ANNUAL DRINKING WATER QUALITY REPORT 2021-22

South Gippsland Region Water Corporation

South Gippsland Water

START SAFE
WORK SAFE
HOME SAFE

Acknowledgement of Traditional Owners

South Gippsland Water proudly acknowledges Aboriginal and Torres Strait Islander peoples as Australia's first peoples, and the local Traditional Owners, Gunaikurnai and Bunurong, as the original custodians of the land and water on which we rely.

We pay our deepest respects to their Elders, past, present, and emerging. We acknowledge the continued cultural, social, and spiritual connections that Aboriginal and Torres Strait Islander people have with the lands and waters and recognise and value that the Traditional Owner groups have cared for and protected them for thousands of generations.

In the spirit of reconciliation, we remain committed to working in partnership with local Traditional Owners to ensure their ongoing contributing to the future of the water management landscape while maintaining their cultural and spiritual connections.

Contents

1. Introduction from the Managing Director

I am pleased to present South Gippsland Water's annual drinking water quality report for the year ending 30th of June 2022. In accordance with requirements of the Safe Drinking Water Act 2003 ("the Act"), this report summarises our performance against water quality standards, provides an overview of management practices, and describes how we respond to water quality challenges as they arise.

"Committed to high-quality drinking water" [1]

As part of South Gippsland Water's commitment to quality, we maintain a drinking water management system based on Hazard Analysis and Critical Control Point (HACCP) principles and the Australian Drinking Water Guidelines[1]. The system incorporates a risk-based, catchment-to-tap monitoring program to ensure drinking water meets legislative requirements of the Act and associated Safe Drinking Water Regulations 2015 ("the Regulations"). Information on water treatment, quality management systems, and operational improvements can be found in Part 2 of this report.

For the 2021-22 fiscal year, South Gippsland Water achieved 100% compliance with the prescribed standards of the Regulations for *Escherichia coli* and turbidity. With the exception of one, all localities complied with the water quality standard for trihalomethanes. Part 3 of this report provides a summary of results from our comprehensive monitoring program, while Part 4 outlines corrective actions taken to resolve water quality issues.

The 2021-22 year presented a number of challenges, including those relating to the La Niña weather pattern. The region experienced heavy rainfall and damaging high winds at times, including a significant storm event in October 2021. Thanks to careful management of our water treatment plants, dedicated staff, and strategic use of electrical generators, we were able to navigate our way through the storm and related power outages with no resultant water quality concerns.

In March 2022, we issued a 'Boil Water Advisory' to the town of Inverloch following a breach of the Inverloch clear water storage tank roof and subsequent entry of small birds. While there was no measured indication that water was unsafe to drink, the advisory was deemed necessary in the interests of a no-risk approach to public health. We apologise to our Inverloch customers for the inconvenience and thank them for their patience while we cleaned and flushed the supply system.

The on-going COVID-19 pandemic also provided challenges in 2021-22. We continued to adapt our ways of working and postpone some non-critical activities where required. Despite this, some major improvement projects were completed in 2021-22. These include upgrades of the pumps and pipework supplying water to Wonthaggi and Cape Paterson, and renewal of the geomembrane lining and cover of the Wonthaggi clear water storage

1 South Gippsland Water Drinking Water Quality Policy. Refer to Appendix 1: South Gippsland Water's Drinking Water Quality Policy
2 National Health and Medical Research Council Australian Drinking Water Guidelines 2011

basin. Such improvements ensure continued supply of safe drinking water to these growing towns, long into the future.

While drinking water safety is our number one priority, customer satisfaction is also of immense importance to us at South Gippsland Water. We strive to meet expectations in terms of supplying water that is both safe *and* pleasant to drink. In doing so we take pride in providing prompt and helpful service in response to water quality concerns. As further testament to our commitment to high quality drinking water and continual improvement, we are pleased to note a downward trend in customer complaint numbers over recent years. Further Information on customer complaints is provided in Part 5 of this report.

It is a privilege to service the people of South Gippsland and we take pride in delivering clean, safe drinking water to the region. I trust you will find this report informative. For additional information on anything presented within, we invite you to contact us by phoning 1300 851 636 or emailing sgwater@sgwater.com.au

Robert Murphy

Managing Director

Characterisation of the system

Source water systems and catchment management

As part of the catchment-to-tap approach to providing safe drinking water, South Gippsland Water monitors for hazards in all water supply catchments. This approach is underpinned by the preventative and multiple barrier principles described in the Australian Drinking Water Guidelines 2011 (ADWG). The ADWG states that "prevention of contamination provides greater surety than removal of contaminants by treatments, so the most effective barrier is protection of source waters to the maximum degree practicable."

South Gippsland Water is reliant on "open catchments" for all source water. An open catchment is one in which part or all the rainfall catchment area is in private ownership and land usage and public access is largely unrestricted. This presents a challenge in that complete protection of source water from farm and other run-off is not possible. Crucial to our role as a water supplier is improving our catchments as much as is achievable both within our own control and by engagement with other stakeholders.

There is much pressure on drinking water catchments from increasing development. South Gippsland Water acts a referral authority for planning applications under section 55 of the *Planning and Environment Act 1987*. Planning applications for dwellings or business ventures are assessed carefully to ensure the best outcome for our catchments and communities.

Where catchment hazards cannot be prevented, they are managed with robust and reliable barriers. Examples of these measures are documented in our Water Supply Catchment Monitoring Assessment and Improvement Program which is integrated into the Water Safety Plan and the Drinking Water Quality Management System. The program involves coordination of activities, including catchment surveillance, river health monitoring, land use planning assessment, and Source Water and Health-Based Target reporting. The Corporation also undertakes various catchment improvement works, including tree plantings and weed control, as well as promoting the importance of source water protection to the community via stakeholder engagement programs.

For the 2021-22 fiscal year, specifically, South Gippsland Water (SGW) catchment management activities included:

- Full time weed control at all SGW sites including land surrounding source water reservoirs.
- Investigation into development of improved management strategies in the Lance Creek Water Supply Catchment, including stakeholder engagement with dairy farmers in the catchment.
- Monthly communications with South Gippsland Shire Council on wastewater inspections and programs within the Tarwin River Water Supply Catchment Area.
- Continual engagement with the West Gippsland Catchment Management Authority (WGCMA) on projects, including the Corner Inlet Management Program, Powlett River Management Program, Regional Catchment Strategy Update, and

communications regarding works, projects and strategies undertaken by SGW within the WGCMA management area.
- Communications and support of strategies and projects undertaken by Port Phillip Catchment Management Authority in the SGW region.
- Support of South Gippsland Landcare projects (SGLC).
- Continual assessment of section 55 Planning Applications for suitability of dwellings and businesses in the SGW drinking water supply catchment areas.

Photo: Leongatha Reservoir No. 4

South Gippsland Water supply system

The service area of South Gippsland Water (SGW) covers approximately 4,000 square kilometres of the South Gippsland region, from Wonthaggi in the west to Yarram in the east; refer to Figure 1 – Map of South Gippsland Water water supply area and systems. The total water supply operation for 2021-22 comprised:

- 19 water sampling localities
- 1,234 square kilometres of total catchment area
- 9 reservoirs/dams and 4 raw water storage basins or tanks
- 8 water treatment plants and water supply systems
- 25 treated water distribution storages
- 18 water pumps
- 735 kilometres of water mains
- 22,780 connected properties supplying a population of approximately 41,680 permanent residents
- 4,750 megalitres (million litres) of metered water supplied to customers
- A connection pipeline from the Melbourne water grid to the Lance Creek water treatment plant

Table 1: South Gippsland Water water sampling localities and supply sources

Localities supplied	Population Serviced[2]	Water supply connections (accounts)	Principal raw water supply sources	Supplementary water supply sources	Raw water storage	Water Treatment Plant
Alberton **Yarram**	710 2,570	557 1,206	Tarra River	Gippsland Basin groundwater aquifer (via bore, Devon North)	Devon North Raw Water Basin	Devon north
Dumbalk	460	109	Tarwin River (east branch)		Dumbalk Raw Water Tank	Dumbalk
Fish Creek	860	208	Battery Creek		Battery Creek Reservoir	Fish Creek
Foster	2,040	963	Deep Creek		Deep Creek Reservoir Foster Dam Foster Raw Water Basin	Foster
Cape Paterson **Inverloch** **Lance Creek** **Wonthaggi** **Korumburra** **Loch** **Nyora** **Poowong**	1,110 6,780 100[3] 9,440 4,750 710 1,640 720	1,343 4,958 N/A[4] 5,256 2,414 162 365 213	Lance Creek Reservoir	Potable water also received from Cardinia Reservoir and the Victorian Desalination Plant	Lance Creek Reservoir	Lance Creek
Koonwarra **Leongatha**	370 6,840	83 3,380	Ruby Creek		No.1 Reservoir No. 2 Reservoir No. 3 Reservoir (Hyland) No. 4 Reservoir (Western)	Leongatha
Meeniyan	840	279	Tarwin River		Meeniyan Raw Water Basin	Meeniyan
Port Franklin **Port Welshpool** **Toora**	170 690 820	112 520 523	Agnes River		Cooks Dam	Toora
Total	41,680	22,776				

[2] Population served based on ABS 2021 Census data. The ABS method of population calculation is based on the Australian Statistical Geography Standard Statistical Level 2 data and may not always reflect the exact water district.
[3] Estimate only
[4] Water supply connections for water sampling locality of Lance Creek are included in either that for Wonthaggi or that for Inverloch.

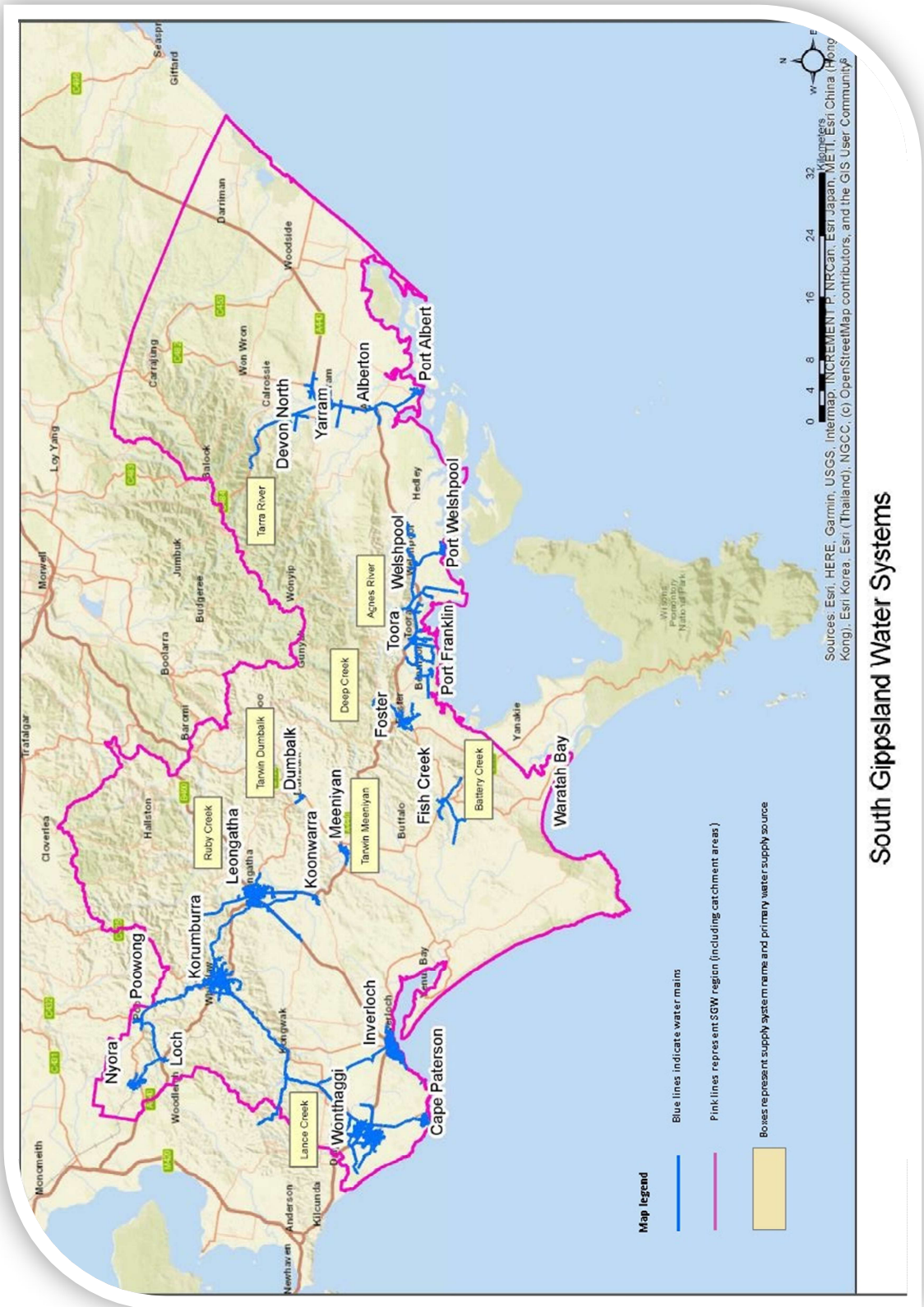

Figure 1: South Gippsland Water water supply area and systems

2. Water Treatment and Quality Management Systems

Water treatment overview

The water treatment process generally begins with the collection of rain (via run-off and streams) in a reservoir. Time spent in a reservoir allows water to settle as debris and large particulate matter fall to the bottom. There may also be large aeration devices in a reservoir that serve to oxidise and precipitate (make solid) dissolved substances in the water. Chemical agents are added as water flows through pipes form the reservoir to the water treatment plant (WTP). The agents cause small particles to clump together into large insoluble masses known as floc in the processes of coagulation and flocculation. The floc formed is separated from the water via gravitational settling or flotation. Filtration of the clarified water further reduces the load of small particles, microorganisms, and other contaminants. The final step in the water treatment process is disinfection. This commonly involves the addition of chlorine-based disinfectants, but other chemical agents or ultra-violet light may also be used to ensure water supplied to customers is free of harmful microorganisms.

A summary of the processes by which the drinking water is treated and disinfected at South Gippsland Water treatment plants is provided in Table 2 and Table 3.

Changes in water treatment and supply conditions

There were no changes to water treatment processes or supply conditions for South Gippsland Water in the 2021-22 reporting period.

Photos: Leongatha Water Treatment Plant (clear water storage tank, turbidity meter, clarifier tank)

Table 2: List of processes and chemicals used to treat and disinfect water supplied by SGW

Water Treatment Plant (WTP)	Localities supplied	Treatment process	Treatment frequency	Added substances
Devon North	Alberton Yarram	Pre-treatment pH correction	As required	Sodium carbonate
		Manganese oxidation	As required	Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium chlorohydrate
		Dissolved air flotation clarification	Regular	Air
		Filtration by granular medium	Regular	-
		Primary chlorination disinfection	Regular	Sodium hypochlorite
		Dewatering of waste-water	Regular	-
Dumbalk	Dumbalk	Pre-treatment pH correction	Regular	Sodium carbonate
		Manganese oxidation	As required	Potassium permanganate
		Coagulation and flocculation	Regular	Aluminium chlorohydrate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	-
		Ultraviolet (UV) disinfection	Regular	-
		Primary chlorination disinfection	Regular	Sodium hypochlorite
		Secondary chlorination disinfection	Regular	Sodium hypochlorite
		Volatile organics removal by aeration	Regular	-
		Dewatering of wastewater	Regular	Anionic polyacrylamide
Fish Creek	Fish Creek	Pre-treatment pH correction	Regular	Sodium carbonate
		Manganese oxidation	As required	Potassium permanganate / Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium sulphate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	Anionic polyacrylamide
		Post treatment pH correction	Regular	Sodium carbonate
		Primary chlorination disinfection	Regular	Sodium hypochlorite
		Volatile organics removal by aeration	Regular	-
		Secondary chlorination disinfection	Regular	Sodium hypochlorite
		Dewatering of wastewater	Regular	-
Foster	Foster	Taste and odour control	As required	Powdered activated carbon
		Pre-treatment pH correction	Regular	Sodium carbonate
		Manganese oxidation	As required	Potassium permanganate / Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium sulphate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	-
		Post treatment pH correction	Regular	Sodium carbonate
		Primary chlorination disinfection	Regular	Chlorine (gas)
		Secondary chlorination disinfection	Regular	Sodium hypochlorite
		Dewatering of wastewater	Regular	-
Lance Creek	Cape Paterson Inverloch Lance Creek Wonthaggi Korumburra Poowong Loch Nyora	Taste and odour control	As required	Powdered activated carbon
		Pre-treatment pH correction	As required	Sodium hydroxide / hydrochloric acid
		Coagulation and flocculation	As required	Aluminium Chlorohydrate
		Dissolved air flotation clarification	Regular	Air
		Filtration by granular medium	Regular	-
		Post treatment pH correction	Regular	Sodium hydroxide
		Fluoridation	Regular	Hexafluorosilicic acid
		Primary chlorination disinfection	Regular	Chlorine (gas)
		Secondary chloramination disinfection	Regular	Chlorine (gas) and ammonia
		Dewatering of wastewater	Regular	Anionic polyacrylamide

Table 2 continues over page…

Water Treatment Plant (WTP)	Localities supplied	Treatment process	Treatment frequency	Added substances
Leongatha	Koonwarra Leongatha	Taste and odour control	As required	Powdered activated carbon
		Pre-treatment pH correction	Regular	Sodium hydroxide
		Manganese oxidation	As required	Potassium permanganate
		Coagulation and flocculation	Regular	Aluminium sulphate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	-
		Post treatment pH correction	Regular	Sodium hydroxide
		Primary chlorination disinfection	Regular	Chlorine (gas)
		Secondary chlorination disinfection	Regular	Chlorine (gas)
		Dewatering of wastewater	Regular	-
Meeniyan	Meeniyan	Manganese oxidation	As required	Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium Chlorohydrate
		Sedimentation clarification	Regular	Anionic polyacrylamide
		Filtration by granular medium	Regular	-
		Primary chlorination disinfection	Regular	Sodium hypochlorite
		Ultraviolet (UV) disinfection	Regular	-
		Volatile organics removal by aeration	Regular	-
		Secondary chlorination disinfection	Regular	Sodium hypochlorite
		Dewatering of wastewater	Regular	Anionic polyacrylamide
Toora	Port Franklin Port Welshpool Toora	Taste and odour control	As required	Powdered activated carbon
		Pre-treatment pH correction	As required	Sodium carbonate
		Manganese oxidation	As required	Potassium permanganate / Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium sulphate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	-
		Post treatment pH correction	Regular	Sodium hypochlorite
		Chlorination disinfection	Regular	Chlorine (gas)
		Dewatering of wastewater	Regular	-

Photo: Korumburra Mine Rd Standpipe

Table 3: List of processes and chemicals used to treat and disinfect supplementary supply from Melbourne Water to Lance clear water storage

Source/water catchment	Storage/transfer	Treatment process	Treatment frequency	Added substances
Transfer from Silvan Reservoir without being treated at Silvan WTP	Cardinia Reservoir	Disinfection	Regular	Chlorine gas (Cl_2)
		Fluoridation	Regular	Fluorosilicic acid (FSA)
		pH Correction	Regular	Lime (Calcium oxide)
		Secondary disinfection	Regular	Sodium hypochlorite
		Secondary pH correction	Regular	Carbon dioxide
Bass Strait sea water via Desalination Plant offtake	Direct supply to Cardinia Reservoir	Coagulation	Regular	Ferric sulphate, sulfuric acid, PolyDADMAC*
		Filtration	Regular	-
		Reverse osmosis	Regular	Antiscalant, Sodium hydroxide
		Remineralisation	Regular	Hydrated lime (Calcium dioxide), Carbon dioxide
		Fluoridation	Regular	Fluorosilicic acid (FSA)
		Disinfection	Regular	Sodium hypochlorite
		Sludge thickening	Regular	Ferric sulphate, Polyacrylamide
		Membrane preservations	Regular	Sodium bisulphite
Melbourne Water Delivery Point 5 (DP5) of desalination pipeline	Transfer pipeline from DP5 to Lance Creek clear water storage tank	pH correction	Regular	Hydrochloric acid, Sodium hydroxide
		Disinfection	Regular	Chlorine gas (Cl_2)

*Polydiallydimethylammonium chloride

Photo: Lance Creek CWS (Clear Water Storage) Tank

Water treatment issues

Continual process monitoring and jar tests are used in water treatment plant laboratories to simulate plant conditions and ensure correct dosage of treatment chemicals. This enables optimisation of treatment processes in response to changes in raw water quality and other factors. Issues occasionally arise out of the application of water treatment processes and corrective actions must be taken.

Three fluoridation outages for periods greater than 72 hours at Lance Creek water treatment plant (WTP) are the only treatment issues noted for 2021-22. These were reported to the Department of Health in accordance with the Code of practice for fluoridation of drinking water supplies. One outage was intentional to facilitate mapping of water through the supply system (refer to part 3). The other two outages were due to a problem with monitoring equipment and an electrical fault with the fluoride day tank load cell. Difficulty sourcing required electrical parts due to the on-going COVID-19 pandemic compounded the issues.

Table 4: Fluoridation outages

Issue	Location	Date	Summary
Fluoridation outage greater than 72 hours	Lance Creek WTP	13/1/2022 to 18/1/2022	Inability to cross-check on-line fluoride analyser due to bench-top analyser fault.
Fluoridation outage greater than 72 hours	Lance Creek WTP	5/3/2022 To 10/3/2022	Intentional shutdown of fluoride system to facilitate supply system monitoring in relation to water quality incident in Inverloch (refer to Table 5). Absence/presence of fluoridated water was used to indicate whether water potentially contaminated with microorganisms had been flushed from the system or not.
Fluoridation outage greater than 72 hours	Lance Creek WTP	28/3/2022 to 7/6/2022	Electrical fault with day tank load cell. Difficulty obtaining required electrical part.

Quality management systems and continual improvement

Programs and practices

The risk management approached adopted by South Gippsland Water is based on the twelve elements of the Framework for Management of Drinking Water Quality as described in the *Australian Drinking Water Guidelines*. Several on-going programs and practices form part of the risk management system. These are designed to ensure treatment plants and water supply distribution systems are always operating optimally; examples are as follows:

- Water treatment plant (WTP) filter management program
- Backflow prevention program
- Regular site security checks of all water treatment facilities and distribution system water storages
- Procedures in relation to hygienic mains break repair and replacement
- Proactive mains flushing and air-scouring programs
- Hydrant replacement program

- Watermains renewal program
- Contingency and resilience planning

The risk management system also includes a commitment to continual improvement, with the aim of achieving best practice in the delivery of drinking water. Training, attendance at seminars, and membership of peak industry bodies (including the Australian Water Association, the Water Industry Operators Association, and the Water Services Association of Australia) ensure employees involved in water treatment and quality assurance are kept abreast of drinking water-related research, and advances in technologies and practices. Incident and emergency drills are also conducted regularly so that staff can respond quickly and appropriately to unexpected events.

Training highlights and trainee program

Water treatment operators are required to complete formal training from an accredited provider upon employment (if not already qualified).

Two water treatment operators commenced their Certificate III in Water Industry Treatment training in 2021-22.

South Gippsland Water also runs a trainee program to encourage young people to enter the industry. Three trainees were engaged in the 2021-22 year. While trainees participate in a range of activities, one is specialising in water treatment and two are specialising in water network maintenance. Trainees are also supported to complete Certificate III in Water Industry training.

In addition to formal industry training, staff attend various short training sessions throughout the year. A highlight in 2021-22 was the delivery of water quality awareness training to maintenance and other South Gippsland Water staff by an industry expert (Dr Peter Mosse). This course is run periodically to promote the importance of water quality across the business, and to complement internal training on hygienic water mains repair for maintenance staff.

Photos: SGW Trainees

Major improvements

While the on-going COVID-19 pandemic has seen delays on works, several improvement projects were completed in the 2021-22 year. These include a significant upgrade of pumps and pipework supplying water to Wonthaggi and Cape Paterson water towers. In addition, the geomembrane lining and cover of the Wonthaggi clear water storage basin (which supplies the Wonthaggi and Cape Paterson water towers) was replaced, further ensuring the safety and security of the water supply. These projects required considerable planning and work to ensure continuity of supply to customers while the works were carried out.

These and other projects are summarised in Table 5. Projects proposed for the 2023-28 pricing period are also included in Table 5.

Photo: Wonthaggi clear water storage basin post relining and covering

Table 5: Capital improvement projects – water treatment and supply

Site	Improvement project	Water quality/supply benefit	Expected completion year	Approximate expenditure $	Status
Devon North CWS Basin	Renewal of geomembrane lining and cover	Continued protection of potable water in basin	2024	$996,000	In progress
Foster CWS Basin	Renewal of geomembrane lining and cover	Continued protection of potable water in basin	2024	N/A	Not started. (Planned for 2024)
Foster WTP	Renewal of filters	Continued effective water treatment	2028	N/A	Commenced
Foster WTP	Upgrade of PAC dosing system	Improved control of cyanobacterial taste and odour compounds	2028	N/A	Not started. (Planned 2023-28)
Leongatha WTP	Installation of an ultraviolet (UV) disinfection system	Provides an additional disinfection barrier against pathogenic microorganisms, particularly protozoan parasites	2023	$1,400,000	Commissioning in progress
Leongatha WTP	Improvements to clear water storages configuration	Greater control of disinfectant contact times	2023	$1,400,000	Commissioning in progress
Leongatha WTP	Filter refurbishment	Continued effective water treatment	2024	N/A	In progress
Meeniyan WTP	Individual filter turbidity monitoring and control	Improved filtration monitoring and control of treatment process	2023	$130,000	In progress
Poowong CWS Basin	Renewal of geomembrane lining and cover	Continued protection of potable water in basin	2024	$692,000	In progress
Poowong water tower	Reconfiguration and upgrade to reduce residency time of water	Improved maintenance of monochloramine residual to protect water in tank, without need for operational intervention (flushing/scouring)	2028	N/A	Not started. (Planned 2023-28)
Toora WTP	Upgrade of the UV disinfection system	Improved reliability of existing system, which provides an additional barrier against pathogenic microorganisms, including protozoan parasites	2023	$70,000	In progress
Toora WTP	Renewal of the 1-ML CWS tank, including complete roof replacement	Continued protection of potable water in tank.	2024	N/A	In progress
Toora WTP	Renewal of filters	Continued effective water treatment	2028	N/A	Commenced
Toora WTP	Upgrade of PAC dosing system	Improved control of cyanobacterial taste and odour compounds	2028	N/A	Not started. (Planned 2023-28)
Wonthaggi CWS Basin	Upgrade of pumps and pipework supplying water to Wonthaggi and Cape Paterson water towers	Surety of supply and greater contingency in the event of a power or storage failure	2021	$1,750,000	Complete
Wonthaggi CWS Basin	Renewal of geomembrane lining and cover	Continued protection of potable water in basin	2022	$1,120,000	Complete

3. Emergency, Incident, and Event Management

Incidents reported under the *Safe Drinking Water Act*

Section 22 of the *Safe Drinking Water Act 2003* (the Act) requires a water supplier to immediately notify the Department of Health (the department) of any circumstances where it is believed that drinking water supplied to the public may be the cause of an illness, pose a risk to human health, or cause widespread public complaint.

Section 18 of the Act requires a water supplier to notify the department when 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. Based on this requirement, the incidents described in this section have been reported to the Department in the 2021-22 reporting period. Table 6 provides a summary of the events. Further discussion is provided below the table.

Table 6: Summary of events reported to the Department of Health under section 22 or section 18 of the Safe Drinking Water Act

Water sampling locality affected	Type of notification	Date of incident	Location of incident	Nature of incident	Investigation result / cause
Inverloch	Section 22	4/3/2022 to 9/3/2022	Inverloch CWS tank	Deceased birds discovered during tank inspection	Boil water advisory issued to customers while tank was cleaned, and system flushed. Extensive monitoring indicated there was no change to usual water quality resulting from the deceased birds.
Fish Creek	Section 18	8/3/2022 to 11/3/2022	Fish Creek customer tap site	Exceedance of the drinking water quality standard for trihalomethanes	Seasonal increase in trihalomethanes compounded by slow water turnover in affected water main
Wonthaggi and Cape Paterson	Section 22	8/4/2022 to 22/4/2022	Wonthaggi CWS Basin	Potential widespread public complaint to due taste and odour	New geomembrane line and cover for the Wonthaggi CWS basin caused a plastic-like taste and odour for water supplied to Wonthaggi and Cape Paterson

Section 22 reported events

Potential contamination of Inverloch water supply and issue of Boil Water Advisory

On the afternoon of Friday the 4th of March 2022, South Gippsland Water (SGW) water treatment and quality staff were informed of three deceased birds at the bottom of the Inverloch clear water storage (CWS) tank. The birds had been observed by contract divers while carrying out planned inlet nozzle replacement works. The department was immediately notified in accordance with section 22 of the *Act*. In consultation with the department, a decision to issue a boil water advisory (BWA) for the town of Inverloch was made. A BWA is a formal instruction to customers to disinfect water by boiling prior to use. It is issued as a precautionary measure in the interests of public health protection.

Other immediate actions included the following:

- Activation of SGW's Emergency Management Plan and formation of an Incident Management Team
- Notification to the Department of Environment, Land, Water and Planning (DELWP) in accordance with Emergency Management Victoria protocols
- Engagement of contract divers to remove the deceased birds
- Review of water quality data to assess potential public health risk
- Investigation of options to isolate, inspect and clean the Inverloch CWS tank
- Preparation of communication plans to inform customers

Customer notification

Issue of the boil water advisory to customers commenced in the late afternoon of Friday 4th of March 2022. Notification of general customers was achieved via alerts and information on SGW's web and social media pages (shared to local news and other community pages), notification through the Vic Emergency app, SMS (Short Message Service), email, signage at road entrances to town, and traditional news media (ABC Gippsland radio broadcast, South Gippsland Sentinel Times, WIN television News).

Self-registered 'vulnerable customers' and other sensitive customers (food businesses and medical practitioners, for example) were contacted by telephone as a matter of high priority.

Alternative water supplies

Portable drinking water trailers were provided at the Inverloch recreational oval, the aged care facility, and Inverloch Primary School as an alternative water source for customers. Bottled water was also supplied to cafes and special needs customers.

Corrective Actions

The following corrective actions were carried out in accordance with SGW incident response procedures and a prepared recovery plan over the 5th and 6th of March 2022:

- Physical removal of the deceased birds and vacuuming of the tank floor and inner surfaces to remove biofilms and sediment

- Closure of the inlet valve to the Inverloch CWS to allow draw down of water to minimum operating volume (approximately 50% of normal operating volume to maintain adequate pressure and supply to customers)
- Three times turn-over (replacement) of the volume of water remaining in the tank by flushing through scour valves and hydrants in the reticulation system and refilling the tank to minimum operating volume
- Continued flushing of the Inverloch reticulation system once tank fill and flush process complete to remove any potentially contaminated water from the system

Monitoring and analysis results

The CWS tank and the Inverloch reticulation system were monitored for water quality indictors prior to and throughout the recovery process. This served to both affirm water quality and map the flow of replacement water in the system. Analysis included tests for monochloramine, total chlorine, and fluoride (fluoride dosing at the supplying Lance Creek water treatment plant (WTP) was ceased temporarily to allow for tracking of unfluoridated replacement water).

A set of samples from seven sites (including the outlet of the Inverloch CWS Tank) was taken on the morning of Saturday the 5th of March 2022 prior to removal of birds from the tank. Analysis was conducted at SGW's contracted external laboratory at Scoresby and comprised the following tests: *Escherichia coli* (*E. coli*), Total Coliforms, Plate Count, Turbidity, pH, and Electrical Conductivity. There were no *E. coli* detected in any of the samples and all other results were within normal range. The results provided a positive indication of continuing drinking water safety, despite the presence of the deceased birds.

Following completion of corrective actions, two sets of seven samples from sites representing the Inverloch supply system were collected on Tuesday the 8th of March 2022 (one set in the morning and one in the afternoon) to verify water quality. The results of analysis received the following day all indicated water was safe to drink.

Rescindment of BWA

In consultation with the department, the boil water advisory was lifted on Wednesday the 9th March 2022 following confirmation of water quality from the verification sampling results. Customers were notified via the communication channels mentioned above.

Possible cause of issue

During an asset condition assessment inspection of the Inverloch CWS Tank on the 7th of January 2022, it was noted that an area of the roof required resealing. When completing these works, it was subsequently found that a small number of rib end caps were either missing or partially displaced. While the openings created by the unsealed roof sheets and missing rib end caps were relatively minor there were no other potential sites of bird entry identified. Replacement of rib end caps and resealing of the tank roof was completed by the 19th of January 2022. As inspection using a remote observation submersible ('underwater drone') on the 12th of January 2022 found no evidence of birds or bird entry, it would seem that the birds gained entry after this date, possibly becoming trapped when the roof was sealed on the 19th of January 2022.

Long-term preventative actions and lessons learned from incident

In response to the incident, inspection of selected South Gippsland Water storages was carried out to ensure structural integrity. To further reduce risk of bird entry, wire bird-

proofing under the eaves of tank rooves are now being replaced with perforated aluminium grill. Additional actions currently under consideration include:

- Review of the design and materials used for clear water storages
- Review of existing storage inspection programs, in terms of frequency and methods
- Review of operational resilience of storages and water supply systems, including works to improve storage bypass systems

While emergency management protocols were enacted successfully in response to the incident, some opportunities for improvement were identified. Key amongst these was the timing of customer communications. Mobile phone short message service (SMS) capability has now been strengthened to enable more rapid alerts in future incidents. Works are currently underway to further enhance customer communications during an incident.

Potential widespread public complaint for Wonthaggi and Cape Paterson

The department was notified under section 22 of the Act of potential widespread public complaint in Wonthaggi and Cape Paterson on the 8th of April 2022. The notification related to detection of a 'plastic-like' taste and odour for water in the 9-megalitre Wonthaggi clear water storage (CWS) basin.

The CWS basin had been taken offline for important geomembrane (PVC-EIA) lining and cover replacement works prior to the detection. The basin lining and cover are critical for protecting stored water from contamination and must be replaced at the end of lifespan (10 to 20 years). Upon completion of works, the basin was refilled with treated and chloraminated water (i.e., normal potable water supply) from the Lance Creek water treatment plant. Before bringing the basin back into service, the water was allowed to sit for a number of days. The purpose of this was to ensure adequate disinfection of the new lining and cover through contact with the monochloramine residual in the water. It is possible the extended residence time of water in the basin led to some leaching of plastic flavour from the new lining and cover.

As the geomembrane material complied with AS/NZS 4020:2018 standard for 'Testing of Products for Use in Contact with Drinking Water', there was no concern in relation to drinking water safety. However, it was believed that the unusualness of the plastic flavour would cause at least some dissatisfaction for customers across Wonthaggi and Cape Paterson. Social media and website posts were used to inform customers of the issue.

The situation was monitored via sensory tests for taste and odour at the Wonthaggi and Cape Paterson water towers. The plastic taste and odour subsided over the course of the ensuing week. Analysis of samples taken from the Wonthaggi CWS basin, and the Wonthaggi and Cape Paterson water towers did not determine the specific compound responsible for the flavour. Samples taken on the 9th of April 2022, returned only a trace-level detection of total recoverable hydrocarbons (TRH), while samples taken on the 12th of April 2022 returned no detections of plastics or other hydrocarbons at all.

Despite concerns, there were no complaints received in relation to the taste and odour for Wonthaggi and Cape Paterson water supplies.

Possibility of tastes and odours will be given greater consideration in relation to planning for future basin cover and lining renewals.

Section 18 reported event

Fish Creek -trihalomethanes

The department was notified under section 18 of the Act for an exceedance of 0.01 mg/L above the water quality standard of 0.25 mg/L for trihalomethanes in Fish Creek on the 8th of March 2022. Trihalomethanes are disinfection by-product chemicals that form when chlorine combines with certain organic compounds. Warm water temperatures facilitate the chemical reaction so trihalomethane levels typically rise in summer and autumn. Trihalomethane levels also increase as a function of time, and it is believed low water

turnover in the Fish Creek clear water storage (CWS) basin and the water main supplying the non-compliant sampling site were contributing factors.

Corrective actions carried out in response to the exceedance included flushing of the affected water main and slight reduction of chlorine dose at the Fish Creek water treatment plant. Samples collected the following week confirmed a return to compliant trihalomethane levels for the town. To prevent recurrence, additional monitoring will be scheduled for high trihalomethane risk summer-autumn period.

Other potential issues

The region experienced a severe storm and related power outages on the 29th of October 2021. Control of affected water treatment plants and telemetry was maintained through use of diesel-powered electrical generators. Reliance on clear water storage volumes (in preference to operating treatment plants continuously through the storm) allowed for both a minimisation of power usage and avoidance of issues relating to treatment of highly turbid source waters.

High winds and heavy rain from the storm caused numerous tree-falls in the region. One such fall caused a water main to break on the outskirts of Yarram around midday on the 29th of October 2022. Another break occurred at Port Albert later that afternoon. The breaks were isolated, repaired, and flushed in accordance with business-as-usual hygienic protocols. Chlorine disinfection residual and clarity monitoring verified drinking water quality prior to reinstatement of the repaired mains.

South Gippsland Water is currently reviewing controls and treatments in relation to increased risk of severe weather events.

Photo: Portable electrical generators

Photo: Water network maintenance team

4. Drinking Water Quality Standards

During the 2021-22 reporting period, South Gippsland Water (SGW) implemented water quality monitoring programs consistent with requirements of the *Safe Drinking Water Act 2003* (the Act) and associated Safe Drinking Water Regulations 2015 (the Regulations).

Schedule 2 of the Regulations stipulates the sampling frequency and water quality standard for three water quality parameters: *Escherichia coli,* trihalomethanes (total), and turbidity. These mandatory samples must be collected from the drinking water supply at relevant frequencies and analysed for performance against the water quality standards as shown in Table 7, below.

Table 7: Drinking water quality standards and required sampling frequencies as defined in Schedule 2 of the Safe Drinking Water Regulations 2015

Parameter	Relevant sampling frequency for each water sampling locality	Quality standard for each water sampling locality
Escherichia coli	One sample per week	All samples of drinking water collected are found to contain no Escherichia coli per 100 millilitres of drinking water, with the exception of any false positive sample. For the purposes of this quality standard, *a false positive sample* means a sample that is found, after an analysis conducted in accordance with regulation 14, to contain *Escherichia coli* per 100 millilitres of drinking water, if--- **a)** following the analysis, the water supplier has conducted an investigation, which has been conducted in accordance with any guidelines issued by the Secretary in relation to such investigations, including any timeframes for commencement and completion of the investigations, to ascertain whether the results for the analysis are representative of water in the relevant sampling locality; and **b)** the water supplier has reported the results of the investigation to the Secretary in relation to such reports, including any timeframes for provision of the report; and **c)** the investigation has concluded that the results of the analysis conducted in accordance with regulation 14 were not representative of the water in the relevant water sampling locality because the investigation established that— **(i)** all other factors that would indicate the presence of *Escherichia* coli are not present in that water in the water sampling locality at the time of the investigation; and **(ii)** the drinking water treatment process applied, or other specified actions taken by the water supplier, are such as would be reasonably expected to have eliminated the presence of Escherichia coli in the water sampling locality at the relevant time; and **(iii)** all plant and infrastructure associated with the water treatment process were operating to specification at all relevant times; and **(iv)** there were no issues arising from degradation of plant or infrastructure in or around the relevant water sampling locality that could reasonably be suspected to have contributed to the presence of *Escherichia coli* in the drinking water in that water sampling locality. A sample analysed in accordance with regulation 14 that is found, on that analysis, to contain *Escherichia coli* per 100 millilitres of drinking water is not a false positive sample unless all of the circumstances in paragraphs (a), (b) and (c) apply.
Trihalomethanes (total)	One sample per month	Less than or equal to 0.25 milligrams per litre of drinking water
Turbidity	One sample per week	The 95 percentile of results for samples in any 12-month period must be less than or equal to 5.0 Nephelometric Turbidity Units

Analysis Results – Schedule 2 parameters

The results of analysis for Schedule 2 parameters for 2021-22 are summarised in Tables 8 to 10.

Section 23 of the Act requires that a water supplier make available for inspection by the pubic the results of any water quality monitoring program that is conducted on any drinking water it supplies. Customers and members of the public may access drinking water quality data by telephoning South Gippsland Water Customer Service on 1300 851 636, or by emailing sgwater@sgwater.com.au

Changes to monitoring program for regulated parameters of *Escherichia coli* and turbidity

Following annual review of South Gippsland Water's monitoring program, the number of samples to be collected for *Escherichia coli* (*E. coli*) analysis for Korumburra, Nyora, and Yarram was increased in 2021-22. The purpose of this was to ensure comprehensiveness of clear water storage monitoring by sampling directly from the outlets of Nyora and Korumburra (Ayrlie Park) standpipes, and to enhance monitoring of the moderately large town of Yarram by addition of an extra customer tap site to the weekly program. The additional customer tap site monitoring for Yarram also includes turbidity analysis. A larger set of analysis results provides greater assurance of drinking water quality in general and can assist with investigations in the event of *E. coli* detections or other potential water quality issues.

Escherichia coli

Escherichia coli (*E. coli*) is an enteric (gut) bacterium. Its presence in water may indicate contamination with human or animal faecal matter and associated microorganisms and viruses – some of which may be pathogenic (disease-causing). For the quality standard for each water sampling locality to be met with respect to *E. coli*, then all samples of drinking water collected must have been found to contain no *E. coli* per 100 millilitres of drinking water, with the exception of any false positive samples (refer to Table 7 for definition of "false positive sample").

Results: *Escherichia coli*

Monitoring for *E. coli* for the 2021-22 reporting period was conducted in accordance with requirements of the Regulations and South Gippsland Water's risk-based monitoring program. The program specifies which sites are to be sampled and at what frequencies. Samples for *E. coli* analysis are collected weekly from a range of different sampling sites and locations, including dedicated customers tap sites, clear water storages (CWSs), and process water from water treatment plants. Other sites in distribution systems, such as upstream and downstream of secondary disinfection dosing units, and at the inlets and outlets CWS tanks and basins are also sampled on a weekly basis.

Compliance with the water quality standard for *E. coli* is based on monitoring of drinking water as it is supplied to customers. For some localities, this includes the results of distribution clear water storage sample analysis (where there is not a more representative site downstream of the storage) in addition to those from customer tap sample analysis. There

were no *E. coli* detections for drinking water samples collected in 2021-22 and hence all localities were compliant with the drinking water standard.

Table 8: Escherichia coli results for 2021-22

Water sampling locality	Customer tap sampling frequency (No. samples per week)	Clear Water Storage outlet sampling frequency (No. samples per week)	Total number of samples collected in compliance period	Maximum result (Orgs/100mL)	Number of investigations	Number of samples where standard was not met
Alberton	1	-	52	0	0	0
Cape Paterson	1	1	104	0	0	0
Dumbalk	1	1	104	0	0	0
Fish Creek	1	1	104	0	0	0
Foster	1	1	104	0	0	0
Inverloch	2	1	156	0	0	0
Koonwarra	1	-	52	0	0	0
Korumburra	1	3*	208	0	0	0
Lance Creek	1	1	104	0	0	0
Leongatha	2	1	156	0	0	0
Loch	1	1	104	0	0	0
Meeniyan	1	1	104	0	0	0
Nyora	1	1*	104	0	0	0
Poowong	1	2	156	0	0	0
Port Franklin	1	-	52	0	0	0
Port Welshpool	1	-	52	0	0	0
Toora	1	2	156	0	0	0
Wonthaggi	2	1	156	0	0	0
Yarram	2*	2	208	0	0	0

Notes: *The number of samples collected for Korumburra, Nyora, and Yarram was increased in 2021-22. Refer to Changes to monitoring program for regulated parameters of *Escherichia coli* and turbidity, above

Trihalomethanes

Trihalomethanes (THMs) are organic chemical compounds in which three of the four hydrogen atoms of methane (CH_4) are replaced by halogen atoms. The compounds may be present in drinking water principally because of chlorination or, to a much lesser extent, chloramination. Chlorine forms hypochlorous acid when added to water and can react with naturally-occurring organic material to produce the trihalomethane species trichloromethane (chloroform), bromodichloromethane, dibromochloromethane, and tribromomethane (bromoform).

The ADWG state that, "Based on health considerations, the concentration of trihalomethanes, either individually or in total, in drinking water should not exceed 0.25 mg/L. Trihalomethane concentrations fluctuating occasionally (for a day or two annually) up to 1 mg/L are unlikely to pose a significant health risk. Action to reduce THMs is encouraged, but must not compromise disinfection, as non-disinfected water poses significantly greater risk than THMs."

Total trihalomethanes results for 2021-22

For the year ending the 30th of June 2022, testing for trihalomethanes was conducted in accordance with the Regulations and South Gippsland Water's risk-based monitoring program.

Table 9: Trihalomethanes (total) results for 2021-22

Water sampling locality	Customer tap sampling frequency (No. samples per month)	Clear Water Storage outlet sampling frequency (No. samples per week)	Total number of samples collected in compliance period	Average result (mg/L)	Maximum result (mg/L)	Number of samples where standard was not met
Alberton	1	0	12	0.067	0.120	0
Cape Paterson	1	0	12	0.064	0.087	0
Dumbalk	1	0	12	0.093	0.140	0
Fish Creek	1	1	24	0.152	0.260	1
Foster	1	0	12	0.101	0.150	0
Inverloch	1	0	12	0.060	0.086	0
Koonwarra	1	0	12	0.104	0.140	0
Korumburra	1	0	12	0.076	0.096	0
Lance Creek	1	0	12	0.071	0.092	0
Leongatha	1	0	11	0.107	0.150	0
Loch	1	0	12	0.050	0.066	0
Meeniyan	1	0	12	0.093	0.140	0
Nyora	1	0	12	0.071	0.092	0
Poowong	1	0	12	0.063	0.091	0
Port Franklin	1	0	12	0.101	0.130	0
Port Welshpool	1	0	12	0.077	0.130	0
Toora	1	0	12	0.082	0.150	0
Wonthaggi	1	0	12	0.076	0.091	0
Yarram	1	0	12	0.056	0.080	0

Trihalomethane non-compliance for Fish Creek in March 2022

A sample collected from the locality of Fish Creek in March 2022 was found to be non-compliant with the water quality standard for trihalomethanes. Refer to Fish Creek - trihalomethanes in Part 3 of this report for details.

Missed trihalomethane sample for Leongatha in June 2022

A non-compliance with regulation 13(1) of the Safe Drinking Water Regulations 2015 was recorded for the locality of Leongatha in June 2022. The required monthly sample for trihalomethane analysis was not collected due to a scheduling error at the external contracted laboratory. This error followed a major upgrade of the Laboratory Management Information System (LIMS) at the external laboratory.

Turbidity

Turbidity is a measurement of the light-scattering property of water which is dependent on the amount, size, and composition of fine suspended matter. The Safe Drinking Water Regulations 2015 specify that the 95th percentile of results for samples in any 12-month period must be less than or equal to 5.0 Nephelometric Turbidity Units (NTU).

Turbidity results

Monitoring for compliance with the water quality standard for turbidity was conducted in accordance with the Regulations and South Gippsland Water's risk-based monitoring program. Turbidity results are presented in Table 10.

Table 10: Turbidity results for 2021-22

Water sampling locality	Customer tap sampling frequency (No. samples per week)	Total number of samples collected in compliance period	Maximum turbidity in a sample (NTU)	Maximum 95th percentile of turbidity results in any 12 months	Number of 95th percentile of results in any 12 months above standard
Alberton	1	52	0.3	0.2	0
Cape Paterson	1	52	<0.1	0.1	0
Dumbalk	1	52	0.6	0.1	0
Fish Creek	1	52	1.2	0.2	0
Foster	1	52	0.2	0.2	0
Inverloch	2	104	0.2	0.1	0
Koonwarra	1	52	0.2	0.1	0
Korumburra	1	52	<0.1	0.1	0
Lance Creek	1	52	0.4	0.2	0
Leongatha	2	104	0.5	0.2	0
Loch	1	52	1.4	0.2	0
Meeniyan	1	52	0.2	0.1	0
Nyora	1	52	0.2	0.1	0
Poowong	1	52	0.3	0.1	0
Port Franklin	1	52	0.3	0.2	0
Port Welshpool	1	52	0.2	0.2	0
Toora	1	52	0.2	0.2	0
Wonthaggi	2	104	0.2	0.1	0
Yarram	2*	104	0.5	0.1	0

Notes: *The number of turbidity samples collected for Yarram was increased in 2021-22. Refer to text. Refer to Changes to monitoring program for regulated parameters of *Escherichia coli* and turbidity

Analysis results - other water quality standards (algal toxin, pathogen, chemical or substance that may pose a risk to human health)

As part of South Gippsland Water's drinking water quality management system, water quality parameters with potential to affect human health are monitored. These parameters are measured against standard values defined in the Australian Drinking Water Guidelines 2011 (ADWG).

As many of these parameters do not change significantly over time or through water supply systems, frequent monitoring is not required. Results are summarised in Tables 11 to 26.

Section 23 of the Act requires that a water supplier make available for inspection by the public the results of any water quality monitoring program that is conducted on any drinking water it supplies. Customers and members of the public may access drinking water quality data by telephoning South Gippsland Water Customer Service on 1300 851 636, or by emailing sgwater@sgwater.com.au

Photos: SGW water quality sampling staff and dedicated sampling vehicles

Aluminium (total) results

Aluminium may be present in drinking water where aluminium salts are used as coagulants in water treatment processes to destabilise particles in water. Water quality performance with respect to aluminium was measured against the ADWG aesthetic guideline value of 0.2 mg/L. As stated in the ADWG, "no health-based guideline is set for aluminium at this time, but this issue will be kept under review." A summary of aluminium (total) results is presented in Table 11.

Table 11: Aluminium (total) results for 2021

Water sampling locality	Customer tap sampling frequency (No. samples per month)	Total number of samples collected in compliance period	ADWG aesthetic drinking water quality guideline (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Alberton	1	12	0.2	0.02	0.13	0
Cape Paterson	1	12	0.2	<0.02	0.04	0
Dumbalk	1	12	0.2	<0.01	0.01	0
Fish Creek	1	12	0.2	0.03	0.09	0
Foster	1	12	0.2	<0.01	0.02	0
Inverloch	1	12	0.2	0.02	0.05	0
Koonwarra	1	12	0.2	0.02	0.05	0
Korumburra	1	12	0.2	<0.02	0.04	0
Lance Creek	1	12	0.2	0.02	0.04	0
Leongatha	1	12	0.2	0.02	0.04	0
Loch	1	12	0.2	0.03	0.05	0
Meeniyan	1	12	0.2	0.08	0.46	1
Nyora	1	12	0.2	<0.02	0.06	0
Poowong	1	12	0.2	0.02	0.04	0
Port Franklin	1	12	0.2	0.01	0.02	0
Port Welshpool	1	12	0.2	<0.02	0.03	0
Toora	1	12	0.2	0.02	0.03	0
Wonthaggi	1	12	0.2	0.02	0.04	0
Yarram	1	12	0.2	<0.02	0.04	0

Exceedance of aesthetic guideline for aluminium in Meeniyan

An exceedance of the ADWG aesthetic guideline for aluminium was recorded for Meeniyan in June 2022. Adjustments to treatment chemical dosages and plant flow rate were carried out in response. No customer complaints in relation to the exceedance were recorded.

Arsenic results

Arsenic is a naturally-occurring element which can be introduced to water through dissolution of minerals and ores, or from industrial effluent, atmospheric deposition, drainage from old gold mines or the use of some types of sheep dip. The ADWG specify that, from a health perspective, the concentration of arsenic should not exceed 0.01 mg/L. Water supplied by South Gippsland Water complied with the ADWG guideline value for arsenic, with all results indicating levels were below detection limits; refer to Table 12.

Table 12: Arsenic results for 2021-22

Water treatment plant / system	Customer tap sampling frequency (No. samples per year)	Total number of samples collected in compliance period	ADWG aesthetic drinking water quality guideline (mg/L)	Result (mg/L)	Number of samples where guideline was not met
Alberton	1	1	0.01	<0.001	0
Cape Paterson	1	1	0.01	<0.001	0
Dumbalk	1	1	0.01	<0.001	0
Fish Creek	1	1	0.01	<0.001	0
Foster	1	1	0.01	<0.001	0
Inverloch	1	1	0.01	<0.001	0
Koonwarra	1	1	0.01	<0.001	0
Korumburra	1	1	0.01	<0.001	0
Lance Creek	1	1	0.01	<0.001	0
Leongatha	1	1	0.01	<0.001	0
Loch	1	1	0.01	<0.001	0
Meeniyan	1	1	0.01	<0.001	0
Nyora	1	1	0.01	<0.001	0
Poowong	1	1	0.01	<0.001	0
Port Franklin	1	1	0.01	<0.001	0
Port Welshpool	1	1	0.01	<0.001	0
Toora	1	1	0.01	<0.001	0
Wonthaggi	1	1	0.01	<0.001	0
Yarram	1	1	0.01	<0.001	0

Copper

Copper is naturally distributed in rocks and soils. It may also be present in drinking water where aggressive waters of low pH and hardness induce corrosion of copper pipes. The ADWG specify that the concentration of copper should not exceed 1 mg/L based on aesthetic considerations, and 2 mg/L based on health considerations. Water supplied by South Gippsland Water complied with both the aesthetic-based and health-based guideline values for copper; refer to Table 13.

Table 13: Copper results

Water treatment plant / system	Customer tap sampling frequency (No. samples per quarter)	Total number of samples collected in compliance period	ADWG aesthetic drinking water quality guideline (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Alberton	1	4	2	<0.001	0.002	0
Cape Paterson	1	4	2	0.008	0.011	0
Dumbalk	1	4	2	0.005	0.006	0
Fish Creek	1	4	2	0.006	0.011	0
Foster	1	4	2	0.006	0.009	0
Inverloch	1	4	2	0.010	0.014	0
Koonwarra	1	4	2	0.009	0.014	0
Korumburra	1	4	2	0.008	0.018	0
Lance Creek	1	4	2	0.022	0.033	0
Leongatha	1	4	2	0.007	0.011	0
Loch	1	4	2	0.005	0.007	0
Meeniyan	1	4	2	0.010	0.011	0
Nyora	1	4	2	0.011	0.016	0
Poowong	1	4	2	0.001	0.002	0
Port Franklin	1	4	2	0.001	0.002	0
Port Welshpool	1	4	2	0.007	0.017	0
Toora	1	4	2	0.008	0.015	0
Wonthaggi	1	4	2	0.010	0.012	0
Yarram	1	4	2	0.001	0.006	0

Note: Samples are taken for analysis from the reticulation system. Copper levels may be higher at the customers' internal taps if copper plumbing is used in the domestic system. Customers experiencing blue copper staining of fixtures or discolouration of water are advised to call South Gippsland Water Customer Service on 1300 851 636.

Cyanogen chloride

Cyanogen chloride is a by-product of chloramination that can be formed through the reaction between organic precursors with hypochlorous acid in the presence of the ammonium ion. Based on health considerations, the ADWG specify that the concentration of total cyanogenic compounds in drinking water should not exceed 0.08 mg/L.

Monitoring of the chloraminated Lance Creek system confirmed that water supplied by South Gippsland Water complied with the guideline value for cyanogen chloride, with all results indicating levels were below the detection limit; refer to Table 14.

Table 14: Cyanogen chloride results for 2021-22: chloraminated systems

Water treatment plant / system	Locality supplied	Customer tap sampling frequency (No. samples per year)	Total number of samples collected in compliance period	ADWG aesthetic drinking water quality guideline (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Lance Creek	Cape Paterson Inverloch Korumburra Lance Creek Loch Nyora Poowong Wonthaggi	1	3	0.01	<0.001	0

Chlorine disinfection residual (Free or Total Chlorine)

Disinfection is a critical part of water treatment. Not all microorganisms can be removed during clarification and filtration processes, so an additional disinfection step is required to ensure drinking water safety. Chlorine and chloramine (compounds formed from chlorine and ammonia) are the most commonly used agents. These are applied in carefully controlled dosages at treatment plants in the process known as primary disinfection.

The actual amount of disinfection agent dosed is very small (comparable to about a cup's worth in an Olympic-sized swimming pool). It is just adequate to both inactivate microorganisms that have made it through the purification process, and to confer a disinfection residual on the water. The residual helps to protect water as it passes through the pipes and storages of the distribution system. Chlorine and, to a lesser extent, chloramine tend to dissipate with time and distance through a water supply network so secondary dosing units may be used to ensure water remains protected to the ends of the system.

Disinfection agent dosing is automatically controlled by on-line monitoring systems which shut-down treatment plant operation in the event of levels being either too low or too high. This prevents out-of-specification water from being produced while the problem is addressed. With these controls in place, water supplied to customers is unlikely to ever exceed the ADWG guideline. The main purpose of disinfection residual monitoring is to ensure that it remains at an adequate level throughout the distribution system. There is no guideline for minimum disinfection residual and what is considered acceptable is particular to an individual water supply system based on its size and components, as well as the results of microbiological monitoring results.

South Gippsland Water uses both chlorine and chloramine disinfection. Chlorine dissociates in water to form 'free chlorine', which consists of aqueous molecular chlorine, hypochlorous acid and hypochlorite ion. Free chlorine is monitored in the reticulation systems of chlorinated supplies on a (minimum) weekly basis during routine sampling. For the chloraminated supplies, 'total chlorine' is monitored. Total chlorine is the sum of chlorine in combined form (with ammonia and other nitrogenous or organic compounds) and free chlorine.

Based on health considerations, the ADWG guideline value for total chlorine in drinking water is 5 mg/L. There is no specific guideline for free chlorine; however, in chlorinated systems the level of free chlorine approximates or is lower than the level of total chlorine. As both total and free Chlorine levels are well below 5 mg/L, all localities can be assumed to be compliant with the water quality guideline for total chlorine; refer to Tables 15 and Table16.

Table 15: Free Chlorine for 2021-22 (chlorinated localities)

Water treatment plant / system	Minimum customer tap sampling frequency (No. samples per week)	Total number of samples	Minimum result (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where guideline (for Total Chlorine) was not met
Alberton	1	52	0.33	1.11	1.64	0
Dumbalk	1	52	0.04	0.27	0.78	0
Fish Creek	1	52	0.02	0.35	0.89	0
Foster	1	52	0.01	0.43	1.00	0
Koonwarra	1	52	0.00	0.02	0.10	0
Leongatha	1	104	0.02	0.49	1.00	0
Meeniyan	1	52	0.03	0.45	0.96	0
Port Franklin	1	52	0.04	0.49	0.99	0
Port Welshpool	1	96	0.22	1.00	1.60	0
Toora	1	52	0.23	0.90	1.33	0
Yarram	1	104	0.47	1.25	1.87	0

Table 16: Total Chlorine for 2021-22 (chloraminated localities)

Water treatment plant / system	Minimum customer tap sampling frequency (No. samples per week)	Total number of samples	Minimum result (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Cape Paterson	1	52	0.07	0.53	1.23	0
Inverloch	1	127	0.35	1.59	2.60	0
Korumburra	1	63	0.31	1.63	2.30	0
Lance Creek	1	52	0.34	2.17	3.00	0
Loch	1	63	0.05	0.63	1.50	0
Nyora	1	63	0.07	1.06	1.64	0
Poowong	1	52	0.05	0.77	1.64	0
Wonthaggi	1	106	0.04	1.40	2.20	0

Fluoride

Naturally-occurring fluoride concentrations in drinking water are dependent on the type of soil and rock through which source water drains. Fluoride may also be added to drinking water supplies as a public health measure for the prevention of dental decay. The (ADWG) specify that the maximum concentration of fluoride in drinking water should not exceed 1.5 mg/L. Under the Health (fluoridation) Act, fluoride added to drinking water must not result in an average optimum concentration in excess of one part per million parts of water.

The Code of practice for fluoridation of drinking water supplies (second edition) made under the Health (Fluoridation) Act 1973 states that a water agency must not add fluoride to an extent that results in an average optimum concentration in excess of one part fluoride per million parts of water (1.0 mg/L) over any 12-month period in any water sampling locality.

Results: Fluoride in non-fluoridated supplies

Monitoring of non-fluoridated drinking water is conducted annually to verify continued low levels of naturally-occurring fluoride, as have been recorded historically. Results of fluoride monitoring for non-fluoridated supplies are provided in Table 17.

Table 17: Fluoride results for non-fluoridated supplies in 2021-22

Water treatment plant / system	Locality supplied	Sampling frequency (samples per year)	Total number of samples	Drinking water quality standard	Result (mg/L)	Number of samples where guideline was not met
Devon North	Alberton Yarram	1	1	1.5	<0.05	0 0
Dumbalk	Dumbalk	1	1	1.5	0.09	0
Fish Creek	Fish Creek	1	1	1.5	<0.05	0
Foster	Foster	1	1	1.5	<0.05	0
Leongatha	Leongatha Koonwarra	1	1	1.5	0.06	0 0
Meeniyan	Meeniyan	1	1	1.5	0.06	0
Toora	Pt Franklin Pt Welshpool Toora	1	1	1.5	<0.05	0

Results: Fluoride in fluoridated supply

For the fluoridated supply system of Lance Creek, monitoring is conducted in accordance with the Code of practice for fluoridation of drinking water supplies (second edition) under the *Health (fluoridation) Act 1973.* Refer to Table 18 for results.

Table 18: Fluoride results for fluoridated supply in 2021-22

Water sampling locality	Frequency of sampling (samples per week)	Total Number of samples	Drinking water quality guideline (mg/L)	Operating target range mg/L	Average* result mg/L	Maximum result mg/L	Number of samples where standard was not met
Cape Paterson	1	52	1.5	0.9±0.1	0.71	0.96	0
Inverloch	1	52	1.5	0.9±0.1	0.70	1.00	0
Korumburra	1	52	1.5	0.9±0.1	0.71	0.98	0
Lance Creek	1	52	1.5	0.9±0.1	0.70	0.99	0
Loch	1	52	1.5	0.9±0.1	0.70	1.00	0
Nyora	1	52	1.5	0.9±0.1	0.70	1.00	0
Poowong	1	52	1.5	0.9±0.1	0.69	0.97	0
Wonthaggi	1	52	1.5	0.9±0.1	0.74	1.00	0

* *Note:* under s. 5(3) of the *Health (Fluoridation) Act* 1973 fluoride added to drinking water must not result in an average optimum concentration in excess of one part fluoride per million parts of water.

Fluoridation obligations

Under the *Health (fluoridation) Act*, an obligation is imposed on suppliers of fluoridated water to achieve a fluoride dose rate that confers a dental health benefit on consumers.

The optimal operating target dose rate is specified by the Department of Health and is based on maximum daily air temperature (which has been shown to correlate closely with water consumption). For the South Gippsland region, the optimal fluoridate dosage for conferring a dental health benefit is 0.9 plus or minus 0.1 milligrams per litre (i.e. the target is a range where concentrations of 0.8 to 1.0 milligrams per litre are acceptable).

Due to fluoride dosing system outages (including an extended one of more than two months) at the Lance Creek water treatment plant, South Gippsland Water did not fulfill the obligation to supply water meeting the optimal target range in terms of annual average for the 2021-22 reporting period. A summary table and discussion of the fluoridation outages is provided in the Water treatment issues section of this report.

Lead

Lead may be detected in drinking water as a result of dissolution from natural sources or from household plumbing systems containing lead. The ADWG specify that, from a health perspective, the concentration of lead should not exceed 0.01 mg/L. Water supplied by South Gippsland Water complied with the ADWG guideline value; refer to Table 19.

Table 19: Lead results for 2021-22

Water sampling locality	Frequency of sampling (samples per quarter)	Total number of samples	Drinking water quality standard (mg/L)	Average result (mg/L	Maximum result (mg/L)	Number of samples where standard was not met
Alberton	1	4	0.01	<0.001	<0.001	0
Cape Paterson	1	4	0.01	<0.001	<0.001	0
Dumbalk	1	4	0.01	<0.001	<0.001	0
Fish Creek	1	4	0.01	<0.002	0.003	0
Foster	1	4	0.01	<0.001	<0.001	0
Inverloch	1	4	0.01	<0.001	<0.001	0
Koonwarra	1	4	0.01	<0.001	<0.001	0
Korumburra	1	4	0.01	<0.001	<0.001	0
Lance Creek	1	4	0.01	<0.001	<0.001	0
Leongatha	1	4	0.01	<0.001	<0.001	0
Loch	1	4	0.01	<0.001	<0.001	0
Meeniyan	1	4	0.01	<0.001	0.001	0
Nyora	1	4	0.01	<0.001	<0.001	0
Poowong	1	4	0.01	<0.001	<0.001	0
Port Franklin	1	4	0.01	<0.001	<0.001	0
Pt Welshpool	1	4	0.01	<0.001	<0.001	0
Toora	1	4	0.01	<0.001	<0.001	0
Wonthaggi	1	4	0.01	<0.001	<0.001	0
Yarram	1	4	0.01	<0.001	<0.001	0

Manganese

Manganese may be present in source waters as a result of dissolution form natural sources. Concentrations may be reduced in drinking water by converting soluble forms of the element to insoluble precipitates followed by physical removal using filtration. The ADWG specify that the concentration of manganese should not exceed 0.1 mg/L based on aesthetic considerations, and 0.5 mg/L based on health considerations. Drinking water supplied by South Gippsland Water complied with both the aesthetic and health guidelines for manganese; refer to Table 20.

Table 20: Manganese results for 2021-22

Water sampling locality	Frequency of sampling (samples per month)	Total number of samples	Drinking water quality health guideline (mg/L)	Average result (mg/L	Maximum result (mg/L)	Number of samples where standard was not met
Alberton	1	12	0.5	<0.001	<0.001	0
Cape Paterson	1	12	0.5	<0.003	0.006	0
Dumbalk	1	12	0.5	<0.001	<0.001	0
Fish Creek	1	12	0.5	0.013	0.130	0
Foster	1	12	0.5	0.001	0.002	0
Inverloch	1	12	0.5	0.003	0.005	0
Koonwarra	1	12	0.5	0.002	0.004	0
Korumburra	1	12	0.5	0.003	0.005	0
Lance Creek	1	12	0.5	0.002	0.004	0
Leongatha	1	12	0.5	0.003	0.004	0
Loch	1	12	0.5	0.002	0.003	0
Meeniyan	1	12	0.5	<0.002	0.004	0
Nyora	1	12	0.5	0.002	0.003	0
Poowong	1	12	0.5	0.002	0.004	0
Port Franklin	1	12	0.5	<0.004	0.009	0
Pt Welshpool	1	12	0.5	0.003	0.013	0
Toora	1	12	0.5	0.006	0.017	0
Wonthaggi	1	12	0.5	<0.003	0.006	0
Yarram	1	12	0.5	<0.001	0.002	0

Nitrate and Nitrite

Nitrates and nitrites are naturally-occurring oxides of nitrogen. Nitrite is rapidly oxidised to nitrate and is seldom present in well-oxygenated or chlorinated supplies. Chloramination disinfection can lead to nitrate and nitrite formation in the distribution system due to the action of nitrifying bacteria. The ADWG specify that, from a health perspective, the concentrations of nitrate and nitrite should not exceed 50 mg/L and 3 mg/L respectively.

Monitoring for oxidised nitrogen (nitrate plus nitrite) was conducted on a quarterly basis in chlorinated South Gippsland Water systems in 2021-22. The standard of 50 mg/L for nitrate was used to measure water quality performance for oxidised nitrogen given nitrite's rapid conversion to nitrate. Based on nitrification risk, more frequent specific analysis for both nitrate and nitrite was conducted in the chloraminated localities. All the chloraminated localities complied with the specific guideline values for nitrate and nitrite; refer to Tables 21, 22 and 23.

Table 21: Oxidised nitrogen (nitrate + nitrite) for 2021-22 (chlorinated supplies)

Water treatment plant / system	Localities supplied	Sampling frequency (samples per quarter)	Total number of samples	Minimum Result (mg/L)	Maximum Result mg/L	Number of samples where standard was not met
Devon Nth	Alberton Yarram	1	4	0.35	1.10	0
Dumbalk	Dumbalk	1	4	0.05	1.00	0
Fish Creek	Fish Creek	1	4	0.34	0.42	0
Foster	Foster	1	4	0.05	0.09	0
Leongatha	Leongatha Koonwarra	1	4	0.26	0.72	0
Meeniyan	Meeniyan	1	4	0.16	0.84	0
Toora	Port Franklin Post Welshpool Toora	1	4	0.34	1.70	0

Table 22: Nitrate for 2021-22 (chloraminated localities)

Water sampling locality	Minimum sampling frequency (samples per month)	Total number of samples	Minimum result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Cape Paterson	1	12	0.031	0.42	0
Inverloch	1	12	0.025	0.44	0
Korumburra	3	36	0.013	0.48	0
Lance Creek	1	12	0.012	0.44	0
Loch	1	12	0.086	0.51	0
Nyora	2	24	0.027	0.48	0
Poowong	1	12	0.019	0.44	0
Wonthaggi	1	12	0.015	0.46	0

Table 23: Nitrite for 2021-22 (chloraminated localities)

Water sampling locality	Minimum sampling frequency (samples per month)	Total number of samples	Minimum result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Cape Paterson	1	12	0.004	0.036	0
Inverloch	1	12	0.002	0.022	0
Korumburra	3	36	<0.002	0.006	0
Lance Creek	1	12	<0.002	0.003	0
Loch	1	12	<0.002	0.550	0
Nyora	2	24	0.002	0.110	0
Poowong	1	12	<0.002	0.006	0
Wonthaggi	1	12	<0.002	0.004	0

Nitrosodimethylamine (NDMA)

N-Nitrosodimethylamine (NDMA) is produced as a by-product of the chloramination of drinking water due to the oxidation of natural organic matter by chlorine in the presence of ammonia. The ADWG specify that, based on health considerations, the concentration of NDMA in drinking water should not exceed 0.0001 mg/L (100 ng/L).

Monitoring of chloraminated systems for NDMA was conducted annually, with results indicating water supplied by South Gippsland Water complied with the guideline value for NDMA; refer to Table 24.

Table 24: NDMA in chloraminated supplies for 2021-22

Water treatment plant /system	Localities supplied	Sampling frequency (samples per year)	Total number of samples	Average Result (mg/L)	Number of samples where standard was not met
Lance Creek	Cape Paterson Inverloch Korumburra Lance Creek Loch Nyora Poowong Wonthaggi	3	3	<0.000003	0

Other inorganic chemicals

Inorganic chemicals may be present in water as a result of the natural dissolution of rocks, soils and some plants, or through contamination from industrial and agricultural sources. Materials used to coat pipes and plumbing fittings may also be sources of inorganic chemicals in drinking water. Monitoring of all water supply systems was conducted to verify compliance with ADWG health-related guidelines for chemical concentrations as specified in Table 25.

Table 25: Other inorganic chemicals for 2021-22

Parameter	Sampling frequency	Number of samples per water system/locality*	Total Number of samples	ADWG guideline value (mg/L)	Maximum results (mg/L)	Number of samples where standard was not met
Antimony	Annually	one per locality	19	0.003	<0.001	0
Barium	Annually	one per locality	19	2	0.030	0
Beryllium	Annually	one per locality	19	0.06	<0.001	0
Boron	Annually	one per locality	19	4	0.15	0
Cadmium	Annually	one per locality	19	0.002	<0.0002	0
Chromium	Annually	one per locality	19	0.05	<0.001	0
Cobalt	Annually	one per locality	19	-	<0.001	0
Cyanide	Annually	one per system	8	0.08	<0.005	0
Mercury	Annually	one per locality	19	0.001	<0.0001	0
Molybdenum	Annually	one per locality	19	0.05	<0.001	0
Nickel	Annually	one per locality	19	0.02	<0.001	0
Selenium	Annually	one per locality	19	0.01	<0.001	0
Silver	Annually	one per locality	19	0.1	<0.001	0
Sulphate	Quarterly	one per system	32	500	57	0
Zinc	Annually	one per locality	19	3	0.011	0

***Note:** Monitoring may be conducted at the entry point to distribution systems or at customer tap sites in each locality dependent on likelihood of change in level of chemical as it passes through the water supply system.

Other organic chemicals

Potential sources of contamination of the drinking water supply with organic chemicals are industrial effluent, run-off from agricultural land, and the use of pesticides and herbicides. Organic disinfection by-products, such as the chloroacetic acids, can also form as result of disinfection processes. Consistent with historical data, monitoring of raw water intakes, distribution entry point water or customer tap sites found that levels of organic chemicals were compliant with the ADWG health-related guidelines for the 2021-22 period; refer to Table 26.

Table 26: Organic chemical monitoring results for 2021-22

Parameter	Sampling frequency (samples per year)	Number of samples per water supply system/locality*	Total Number of samples	ADWG Guideline value mg/L	Maximum results mg/L	Number of samples where guideline was not met
1,1-dichloroethane	1	One per system	8	a	<0.001	-
1,2-dichloroethane	1	One per system	8	0.003	<0.001	0
2,4,5-T	1	One per system	8	0.1	<0.00001	0
2,4,5-TP	1	One per system	8	b	<0.00001	-
2,4,6-T	1	One per system	8	b	<0.0001	-
2,4,6-trichlorphenol	1	One per system	8	0.02	<0.001	0
2,4-D	1	One per system	8	0.03	0.00008	0
2,4-DB	1	One per system	8	b	<0.00001	-
2,4-DP	1	One per system	8	b	<0.00001	-
2,6-D	1	One per system	8	b	<0.0001	-
4-Chlorophenoxyacetic Acid	1	One per system	8	b	<0.00001	-
Atrazine	1	One per system	8	0.02	<0.002	0
Benzene	1	One per system	8	0.001	<0.001	0
Benzo(a)pyrene	1	One per system**	4	0.00001	<0.000002	0
Total PAH	1	One per system**	4	b	<0.00001	-
Carbon tetrachloride	1	One per system	8	0.003	<0.001	0
Chloroacetic acid	1	One per locality	19	0.15	<0.005	0
Clopyralid	1	One per system	8	2	<0.00005	0
Dicamba	1	One per system	8	0.1	<0.00001	0
Dichloroacetic acid	1	One per locality	19	0.1	0.017	0
Fluoroxypyr	1	One per system	8	b	<0.00005	-
Glyphosate	1	One per system	8	1	<0.03	0
MCPA	1	One per system	8	0.04	0.00005	0
MCPB	1	One per system	8	b	<0.00001	-
Mecoprop	1	One per system	8	b	<0.00001	-
Metsulfuron methyl	1	One per system	8	0.04	<0.0001	0
Pentachlorphenol	1	One per system	8	0.01	<0.001	0
Picloram	1	One per system	8	0.3	0.00005	0
Prometryn	1	One per system	8	b	<0.002	-
Simazine	1	One per system	8	0.02	<0.002	0
Tetrachloroethene	1	One per system	8	0.05	<0.001	0
Trichloroacetic acid	1	One per locality	19	0.1	0.047	0
Triclopyr	1	One per system	8	0.02	<0.00001	0

Table notes:
a Insufficient data to set an ADWG guideline value based on health considerations
b No ADWG information available
* Monitoring is conducted at raw water inlets to WTPs or at clear water storage outlets to distribution systems
** Monitoring conducted at Devon North, Lance Creek and Leongatha water treatment plants only

Raw water monitoring

For the purposes of risk management, the parameters listed in Table 27 were monitored in raw water at the specified (minimum) frequencies in raw water at all South Gippsland Water treatment plants for the 2021-22 reporting period.

Table 27: Raw water monitoring frequencies

Parameter	Sampling frequency
Escherichia coli	Weekly
Total Coliforms	Weekly
Cryptosporidium	Event-based
Giardia	Event-based
Cyanobacteria (Blue-green algae)	Weekly (external/internal)
Algae by-products (MIB/Geosmin/Saxitoxin)	Event-based
Alkalinity	Monthly
Aluminium	Quarterly
Calcium	Quarterly
Copper	Quarterly
Dissolved Organic Carbon	Quarterly
Manganese	Quarterly
Nitrogen	Quarterly
Orthophosphorous	Quarterly
Total Organic Carbon	Quarterly
Turbidity	Weekly
Pesticides	Annually/Biannually/Event-based
Radionuclides	Every 5 years: Sampling conducted in Nov. 2021

Data obtained from all water quality monitoring programs conducted by South Gippsland Water is available on request by telephoning Customer Service on 1300 5682 0444 or emailing sgwater@sgwater.com.au

Aesthetics

South Gippsland Water strives to provide drinking water that is consistently clear and pleasant to drink for all customers. Actions taken to manage aesthetic characteristics include:

- Optimisation of treatment processes to minimise levels of iron, manganese, and organic compounds in supplied water
- pH adjustment of treated water
- Regular flushing and air-scouring to remove sediment accumulation in water mains
- Frequent sampling and analysis for aesthetic parameters
- Monitoring and management of cyanobacterial ('algal') blooms in raw water reservoirs
- Monitoring when required for compounds that may impart unpleasant tastes and odours to drinking water

Results of monitoring for aesthetic characteristics are provided in Tables 28 to 33 on the following pages.

Colour

Water may appear coloured due to the presence of natural organic substances including humic and fulvic acids, and dissolved inorganics, such as iron and manganese. Based on aesthetic considerations, the ADWG specifies that colour should not exceed 15 Hazen Units (HU). Water supplied by South Gippsland Water complied with the guideline value for colour; refer to Table 28.

Table 28: True Colour Results for 2021-22

Water treatment plant / system	Localities supplied	Minimum sampling frequency (samples per quarter)	Total number of samples	Average result (HU)	Maximum result (HU)	Number of samples where guideline was not met
Devon North	Alberton Yarram	1	4	<2	<2	0
Dumbalk	Dumbalk	1	4	<2	<2	0
Fish Creek	Fish Creek	1	4	<2	<2	0
Foster	Foster	1	4	<2	<2	0
Lance Creek	Cape Paterson Inverloch Korumburra Lance Creek Loch Nyora Poowong Wonthaggi	1	4	<2	4	0
Leongatha	Leongatha Koonwarra	1	4	2	4	0
Meeniyan	Meeniyan	1	4	<2	<2	0
Toora	Port Franklin Port Welshpool Toora	1	4	<2	<2	0

Iron

Iron is present in source waters due to dissolution of soil and rock. High iron concentrations in drinking water can occur through rusting of iron pipes and fittings. Based on aesthetic considerations, the ADWG specify that the concentration of iron should not exceed 0.3 mg/L. Water supplied by South Gippsland Water complied with the guideline value for iron; refer to Table 29.

Table 29: Iron results for 2021-22

Water sampling locality	Frequency of sampling (samples per quarter)	Total number of samples	Minimum result mg/L	Maximum result mg/L	Number of samples where guideline was not met
Alberton	1	4	<0.01	<0.01	0
Cape Paterson	1	4	<0.01	<0.01	0
Dumbalk	1	4	0.02	0.02	0
Fish Creek	1	4	0.02	0.04	0
Foster	1	4	<0.01	<0.01	0
Inverloch	1	4	0.01	0.01	0
Koonwarra	1	4	<0.01	<0.01	0
Korumburra	1	4	<0.01	<0.01	0
Lance Creek	1	4	<0.01	<0.01	0
Leongatha	1	4	<0.01	<0.01	0
Loch	1	4	0.02	0.03	0
Meeniyan	1	4	0.02	0.03	0
Nyora	1	4	<0.01	<0.01	0
Poowong	1	4	0.02	0.03	0
Port Franklin	1	4	<0.01	<0.01	0
Port Welshpool	1	4	<0.01	<0.01	0
Toora	1	4	<0.01	<0.01	0
Wonthaggi	1	4	<0.01	<0.01	0
Yarram	1	4	<0.01	0.05	0

Alkalinity

Alkalinity is defined as the quantitative capacity of an aqueous solution to neutralise an acid. In simpler terms, it is a measure of how easily the pH of water can be changed. Alkalinity is mainly determined by the levels of carbonate, bicarbonate and hydroxyl anions (negatively-charged ions) present. The property of alkalinity has a strong influence on what is referred to as water stability, which is the tendency of water to be corrosive, stable, or scale-forming on contact with surfaces.

Water stability is complex and influenced by a number of factors, but in general soft water of low pH and low alkalinity will tend to corrode surfaces. Highly corrosive (aggressive) water is not desirable in that it can lead to the leaching of copper and other metals from pipes and plumbing fittings.

In contrast, hard water of high pH and high alkalinity will tend to deposit calcium carbonate (form scale) on pipes, plumbing fittings and hot water systems. While encrustation of pipes and fittings is not desirable, a thin layer of calcium carbonate can be beneficial in that it provides protection against corrosion in conditions of changing water stability.

There are no specific standards for alkalinity in drinking water but as this property provides resistance against changes in pH that can lead to either corrosion or excessive encrustation, a reasonable level should be maintained in drinking water supplies. What is reasonable for a particular type of water will depend upon its other characteristics of pH and hardness, but a value in the range of 50 to 200 mg/L $CaCO_3$ (refer to note below for definition of unit) is generally considered optimal. Results of alkalinity monitoring are provided in Table 30.

*Explanatory note on units used to express both alkalinity and hardness properties

Calcium carbonate equivalent (mg/L CaCO3) is the value obtained when taking into account the distinct characteristics in relation to reactivity (ability to combine) of various salts, such that the overall effect is the same as that produced by the expressed concentration of calcium carbonate. Use of this expression allows for a convenient method of comparison in chemistry. As both alkalinity and hardness are aggregate properties created by the combined effects of different salts, the calcium carbonate equivalent unit is used in each case. This does not mean, however, that alkalinity and hardness are the same property. Alkalinity is chemically defined as the sum of all titratable bases in a solution, whereas hardness is the sum of all polyvalent cation (ions having more than one positive charge) concentrations in a solution. With respect to a solution made purely from the compound calcium carbonate, therefore, the property of alkalinity is due to the component carbonate anion (a base), while the property of hardness is due to the component calcium cation.

Table 30: Alkalinity results for 2021-22

Water treatment plant / system	Localities supplied	Minimum sampling frequency (samples per quarter)	Total number of samples	Minimum result (mg/L as $CaCO_3$) *	Average result (mg/L as $CaCO_3$) *	Maximum result (mg/L as CaCO3) *
Devon North	Alberton Yarram	1	4	16	20	26
Dumbalk	Dumbalk	1	4	41	67	97
Fish Creek	Fish Creek	1	4	31	37	44
Foster	Foster	1	4	40	44	47
Lance Creek	Cape Paterson Inverloch Korumburra Lance Creek Loch Nyora Poowong Wonthaggi	1	4	62	69	80
Leongatha	Leongatha Koonwarra	1	4	39	46	53
Meeniyan	Meeniyan	1	4	42	53	65
Toora	Port Franklin Post Welshpool Toora	1	4	35	44	50

**refer to explanatory note in text on previous page*

Hardness

Hardness is a measure of the concentration of calcium and magnesium ions in water. To minimise undesirable build-up of scale in hot water systems, the ADWG specifies that total hardness (as calcium carbonate) in drinking water should not exceed 200 mg/L. Water supplied by South Gippsland Water complied with the guideline value for hardness; refer to Table 31.

Table 31: Total Hardness in calcium carbonate (CaCO3) equivalents for 2021-22*

Water treatment plant / system	Localities supplied	Sampling frequency (samples per quarter)	Total number of samples	Minimum result (mg/L as $CaCO_3$) *	Average result (mg/L as $CaCO_3$) *	Maximum result (mg/L as $CaCO_3$) *	Number of samples where guideline was not met
Devon North	Alberton Yarram	1	4	18	23	27	0
Dumbalk	Dumbalk	1	4	48	87	130	0
Fish Creek	Fish Creek	1	4	18	26	36	0
Foster	Foster	1	4	25	35	43	0
Lance Creek	Cape Paterson Inverloch Korumburra Lance Creek Loch Nyora Poowong Wonthaggi	1	4	58	67	81	0
Leongatha	Leongatha Koonwarra	1	4	43	52	59	0
Meeniyan	Meeniyan	1	4	55	74	95	0
Toora	Pt Franklin Pt Welshpool Toora	1	4	21	31	40	0

**Refer to explanatory note on units in alkalinity section on previous pages.*

pH

The property of pH relates to the hydrogen ion concentration of water. pH is measured on a logarithmic scale from 0 to 14. A pH of 7 is neutral, a pH greater than 7 is alkaline, and a pH less than 7 is acidic.

To reduce corrosion and encrustation in pipes and fittings, the ADWG specifies that the pH of drinking water should be between 6.5 and 8.5. The ADWG also states that new concrete tanks and cement-mortar lined pipes can significantly increase pH and a value up to 9.2 may be tolerated, provided monitoring indicates no deterioration in microbiological quality. The reference to microbiological quality is made in the ADWG because the disinfecting power of chlorine in chlorinated systems is greatest at lower pH and gradually declines as pH increases. Significant impairment of chlorine disinfection occurs above pH 8.0. The results for pH in chlorinated systems are provided in Table 32.

All but two chlorinated localities complied with the aesthetic guideline range of 6.5 to 8.5 One sample from Alberton and one from Port Franklin each recorded a pH above this range but within the upper tolerance limit of 9.2 due to cement-mortar lined mains and low water usage in these localities. Mains flushing was carried out to remove aged water from the system in response. There were no indicators of microbiological deterioration in relation to the elevated pH.

The chemistry (and the effect of pH) for chloramination disinfection differs from that of chlorination. A higher pH is beneficial in a chloraminated system as it slows the natural decay of monochloramine and prevents the formation of dichloramine and trichloramine, which can cause unpleasant tastes and odours.

The pH results for chloraminated localities is provided in Table 33. All localities complied with the aesthetic guideline for pH.

Table 32: pH results for chlorinated system in 2021-22

Water sampling locality	Minimum frequency of sampling (samples per week)	Total number of samples	Minimum result pH	Mean result pH	Maximum result pH	Number of samples not compliant with aesthetic guideline
Alberton	1	52	7.7	8.3	9.0	0
Dumbalk	1	52	7.7	8.1	8.4	0
Fish Creek	1	52	6.3	7.9	8.2	0
Foster	1	52	7.4	7.7	8.0	0
Koonwarra	1	52	7.5	7.7	7.9	0
Leongatha	2	104	7.3	7.6	8.0	0
Meeniyan	1	52	7.2	7.7	8.0	0
Port Franklin	1	52	7.6	8.3	9.2	0
Port Welshpool	1	52	7.2	7.7	8.2	0
Toora	1	52	7.3	7.6	8.1	0

Table 33: pH results for chloraminated localities in 2021-22

Water sampling locality	Minimum frequency of sampling (samples per week)	Total number of samples	Minimum result pH	Mean result pH	Maximum result pH	Number of samples not compliant with aesthetic guideline
Cape Paterson	1	52	7.6	7.9	8.4	0
Inverloch	2	118	7.7	8.0	8.4	0
Korumburra	2	62	7.8	8.0	8.6	0
Lance Creek	1	52	6.9	7.9	8.4	0
Loch	1	63	7.7	8.1	8.3	0
Nyora	1	64	7.8	8.0	8.6	0
Poowong	1	52	7.6	8.0	8.6	0
Wonthaggi	2	105	7.5	8.0	8.4	0

Analysis of results

Comparison of results for Schedule 2 parameters over three years

A comparison of compliance with water quality standards specified in Schedule 2 of the Safe Drinking Water Regulations 2015 in the 2021-22 period with that of the previous two fiscal years is presented in Figure 2. Consistent compliance across all South Gippsland Water water sampling localities is illustrated and in measure with the water quality standards listed for *Escherichia coli* and turbidity. A single exceedance of the drinking water quality standard for trihalomethanes in Fish Creek reduced the percentage of compliant localities to 94.7 for the 2021-22 period. Refer to section 3 for details.

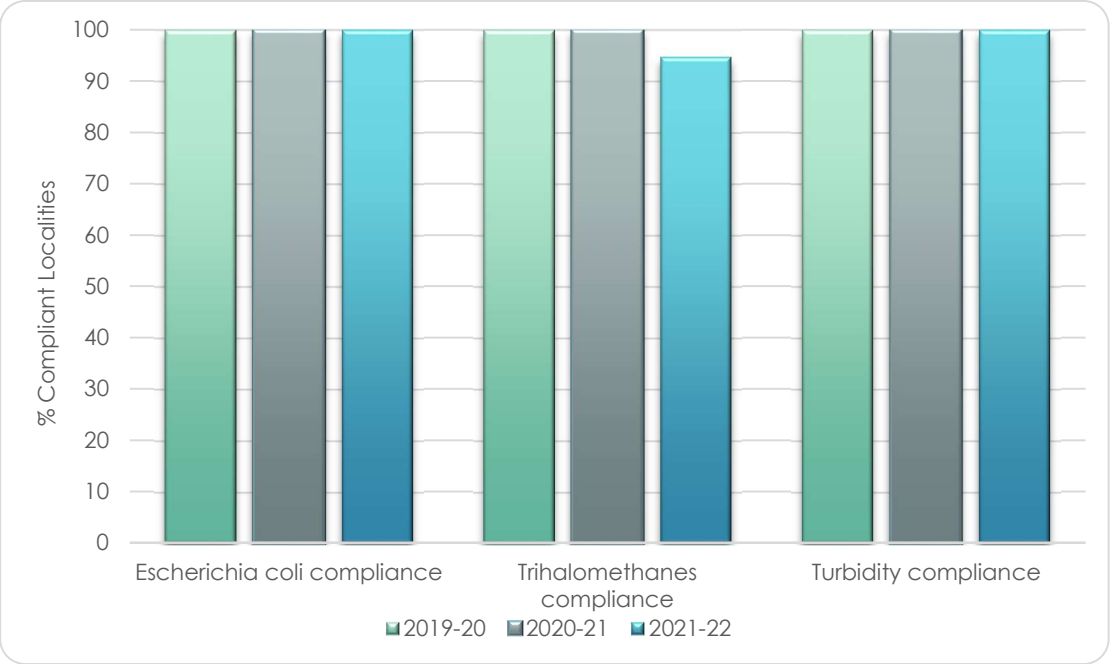

Figure 2: Percentage of localities where the drinking water complied with the water quality standards for Escherichia coli, trihalomethanes and turbidity

Comparison of results for other water quality parameters over three years

A comparison of results for the 2021-22 reporting period and the previous two fiscal years for water quality parameters other than those listed in Schedule 2 of the Safe Drinking Water Regulations 2015 is presented in Table 33. The comparison is based on percentage compliance with the guideline values of the Australian Drinking Water Guidelines 2011.

Table 34: Percentage of samples compliant with health-related guidelines from the ADWG

Water Quality Parameter	Percentage of samples compliant with health-related guidelines from the *Australian Drinking Water Guidelines 2011*		
	2019-20	2020-21	2021-22
Arsenic	100 %	100 %	100 %
Aluminium	100 %	100 %	100 %
Chlorine	100 %	100 %	100 %
Copper	100 %	100 %	100 %
Cyanogen chloride	100 %	100 %	100 %
Iron	100 %	100 %	100 %
Lead	100 %	100 %	100 %
Manganese	100 %	100 %	100 %
Nitrate	100 %	100 %	100 %
Nitrite	100 %	100 %	100 %
NDMA	100 %	100 %	100 %
Antimony	100 %	100 %	100 %
Barium	100 %	100 %	100 %
Beryllium	100 %	100 %	100 %
Boron	100 %	100 %	100 %
Cadmium	100 %	100 %	100 %
Chloroacetic acid	100 %	100 %	100 %
Chromium	100 %	100 %	100 %
Cyanide	100 %	100 %	100 %
Dichloroacetic acid	100 %	100 %	100 %
Mercury	100 %	100 %	100 %
Molybdenum	100 %	100 %	100 %
Nickel	100 %	100 %	100 %
Selenium	100 %	100 %	100 %
Silver	100 %	100 %	100 %
Sulphate	100 %	100 %	100 %
Trichloroacetic acid	100 %	100 %	100 %
Zinc	100 %	100 %	100 %
1,2-dichloroethane	100 %	100 %	100 %
2,4,5-T	100 %	100 %	100 %
2,4,6-trichlorphenol	100 %	100 %	100 %
2,4-D	100 %	100 %	100 %
Atrazine	100 %	100 %	100 %
Benzene	100 %	100 %	100 %
Benzo(a)pyrene	100 %	100 %	100 %
Carbon tetrachloride	100 %	100 %	100 %
Clopyralid	100 %	100 %	100 %
Dicamba	100 %	100 %	100 %
Glyphosate	100 %	100 %	100 %
MCPA	100 %	100 %	100 %
Metsulfuron methyl	100 %	100 %	100 %
Pentachlorphenol	100 %	100 %	100 %
Picloram	100 %	100 %	100 %
Simazine	100 %	100 %	100 %
Tetrachloroethene	100 %	100 %	100 %
Triclopyr	100 %	100 %	100 %
Gross Alpha Activity *	Not monitored	Not monitored	100%
Gross Beta Activity*	Not monitored	Not monitored	100%

***** Radionuclides are monitored every 5 years.

5. Complaints Relating to Water Quality for 2021-22

South Gippsland Water records and attends to all complaints relating to drinking water quality to ensure the highest level of customer satisfaction. Table 35 displays the five complaint types and the number of complaints received for each type over the 2021-22 year. Determination of the number of complaints per 100 customers supplied is based on the number of complaints compared with the total number of connected properties. Complaints are broken down into complaint type per locality and supply system in Table 36. A comparison of the number complaints with that of the previous three reporting periods is provided in Table 37.

Table 35: Customer complaints for 2021-22

Type of complaint	Number of complaints	Number of complaints per 100 customers (connected properties) supplied
Colour/'Dirty water'	28	0.12
Taste and/or odour	11	0.05
Air in water	3	0.01
Suspected illness & health concerns	4	0.02
Other	5	0.02
Total complaints	51	0.22

Table 36: Customer complaints per complaint type and locality for 2021-22

Water treatment plant / supply system	Water sampling locality	Complaint category					Total complaints per locality	Total complaints per supply system
		Colour /Dirty Water	Taste and/or odour	Air in water	Suspect-ed illness & health concerns	Other		
Devon North	Alberton	10	2	0	0	0	12	**17**
	Yarram	4	0	1	0	0	5	
Dumbalk	Dumbalk	0	0	0	0	0	0	**0**
Fish Creek	Fish Creek	0	0	0	0	0	0	**0**
Foster	Foster	1	0	0	0	0	1	**1**
Lance Creek (southern towns)	Cape Paterson	0	0	0	2	0	2	**19**
	Inverloch	4	2	0	1	2	9	
	Lance Creek	0	0	0	0	0	0	
	Wonthaggi	1	0	0	0	1	2	
Lance Creek (northern towns)	Korumburra	1	1	2	0	0	4	
	Loch	0	0	0	0	0	0	
	Nyora	0	0	0	0	0	0	
	Poowong	1	0	0	0	1	2	
Leongatha	Koonwarra	1	0	0	0	0	1	**7**
	Leongatha	1	3	0	1	1	6	
Meeniyan	Meeniyan	0	0	0	0	0	0	**0**
Toora	Port Franklin	1	1	0	0	0	2	**7**
	Port Welshpool	2	0	0	0	0	2	
	Toora	1	2	0	0	0	3	
Total complaints per category		**28**	**11**	**3**	**4**	**5**	**51**	**51**

Table 37: Complaints comparison of 2021-22 with the previous three reporting periods

Type of complaint	Number of Complaints				Comparison with previous reporting period	Comments
	2018-19	2019-20	2020-21	**2021-22**		
Colour/'Dirty water'	41	27	50	**28**	Moderately significant decrease	Relatively high number for 2020-21 can be attributed to a large water main break in Inverloch in Oct 2020. Lower numbers for 2021-22 reflect an absence of majorly disruptive water main breaks for the year.
Taste/odour	32	20	17	**11**	Slight decrease	Sustained decline in complaints over the 3-year period from 2019 can be largely attributed to improved ability to mitigate the effects of algal blooms in Lance Creek Reservoir. This includes use of supplemental supply from Melbourne water grid, and improved treatment technologies. Water network cleaning programs have also contributed to low complaint level for 2021-22.
Air in Water	9	14	4	**3**	No significant change	Complaints have followed water mains break repair. The decline in complaints since 2019-20 may be attributed to suspension of reticulation air-scour cleaning programs in relation to the on-going Covid-19 pandemic.
Suspected illness & health concerns	2	1	1	**4**	Slight increase	Category includes general queries re water quality and health concerns. No evidence provided or found that supplied drinking water was cause.
Other	3	8	9	**5**	Slight decrease	Complaints include problems with aquatic animal pets, corrosion of internal household plumbing or appliances, general concerns about the use of chlorine, etc.
Total	87	70	81	**51**	Moderately significant decrease	See above comments and "Management of complaints" discussion on following pages.

Management of complaints

Colour / "Dirty Water"

Colour / "Dirty Water" complaints relate to problems with the clarity of water. Tap water that contains sediments or particles and is coloured yellow, brown or blackish hues may be reported as "dirty water" by the customer. The particles and colour are produced by manganese and other mineral oxides rather than what might commonly be referred to as "dirt" (i.e. soil, mud, sewerage), but the overall effect is that water appears dirty and is unacceptable to the customer. Complaints in this category include reports of stained laundry items which may result from oxidation of minerals in contact with laundry detergents in a washing machine.

Coloured or "dirty" water complaints primarily result from:

- High manganese levels in source waters. The soil in the South Gippsland region is naturally high in manganese, and run-off into reservoirs and rivers is unavoidable. Not all manganese can be removed during the water treatment process so accumulation in the distribution system can occur;
- Accumulation of sediment within clear water storages and water mains over time; and/or
- Unintended scouring of water mains following high flows or recharging of the system.

Corrective actions to address dirty/discoloured water include:

- Use of aeration and potassium permanganate dosing systems at water treatment plants to oxidise manganese and maximise physical removal through filtration;
- Cleaning of clear water storage tanks and basins
- Implementation of scheduled air-scouring and flushing programs within all water sampling localities to remove manganese and other accumulated sediments;
- Additional flushing when required in response to individual complaints, and increased frequency of flushing regimes for problem areas.
- Provision of a commercial cleaning product which removes discolouration marks from laundry items in response to individual customer complaints.

There were 28 complaints received in relation to coloured water in the 2021-22 reporting period. The return to a level comparable to the 2019-20 period (see Table 35) can be attributed to an absence of majorly disruptive water main breaks. One such break in Inverloch caused the increase in complaints for the 2020-21 reporting period; Refer to SGW's 2020-21 Annual Drinking Water Quality Report for further details.

Taste and odour

What is considered acceptable in terms of the flavour and smell of water has some level of individual subjectivity. Some customers, for example, may object to the taste and odour of chlorine, while others receiving water with the same chlorine concentration do not. This could be because the objecting customers sense the chlorine taste and odour more acutely than others, or because they perceive chlorine as something they do not want to drink. While tastes and odours in drinking water do not generally denote that water is

unsafe, South Gippsland Water endeavours to minimise unpleasant flavours as much as possible. This is important not only for the customer's satisfaction and enjoyment but also so that they will choose supplied tap water over other potentially less-safe or healthful forms of hydration (e.g. from a poorly-managed tank water system, or from sugary soft drinks) or options having adverse environmental impacts (i.e., purchased bottled water).

Taste and odour complaints result primarily from:

- Cyanobacterial (blue-green algal) compounds in the water;
- Manganese and/or iron sediment in the water;
- Changes in pH, dissolved oxygen, and other factors in relation to ageing of water within a water main due to low flows.
- Chlorine in water.

Corrective actions to prevent or address taste and odour issues include:

- Routine monitoring of supplied water for taste and odour, manganese, iron, turbidity, pH and chlorine;
- Analysis for taste and odour related parameters (as above) when required in response to individual complaints;
- Use of powdered activated carbon (PAC) at treatment plants to remove algae-related and other taste and odour compounds from water;
- Use of aeration and potassium permanganate dosing systems at water treatment plants to oxidise manganese and maximise removal from source waters.
- Water main flushing and air-scouring programs
- Use of supplementary supply where available (i.e., Melbourne water for Lance Creek system)

There were 11 complaints relating to taste and odour issues received from customers in 2021-22. From a historical perspective, this can be considered a good outcome. The observed decline in taste and odour complaints in the past three years (refer to Table 35) can be largely attributed to the connection of the Lance Creek system to the Melbourne water supply grid. The ability to supply the system with 100 per cent Melbourne water has allowed the Lance Creek Reservoir to be taken completely offline when affected by cyanobacterial blooms. The capacity to blend Melbourne and Lance Creek waters has also enabled dilution of cyanobacterial taste and odour compounds in the reservoir to levels acceptable to customers.

Air in water

Air in water complaints are mostly received following mains breaks or the implementation of air-scour mains cleaning programs. While notification is given to residents prior to air-scouring, customers may become concerned at the 'milky' appearance of water. Customers are advised that the white colour of the water is due to the presence of tiny air-bubbles and that flushing through a tap for a few minutes should correct the problem. If the problem cannot be resolved by the customer, mains flushing is carried out.

There were three complaints involving air in water from South Gippsland Water customers in the 2021-22 reporting period. These followed mains break repairs.

Suspected illness and health concerns

Customers may make a complaint if they suspect supplied tap water is the cause of illness or other conditions, such as skin/eye irritation and problems with hair. In general, a customer will call to seek reassurance with regards to water quality rather than alleging that the water is the cause of their health problem. Customers with health concerns are encouraged to consult a medical professional for diagnosis and treatment. Depending on the nature of the complaint, additional monitoring to verify quality of drinking water supplied to the customer's residence and through the domestic plumbing system may be carried out. Details of the complaint and results of both monitoring and diagnostic testing (if provided) are recorded via an Illness Complaint Record Form. In the unlikely event of supplied drinking water being found to be a causative factor of illness, the Department of Health would be immediately notified. Further actions, which might include issuing of a boil water advisory, would be implemented as a matter of the highest priority.

There were four complaints recorded in this category for 2021-22. Two were (unrelated) queries relating to gastrointestinal illness, one was for eye irritation, and the other related to a problem with hair condition. The customers were exploring possible causes of their symptoms. Investigation of these separate issues found no evidence of water quality problems.

Other complaints

Other complaints relate to concerns that are beyond the control and responsibility of South Gippsland Water, such as problems with aquarium fish or garden plants, and issues with domestic plumbing or appliances. In response to such complaints, results of monitoring programs that may be relevant are reviewed, and additional investigation and sampling is carried out where appropriate. Customers are informed of the likelihood of supplied water being the cause of the problem and given advice on where to seek additional assistance if required. There were five calls in this category for 2021-22

6. Findings of the Most Recent Risk Management Plan Audit

Under section 7 of the Safe Drinking Water Act 2003 (the Act), a water supplier is required to prepare, implement, and review a risk management plan for the supply of drinking water to the public. The plan must be audited by an approved external auditor periodically as directed by the Department of Health. An audit was not required to be conducted in the 2021-22 reporting period. Details of the audit conducted in the 2020-21 period can be found in SGW's 2020-21 Annual Drinking Water Quality Report. A summary of that audit is provided in this report as Appendix 2: Progress summary for 2020 Risk management plan audit.

7. Regulated Water

Regulation 16 of the Safe Drinking Water Regulations 2015 requires that details of regulated water supplied be included in this annual report. Regulated water is defined as "water that is not intended for drinking but could reasonably be mistaken as drinking water" as declared by the Minister under section 6 of the Safe Drinking Water Act. South Gippsland Water did not supply any regulated water in the 2021-22 period.

Appendices

Appendix 1: South Gippsland Water's Drinking Water Quality Policy

Drinking Water Quality Policy

"Committed to high-quality drinking water"

South Gippsland Water is committed to providing safe, high-quality drinking water that consistently meets accepted standards, guidelines, regulatory requirements, and customer expectations. To achieve this, in partnerships with stakeholders and relevant agencies, the Corporation will:

- Manage water quality at all points along the delivery chain from source water to consumer;
- Use a risk-based approach to identify and manage potential threats to water quality;
- Continually assess the quality of drinking water through appropriate monitoring programs and effective reporting systems;
- Develop appropriate contingency planning and incident response capability;
- Integrate into our planning the needs and expectations of customers, stakeholders, regulators, and employees;
- Continually improve our management systems by assessing performance against industry best practice, corporate commitments, and stakeholder expectations;
- Participate in appropriate research and development activities to ensure continued understanding of drinking water quality issues and performance;
- Contribute to the debate on setting industry regulations and guidelines, and other standards relevant to public health and the water cycle.

The Corporation will implement and maintain a drinking water quality management system consistent with the NHMRC, NRMMC *Australian Drinking Water Guidelines* to* effectively manage risks to drinking water quality.

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

This Drinking Water Quality Policy is proudly displayed at South Gippsland Water facilities and is communicated to all persons working for or on the Corporation's behalf during induction or contract proceedings. The Policy is available to the public upon request or via the South Gippsland Water website. Contact details are: –

South Gippsland Water
14-18 Pioneer Street
PO Box 102
Foster, Victoria 3960
(03) 5682 0444

or: sgwater@sgwater.com.au

Appendix 2: Progress summary for 2020 Risk management plan audit

Item	Opportunity for improvement (OFI)	To be implemented	Target completion date	Status as of September 2022	Comments
1.	Consideration could be given to the possible value of roofing of the (Leongatha) WTP infrastructure to improve ease of maintenance and asset life and reduce slime formation.	To be determined	Sep 2022 (consideration)	Started	Will be considered for 2023 pricing plan (draft plan is due for submission September 2022).
2.	SGW could consider means to keep analytical instrumentation reagents and standards within their appropriate operating temperature range and seek to minimise variations in that temperature.	Not applicable	Not applicable	Complete	Brick analyser shed at Lance Creek WTP is already installed. OFI is based on a misunderstanding during the audit. Operator was speaking of issues with operating temperatures previous to construction of shed.
3.	SGW may wish to keep track of emerging issues relating to microbial pathogens and disinfection by-products given its continuing use of floating covers rather than conventional tanks.	Yes	On-going	Complete	SGW will keep abreast of emerging issues via on-going review of relevant publications and attendance at seminars, etc. Monitoring of basins is already in place.
4.	SGW could more clearly label some of its sampling points to help reduce the risk of misunderstanding when samples are collected.	Yes	Dec 2022	In progress	An audit of existing signage has been conducted. Additional signage will be installed where required
5.	Where parts and fittings are being stored, SGW could consider providing sufficient space under cover to protect parts and fittings from potential UV degradation	Yes	Jul 2023	Started	Intended works added to Interim Facilities project.
6.	SGW could consider adding some clear signage on the temporary potable water tanker	Yes	Dec 2021	Complete	Signage on temporary water trailers complete.
7.	SGW could consider some formal resilience planning to provide safe water for systems that do not have a backup water supply feed to protect the supply of safe water in the event of untreatable source water contamination or treatment system failure (e.g. Leongatha that is a large system with limited contingency).	Yes	On-going	Complete	Resilience planning included in SGW's Urban Water Strategy (UWS). The UWS is a 50-year strategy for water and waste-water services that recognizes the variables and future impacts of climate change and growth. The UWS process completed and report produced April 2022. Contingency (clear water storages and bypasses) planning and work is on-going.

Glossary of acronyms and terms used in report

ADWG	*Australian Drinking Water Guidelines* 2011; published by the National Health and Medical Research Council
CWS	Clear water storage: A tank or basin that contains and protects water that is safe to drink
Coliforms	A general term for certain types of rod-shaped bacteria that share identifying characteristics.
Cyanobacteria	Photosynthetic aquatic bacteria commonly referred to as 'blue-green algae' (though not actually algae).
DWMS	Drinking Water Management System
'the department'	Department of Health (State Government of Victoria)
E. coli	*Escherichia coli*: thermotolerant bacteria used as an indicator of faecal contamination
HACCP	Hazard Analysis and Critical Control Point
HBT	Health based targets: measurable health, water quality or performance objectives that are established based on a judgement of safety and on risk assessments of waterborne hazards
<	'Less than' (mathematical term)
>	'Greater than' (mathematical term)
L	Litre: a unit of volume (equal to 1000 cubic centimetres)
mg/L	Milligrams per litre: a unit of concentration (one milligram is equal to 0.001 grams)
ML	Megalitres: a unit of volume (one megalitre is equal to one million litres)
NATA	National Association of Testing Authorities
ng/L	Nanograms per Litre: a unit of concentration (one ng is equal to 0.000000001 grams)
NHMRC	National Health and Medical Research Council
OFI	Acronym for "opportunity for improvement" as noted in audit reports
Orgs/100 mL	Organisms/per 100 millilitres of water: a unit of measurement used in microbiology
Pathogen	Disease-causing microorganism (bacteria, viruses, protozoa or fungi)
PAC	Powdered activated carbon
PLC	Programmable logic controller: a digital computer used for automation of electromechanical processes
Potable water	Water that is safe to drink
PVC-EIA	Polyvinyl chloride – Ethylene interpolymer alloy: Geomembrane material for linings and coverings
Quarter	Time period referring to one quarter of a year, *i.e.* three months.
Raw water	Untreated source water (from a river, creek or reservoir) that is yet to be rendered
RMP	Risk Management Plan
'the Act'	*Safe Drinking Water Act 2003*
'the Regulations'	Safe Drinking Water Regulations 2015
SGW	South Gippsland Water (South Gippsland Region Water Corporation, 'the Corporation')
Turbidity	A measure of the cloudiness of water due to suspended solids

Glossary of water treatment agents and processes

Aluminium chlorohydrate	Aluminium salt used as a coagulant in water treatment
Aluminium sulphate	Aluminium salt used as a coagulant in water treatment
Chloramine	A compound of chlorine and ammonia used for disinfection
Chlorine	An element used as a disinfectant in water treatment. May be applied in gaseous, elemental form, or via aqueous solution of sodium hypochlorite.
Coagulation	A chemical water treatment process that involves neutralisation of charge on particles (impurities) in water. This destabilisation of charge allows for particles to clump together rather than repel each other electrostatically.
Dewatering of wastewater	Method of post water treatment water conservation. Removes excess water from sludge so it can be returned to a reservoir and reused.
Disinfection	Use of chemical, other agent (e.g. ultraviolet light) or process to kill or inactivate microorganisms which may be harmful to human health.
Dissolved air floatation (DAF) clarification	Water treatment process involving use of pressurised air for clarification. Microscopic air bubbles attach to floc and cause floc to float and make a sludge layer. This allows for separation of impurities (as floc) from water.
Filtration	Final water treatment process prior to disinfection; clarified water passes through large filters where impurities are entrapped.
Flocculation	A physical water treatment process that causes clumps formed through coagulation processes to come together into larger masses known as floc. Formation of floc allows for purification of water via sedimentation and filtration processes.
Fluoridation	Addition of fluoride to water for public dental health purposes.
Granular medium	Layers of sand, gravel and crushed anthracite that make up a water treatment plant filter.
Hydrochloric acid	An acid used to lower the pH of water which enables optimisation of coagulation processes
Manganese oxidation	Water treatment process important for minimising dirty/discoloured water complaints. Oxidation of dissolved manganese in raw (source) water causes it to precipitate out of solution as a solid. This is in turn allows for the solid oxidised manganese particles to be removed via coagulation, flocculation and filtration processes.
Manganese sequestration	Process that may be used to mitigate post treatment manganese oxidation and resulting discolouration of water. Manganese that has not been removed in treatment may oxidise on contact with chlorine disinfectants or air. Sequestration (or chelation) causes manganese to form soluble complexes that do not cause discolouration of water.
pH correction (pre/post treatment)	Raw water pH can vary due to environmental factors. Pre pH correction is needed to optimise treatment processes. Post pH treatment may be required to ensure pH is suitable for disinfection, and for distribution to customers in terms of aesthetics and water stability.
Polyacrylamide	Chemical polymer which may be used to facilitate flocculation or dewatering processes. Acts by binding particles/floc together.
Potassium permanganate	Compound used to oxidise manganese
Powdered activated carbon (PAC)	Primarily used to adsorb taste and odour compounds produced by algae from raw water
Sedimentation clarification	A physical water treatment process using gravity to remove suspended solids from water
Sodium hydroxide	Base used to raise the pH of water and optimise coagulation pH levels.
Ultraviolet disinfection	Use of ultraviolet light to kill/inactivate water-borne microorganisms that may be harmful to human health.