercury	100%	100%	100%	100%	100%	100%
Chromium	100%	100%	100%	100%	100%	100%
Cadmium	100%	100%	100%	100%	100%	100%
Nickel	100%	100%	100%	100%	100%	100%
Arsenic	100%	100%	100%	100%	100%	100%
Selenium	100%	100%	100%	100%	100%	100%
Beryllium	100%	100%	100%	100%	100%	100%
Copper	100%	100%	100%	100%	100%	100%
Barium	100%	100%	100%	100%	100%	100%
Lead	100%	100%	100%	100%	100%	100%
Manganese	100%	100%	100%	100%	100%	100%
Cyanide	100%	100%	100%	100%	100%	100%
Selenium	100%	100%	100%	100%	100%	100%
Molybdenum	100%	100%	100%	100%	100%	100%
Acrylamide	100%	100%	100%	100%	100%	100%
Boron	100%	100%	100%	100%	100%	100%
Chloryl Hydrate	100%	100%	100%	100%	100%	100%
2, 4-Dichlorophenoxy acetic acid	100%	100%	100%	100%	100%	100%
Nitrosodimethylamine	100%	100%	100%	100%	100%	100%
2,4,6-Trichlorophenol	100%	100%	100%	100%	100%	100%
2,4-Dichlorophenol	100%	100%	100%	100%	100%	100%
2- Chlorophenol	100%	100%	100%	100%	100%	100%
Pentachlorophenol	100%	100%	100%	100%	100%	100%

Results for all listed tests for all localities either maintained or improved compliance during the 2016-17 reporting period.

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9 UNDERTAKINGS UNDER SECTION 30 OF THE SDWA

Gippsland Water has no undertakings relevant to the 2016-17 reporting year.

10 EXEMPTIONS UNDER SECTION 20 OF THE SDWA

Gippsland Water has no exemptions relevant to the 2016-17 reporting year.

11 VARIATION IN AESTHETIC STANDARDS

Gippsland Water has no variations in aesthetic standards sought under section 19 of the SDWA.

12 REGULATED WATER

Gippsland Water does not manage any regulated water supplies.

13 GLOSSARY OF TERMS

Table 20: Glossary of terms

ADWG	*Australian Drinking Water Guidelines 2011* prepared by National Health and Medical Research Council that details a framework for the management of drinking water.
DHHS	Department of Health and Human Services.
CCP	A physical point in treatment processes that can be controlled either by SCADA, or manually, and has a significant impact on water quality.
Detection limit	The lowest concentration of analytical parameter in the sample that can be detected by the process laboratory.
Drinking Water Supply systems	Towns supplied with water from a common water source (WTP, supply mains and reticulation pipe-work).
E. coli	*Escherichia coli*.
Locality	Under the SDWR, a specified area that is supplied with drinking water by a water supplier.
mg/L	Milligram per litre.
NHMRC	National Health and Medical Research Council.
NTU	Nephelometric Turbidity Units.
Properties	A registered customer connection to the drinking water supply.
RMP	Risk Management Plan.
SCADA system	A Supervisory Control And Data Acquisition (SCADA) system consists of human-machine interface, computerised logics, telemetry communication system, electronically actuated instruments and sensors. SCADA allows remote control and monitor of all key process,

SDWA	*Safe Drinking Water Act 2003* Act No.46/2003.
SDWR	Safe Drinking Water Regulations 2015 S.R No.88/2015.
Source Water	Raw water supply for town, prior to treatment.
THM	Trihalomethane.
WSAA	Water Services Association Australia.
WTP	A facility where raw water is directed through various treatment processes and produces treated water fit for human consumption
100mL	100 millilitres.
<	Less than.
>	Greater than.
≤	Less than or equal to.
≥	Greater than or equal to.

14 FURTHER INFORMATION

Customers and members of the public may access drinking water quality data by contacting Gippsland Water on 1800 050 500 or visiting www.gippswater.com.au.

15 REFERENCES

National Health and Medical Research Council. *Australian Drinking Water Guidelines 2011.* Web address www.nhmrc.gov.au

Department of Health and Human Services *2015-2016 – Guidance: Water Quality Annual Report (Section 26 Safe Drinking Water Act 2003), June 2017*

Safe Drinking Water Act (2003) No.46/2003

Safe Drinking Water Regulations (2015) S.R No.88/2015

Health (Fluoridation) Act (1973)

Code of Practice for Fluoridation of Drinking Water Supplies *Health (Fluoridation) Act 1973* Department of Human Services (March 2009)

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APPENDIX 1: RAW WATER MONITORING

<table>
<tr><th rowspan="2">Locality</th><th rowspan="2">Source water</th><th colspan="3">Nature of other raw water monitoring programs</th></tr>
<tr><th>Weekly/Fortnightly</th><th>Monthly</th><th>Annual/Quarterly</th></tr>
<tr><td>Morwell
Churchill
Yinnar
Jumbuk
Boolarra
Traralgon South/
Hazelwood North</td><td rowspan="3">Moondarra Reservoir via Tyers River</td><td rowspan="15"><u>Physicals</u>
• Absorbance (254nm)
• Colour True (465nm)
• Dissolved Oxygen
• SUVA (245nm)
• Turbidity
• Electrical Conductivity @25^{o}C
• pH

<u>Microbiological</u>
• Escherichia coli
• Total Coliforms
• Heterotrophic Plate Count

<u>Metals*</u>
• Iron Total
• Manganese Total
• Mercury</td><td rowspan="15"><u>Physicals</u>
• Alkalinity Bicarbonate as $CaCO_3$
• Alkalinity Total as $CaCO_3$
• Dissolved Organic Carbon (DOC)
• Total Organic Carbon (TOC)
• Total Dissolved Solids (TDS)
• SUVA (245nm)
• Chlorophyll a

<u>Chemical inorganic</u>
• Ammonia as N
• Bromide
• Chloride
• Fluoride
• Nitrate as N
• Nitrite as N
• Organic Nitrogen as N
• Phosphorous, Reactive as P
• Phosphorous Total as N
• Sulphate
• Total Kjeldahl Nitrogen as N
• Total Nitrogen as N

<u>Biological</u>
• Algae
• Blue Green Algae
(sampling frequency may vary depending on the season and results received)</td><td rowspan="15"><u>Physicals*</u>
• Total Dissolved Solids (TDS)
• Suspended Solids

<u>Chemical inorganic</u>
• Cyanide
• Dissolved Organic Carbon (DOC)
• Total Organic Carbon (TOC)
• Bromide
• Fluoride

<u>Metals*</u>
• Aluminium Total
• Arsenic Total
• Selenium
• Cadmium Total
• Copper Total
• Lead Total
• Mercury
• Zinc Total

<u>Radiological</u>
• Gross Alpha Activity
• Gross Beta Activity

<u>Microbiological</u>
• Cryptosporidium spp
• Giardia spp</td></tr>
<tr><td>Traralgon</td></tr>
<tr><td>Tyers/Glengarry
Rosedale
Cowwarr
Toongabbie</td></tr>
<tr><td>Maffra</td><td rowspan="3">Macalister River</td></tr>
<tr><td>Stratford</td></tr>
<tr><td>Boisdale</td></tr>
<tr><td>Briagolong</td><td>Bore (Freestone Creek Aquifer)</td></tr>
<tr><td>Warragul
(including Nilma, Darnum, Drouin East)</td><td rowspan="4">Pederson Weir (Tarago River)
Tarago Reservoir - (supplementary supply)</td></tr>
<tr><td>Warragul South</td></tr>
<tr><td>Drouin</td></tr>
<tr><td>Rokeby/Buln Buln</td></tr>
<tr><td>Coongulla/
Glenmaggie</td><td>Macalister River</td></tr>
<tr><td>Rawson</td><td rowspan="2">Trigger Creek</td></tr>
<tr><td>Erica</td></tr>
</table>

Locality	Source water	Nature of other raw water monitoring programs		
		Weekly/Fortnightly	Monthly	Annual/Quarterly
Heyfield	Thomson River		**Metals** • Aluminium Total • Arsenic Total • Calcium Total • Cadmium Total • Copper Total • Iron Total • Iron Soluble • Lead Total • Mercury • Potassium • Magnesium • Manganese Total • Manganese Soluble • Selenium • Zinc Total **Chlorophenols (Sale Bores Only)** • 2,3,4,5 Tetrechlorophenol • 2,6-Dichlorphenol • 2-Chlorophenol • 4-Chloro-3-Methylphenol • Total Phenols (Halogenated) • Pentachlorophenol • 2,4,5-Trichlorophenol	**Pesticides, Herbicides and Chemical Organics**** • 2,4,5 T (Herbicide) • 2,4,5 TP (Silvex) • 2,4,6- T • 2,4 D • 2,6 D • 2,4 DB • 3-Hydroxy Carbofuran • 4-CPA • Aldrin • Aldicarb • Ametryn • Asulam • Atrazine • Azinphs-ethyl • Azinphos-methyl • Bendiocarb • Benomyl • Bentazon • BHC (alpha) • BHC (beta) • BHC (delta) • Bifenthrin • Brodifacoum • Bromacil • Bromophos-ethyl • Bromoxynil • Carbaryl • Carbofenothion • Carbofuran • Chlordane (cis) • Chlordane (trans) • Chlorfenvinphos • Chloropyrifos • Chloropyrifos - methyl • Chlorsulfuron • Chlorothalonil
Mirboo North	Little Morwell River			
Moe	Tanjil River and Narracan Creek			
Newborough				
Yallourn North				
Trafalgar				
Yarragon				
Neerim South	Tarago River			
Noojee				
Sale/Wurruk	Bore (Boisdale Aquifer)			
Seaspray	Merrimans Creek			
Thorpdale	Easterbrook Creek			
Willow Grove	Tanjil River			

Locality	Source water	Nature of other raw water monitoring programs		
		Weekly/Fortnightly	Monthly	Annual/Quarterly
				• Chlopyralid • Coumaphos • Cynazine • Cyfluthrin • Cypermethrin • Cyprodinil • Cyproconazole • Cyromazine • 4,4-DDD • 4,4-DDE • 4,4-DDT • Deltametrhrin & Tralomethrin • Demeton-O • Demeton-S • Demeton-S-methyl • Diazinon • Dicamba • Dichlorprop • Dichlorvos • Deildrin • Dinoseb • Diclofop-methyl • Difenoconazole • Diflufenican • Dimethoate • Diquat • Disulfoton • Diuron • Endosulfan (alpha) • Endosulfan (beta) • Endosulfan Sulphate • Eldrin • Eldrin aldehyde • Endrin Ketone • ENP • Ethion • Ethoprophos • Fenamiphos

Locality	Source water	Nature of other raw water monitoring programs		
		Weekly/Fortnightly	Monthly	Annual/Quarterly
				• Fenarimol • Fenchlorphos (Ronnel) • Fenitrothion • Fensulfothion • Fenthion • Fenvalerate & Esfenvalerate • Fiprinol • Fluroxypyr • Fluometuron • Flusilazole • Fluvalinate • Glyphosate • Heptachlor • Heptachlor Epoxide • Hexachlorobenzene • Haxazinone • Hexaconazole • Iprodione • Irgarol • Lindane • Malathion • MCPA • MCPB • Mecoprop • Methidathion • Metolachlor • Methiocarb • Methomyl • Methoxychlor • Metribuzin • Mevinphos • Molinate • Monocrotophos • PFAS • Omethoate • Oryzalin • Oxamyl • Oxychlordane

Locality	Source water	Nature of other raw water monitoring programs		
		Weekly/Fortnightly	Monthly	Annual/Quarterly
				• Oxyfluorfen • Paclobutrazole • Paraquat • Parathion (methyl & ethyl) • Penconazole • Pendimethalin • Permethrin • Phorate • Picloram • Pirimiphos-ethyl • Pirimiphos-methyl • Profenofos • Prometon • Prometryn • Propachlor • Propazine • Prophos • Propiconazole • Prothiofos • Pyrimethanil • Simazine • Simetryn • Sulfotep • Sulprofos • Tebuconazole • Temephos • Terbuthylazine • Terbufos • Tebuthiuron • Terbutryn • Tetrachlovinphos • Tetraethyldithiopyrphos • Thiamethoxam • Thiobencarb • Thiodicarb • Triazophos • Trichlorfon • Trichloronate

Locality	Source water	Nature of other raw water monitoring programs		
		Weekly/Fortnightly	Monthly	Annual/Quarterly
				• Triclopyr • Trifluralin • Tukuthion

*Reduced frequency of monitoring in some catchments based on risk profile.
** Note all pesticides, herbicides and chemical organics results were within ADWG guideline values.
Not all parameters were measured at all localities or source waters.
Purpose of monitoring - risk management within catchments and raw water supply systems.
Comprehensiveness (frequency) – weekly, fortnightly, monthly, quarterly and annual monitoring or as risks identified.

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