Annual report on drinking water quality in Victoria 2021–22

A risk-based preventive management approach to safeguard drinking water

VICTORIA State Government | Department of Health

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Acknowledgement of Aboriginal Victoria

The department proudly acknowledges Victoria's Aboriginal communities, their rich culture and their ongoing strength in practising the world's oldest living culture. We pay our respects to Elders past and present.

We acknowledge Aboriginal people as Australia's First Peoples, and as the Traditional Owners, and custodians of the lands and waterways on which we rely.

We recognise and value the ongoing contribution of Aboriginal people and communities to Victorian life and how this enriches us.

We embrace the spirit of Truth and Treaty, working towards equality of outcomes, for a better shared future and realisation of self-determination.

Secretary's foreword

The *Victorian public health and wellbeing plan 2019–2023* sets the department's vision for *'all Victorians enjoying the highest attainable standards of health, wellbeing and participation at every age'*. This vision is underpinned by Victorian legislation designed to protect the population from hazards to health, including the *Safe Drinking Water Act 2003* (the Act).

Water is essential to sustaining life. Contamination of drinking water is a known vehicle for transmitting disease and can lead to serious health complications. Ensuring access to safe drinking water for Victorians is a core public health function. Our guiding principle for drinking water quality is that preventing detrimental impacts to water quality must be a primary focus. Such an approach requires understanding water supply systems from catchment to consumer.

Our drinking water quality is intrinsically connected to the health of our environment. A One Health approach recognises these interdependencies of humans and the environment, including animals, and supports a unified approach for preventing public health challenges at this interface. The One Health concept is directly relevant to managing drinking water quality and is supported by Victoria's cross-sector policy and regulatory approach. To ensure the safety of our drinking water my department collaborates with, the Department of Health, Department of Energy, Environment and Climate Action, the Environment Protection Authority and other government agencies as appropriate. These partnerships assist us to develop policies and interventions that span the human-environment interface. Such collaborations will continue to develop as we build a more cohesive and proactive approach to managing the impacts of climate change, pollutants, emerging zoonotic disease, emerging contaminants of concerns and the spread of antimicrobial resistance. This approach enables us to better prevent, predict, detect and respond to complex multi-dimensional public health threats where drinking water acts as a conduit.

This past year our 23 water agencies performed well against the drinking water quality standards with eight notifications of water that did not meet a drinking water quality standard under the Safe Drinking Water Regulations 2015 compared with 13 notifications made in 2020–21. All water sampling localities met the turbidity water quality standard for the fifth consecutive year.

There was a drop in reports of known or suspected contamination made to the department, with 43 reported incidents in 2021–22 compared with 63 in 2020-21. Of these incidents three triggered drinking water advisories. However, eight of these incidents and one follow-up case from 2020–21 have been detailed in this report to provide a platform of shared lessons of how incidents can be avoided or minimised through solution-focussed collaborations aimed at minimising the health risks and their impact on Victorians.

Last year I reported that an audit of water agency risk management plans identified several water agencies with minor non-compliances with obligations imposed by the Act. Three of these water agencies have self-reported the completion of actions to become compliant, while the remaining water agency has taken steps to address the non-compliance. Further to this, all 23 water agencies have reported progress in implementing actions to address opportunities for improvement that were identified as part of the audit process.

We are continuing to strengthen our sector engagement, this is key to driving our shared goal of protecting our community from any drinking water hazards. In this regard, the scope of the Safe Drinking Water Inter-agency Strategic Group was established this year, along with a framework to progress strategic priorities. This group will bring the sector together to drive continuous practice improvement and to better prepare us for a changing water quality risk profile.

Importantly, I would like to acknowledge the ongoing dedication of all those involved in delivering safe drinking water to our taps. This is not an easy task, particularly in the face of dynamic environmental challenges, and this work must be commended.

Professor Euan M Wallace AM
Secretary
Department of Health

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Introduction

The *Safe Drinking Water Act 2003* (the Act) and Safe Drinking Water Regulations 2015 (the Regulations) provide Victorian water agencies and the Department of Health (the department) with a framework to ensure safe drinking water is supplied for the health and wellbeing of Victorian communities.

Section 32 of the Act requires that the Secretary of the department provides the Minister for Health with an annual report that details a state-wide perspective of drinking water quality, along with details of the Secretary's activities under the Act, no later than 28 February each year.

Section 26 of the Act requires Victoria's 23 water agencies[1,2] to prepare and submit annual reports on issues relating to the quality of drinking water and regulated water to the Secretary no later than 31 October each year. Water agencies' annual reports help provide a state-wide perspective of drinking water quality.

The Regulations and the department's *Guidance: Water quality annual report*[3] outline the information water agencies need to include in their annual reports. Where applicable, water agencies provide the following information in their annual reports:

- actions taken in respect of each emergency, incident or event that has affected water quality
- written undertakings that have been accepted by the Secretary
- the findings of the most recent risk management plan audit and any issues raised by the approved auditor
- a summary of disinfection or treatment processes, including a list of all chemicals and other substances used to disinfect and treat the water
- information evidencing compliance or non-compliance with specific sections of the Regulations and actions taken
- analysis of water sample information, data and results
- a summary of variations in aesthetic standards and exemptions from a water quality standard
- a summary of complaints, responses and analysis
- details of any regulated water supplied.

In-depth information on the performance of each water agency is provided in their annual reports, which are available on their respective websites (refer to Appendix 1 for water agency contact details).

This annual report summarises Victoria's drinking water quality performance and the department's activities during the 2021–22 reporting period. The report recognises the ongoing efforts made by water agencies in delivering high-quality drinking water to Victorians and the department's regulatory role in achieving this outcome, along with protecting public health.

1 There are 20 water suppliers and four water storage managers, one being both a water supplier and water storage manager.
2 As of 1 July 2021, there are 23 water agencies following the amalgamation of City West Water Corporation and Western Region Water Corporation to form the Greater Western Water Corporation.
3 *Guidance: Water quality annual report,* June 2017

A risk-based preventive management approach to safeguard drinking water

In Victoria about 95% of the population have access to reticulated drinking water that is subject to drinking water standards and regulation. Safe drinking water means consumers are protected from waterborne health risks spanning water consumption over the course of a lifetime. In the path of water from the catchment to the consumer there are many possible sources of contamination that must be proactively managed to avoid detrimental impacts to public health.

Building a One Health approach for drinking water quality management provides a broad multidisciplinary system wide approach for public health protection linked to the human-environmental (including animal) elements. This is paralleled with a risk-based preventive management approach to deliver safe drinking water at the ground level. The risk-based approach is recognised as international best practice and aims to foster proactive identification, control and monitoring of risks to the water supply. This approach also supports flexibility to tailor prevention strategies to local circumstances and enables resources to be allocated to high priority water quality risks to public health.

Water agencies have a responsibility, by law, to apply a risk-based approach to protect public health across the entire system from catchment to consumer. As part of this, water agencies are accountable for maintaining a risk management plan that includes appropriate risk identification, assessment and management (including development and implementation of preventive strategies) to safeguard drinking water; prevent contamination and facilitate proactive planning and preparedness in incident management. Following risk management plan audits completed in 2019–21, water agencies have been implementing recommended opportunities for improvement. Addressing these gaps in risk management and prevention strategies will strengthen our first-line barrier to contamination and bolster response preparedness.

The value of a risk-based approach to managing water quality is reflected in the incidents summarised in the 'Emergency preparedness and incident management' section of this report, which show that many of the incidents described were predictable and preventable through targeted risk management strategies. These incidents highlight that further work on proactive management of environmental hazards, routine inspection, system maintenance and asset repair or replacement are important elements of prevention. Such work needs to consider the potential future impacts of climate change and the influence environmental factors can have on operational performance. It is a requirement under the Act that water agencies keep their risk management plans under continuous review, with a view to updating and improving them.

As the regulator, the department is working to improve its audit process to strengthen the risk-based preventive management approach that water agencies adopt. The department is also responsible for monitoring water agencies' compliance with drinking water standards and for investigating notifications of exceedances with water quality standards and reports of known or suspected contamination. In responding to such incidents,

the department works with water agencies to adopt a risk-based approach to assess the potential risk to public health and to ensure the mitigation strategies implemented by water agencies are appropriate. Water agencies are expected to develop a reinstatement plan outlining the corrective actions and water quality verification monitoring required to safely restore the drinking water supply. Following an incident, the department works with water agencies to understand the causal factors and measures being implemented by water agencies to prevent a reoccurrence. In 2021–22 there were 43 incidents reported to the department. Although this is a drop from 63 in the previous year, it is expected that year on year variability will occur, impacted by the degree of external influences such as climatic events.

As part of the risk-based approach to safe drinking water, this also requires Victoria's water quality management practices to be evidence-based and contemporary. Research and development projects are a key driver for harnessing advances in science and technology that can be translated into practice, to build system resilience, and deliver on public health priorities related to water quality. As such, the department re-invests a portion of revenue derived from the safe drinking water administration levy into research projects co-ordinated by Water Research Australia. The outcomes and benefits realised from investment in research are essential for effective risk management, system monitoring, preparedness and responsiveness. In 2021–22 the department committed to contribute funds to three new research projects. These projects aim to deliver a risk management framework and guidance on response for bloom events of known toxin-producing waterborne pathogens (such as cyanobacteria); collaborative initiatives to mitigate antimicrobial resistance; and a benchmark for technical competency in water industry operations.

We continue to work collaboratively with our industry partners to identify and predict future hazards that may pose a risk to the drinking water supply, and to ensure vigilant assessment and review of the safety and acceptability of Victoria's drinking water. This report provides transparency about the quality of Victoria's drinking water, contaminants that have been identified and how incidents have been managed to prevent re-occurrence. This is to support Victorian consumers and the community to have confidence in the quality of Victoria's drinking water.

Overview of performance and achievements in 2021–22

Ensuring compliance with water quality standards is integral to maintaining community confidence in drinking water supplies and protecting the public from hazards in water. Through administration of the Act and the Regulations, the department regulates the Victorian water agencies and assists them with their legislative and regulatory obligations.

In 2021–22 the department continued to work with water agencies to maintain and improve the quality of drinking water supplied to Victorian communities. The department also continued to implement its *Better regulatory practice framework,* which encompasses a risk-based approach, collaboration with stakeholders and water agencies, and provides consistent regulatory oversight.

Key performance outcomes and achievements relating to the quality of drinking water supplied in this reporting period are summarised below.

- As of 30 June 2022, there were 476 water sampling localities across the state, remaining unchanged from last year.
- The overall performance against the drinking water quality standards are as follows:
  - 473 localities, representing 99.4%, continuously met all three Schedule 2 water quality standards (r. 12 (a)) in the Regulations compared with 98.1% in the previous year.
    - 99.6% of localities met the *Escherichia coli (E. coli)* standard compared with 98.1% in 2020–21.
    - 99.8% of localities met the total trihalomethane standard, which was the same as 2020–21.
    - 100% of localities met the turbidity water quality standard for the fifth consecutive year.
  - 468 localities (98.3%) continuously met all water quality standards in the Regulations compared with 465 localities (97.7%) in the previous year.
  - Eight notifications from six water suppliers were made under s. 18 of the Act regarding water that did not meet a drinking water quality standard under r. 12 of the Regulations. This is a decrease from 13 notifications made by 10 water suppliers in 2020–21.
- A total of 43 reports of known or suspected contamination were made under s. 22 of the Act, compared with 63 reports in 2020–21.
  - Three 'boil water' advisories were issued by three water agencies due to impact of storms, power back-up failure and ingress related to tank integrity. There were no 'do not drink' water advisories issued. By comparison, there were nine advisories issued in the 2020–21 reporting period (six 'boil water' and three 'do not drink').
  - Of the s. 22 reports of known or suspected contamination, there were 24 reports due to *E. coli* detections compared with 28 in 2020–21 and 27 in 2019–20. Following investigations by the water agencies, 21 of these reports did not result in a s. 18 notification because the samples were not representative of the water in the relevant water sampling locality (false-positive samples).

During 2019–21 risk management plan audits were completed. Minor non-compliances with s. 7(1) of the Act have been reported as resolved by three of the four affected water suppliers, with the remaining water supplier also having progressed action to rectify the non-compliance. Additionally, at the end of 2021–22, 111 of 132 identified opportunities for improvement, across the 23 water agencies, have been actioned.

Wannon Water commissioned its Camperdown water fluoridation plant, providing fluoridated drinking water to more than 5,000 residents of Camperdown, Lismore and Derrinallum, as well as customers connected to the Camperdown rural pipeline. This brings us to 88% of rural and regional Victorians accessing fluoridated drinking water. This is a small step closer to achieving our ambitious goal, set in the *Victorian action plan to prevent oral disease,* of achieving 95% of the rural and regional population accessing fluoridated water by 2030.

Victoria's safe drinking water regulatory framework

Victoria's drinking water is managed under a comprehensive regulatory framework that began on 1 July 2004. This framework aims to ensure a consistent and reliable supply of safe, good-quality drinking water for Victorians. The framework consists of the:

- *Safe Drinking Water Act 2003*
- Safe Drinking Water Regulations 2015.

The safe drinking water legislation requires:

- a proactive catchment-to-tap risk management approach by water agencies
- that water agencies meet drinking water quality standards
- that water agencies disclose information to the department and the public.

The framework is consistent with the risk management approach in the *Australian drinking water guidelines 2011* (ADWG; version 3.7 at January 2022) and supports the *Health (Fluoridation) Act 1973*.

Minister for Health

The *Safe Drinking Water Act* provides several functions and powers to the Minister for Health:

- declaring any water that is not drinking water to be regulated water
- approving an application by a water supplier to vary a drinking water aesthetic standard
- approving an application from a water supplier for an exemption from a drinking water quality standard
- imposing conditions in relation to drinking water variations or exemptions
- fixing a period for which an administration levy is payable by water agencies, apportioning the amount between the water agencies and ensuring payment is made into the Consolidated Fund
- ensuring an annual report on drinking water quality is provided to each House of the Parliament on or before the sixth sitting day of the House after the report has been received.

Department of Health

The Secretary of the department is the authority empowered to administer and enforce the Act. The functions of the Secretary under the Act include:

- protecting public health in relation to the supply of drinking water
- monitoring and enforcing compliance with the Act and the Regulations
- reporting on the performance of water agencies in relation to the requirements under the Act
- investigating and reporting on any aspect of drinking water quality in Victoria
- making recommendations to the Minister for Health on any matter relating to drinking water or regulated water
- promoting industry and public awareness and understanding of drinking water quality issues.

The Secretary also has the following specific authority under the Act:

- do all things necessary, including requiring a water agency to give specified information, to carry out the Secretary's functions under the Act
- accept an undertaking by a water agency relating to a contravention of the Act
- issue an enforcement notice to a water agency if it is contravening specific sections of the Act or is in breach of an undertaking
- establish and maintain a register of variations, exemptions and undertakings
- direct a water agency to give specified information and take specified corrective action if there is a risk to public health
- appoint a person to be an authorised officer and authorise them to assess and address immediate risks to public health relating to drinking water
- require water agencies to have their risk management plans audited and approve the auditor.

As required under the Act, this report is produced by the department and delivered by the Secretary to the Minister for Health no later than 28 February 2023.

Water Unit

The department's Water Unit administers Victoria's safe drinking water regulatory framework on behalf of the Secretary. The Water Unit has a regulatory role and activities include:

- reviewing and assessing the health significance of s. 18 notifications and s. 22 reports made by water agencies to the Secretary under the Act and ensuring water agencies implement appropriate corrective actions and mitigation measures to minimise re-occurrences
- discussing current and future regulatory issues with water agencies and following up on compliance actions
- visiting and inspecting water treatment plants
- reviewing water agencies' drinking water quality annual reports
- reviewing and processing proposals by water agencies to vary water sampling localities and declarations concerning regulated water
- providing guidance and advice to water agencies on the safe drinking water regulatory framework and drinking water quality issues and working with them to achieve compliance with the Act and the Regulations
- providing input into national drinking water guidelines and policy development
- raising awareness across government, industry and the community on public health protection and health promotion issues related to drinking water
- reviewing technical appraisals and audit reports for water fluoridation schemes and overseeing the operational efficacy of fluoridation plants to ensure reliability in terms of safety and desired oral health benefits
- contributing to research about emerging drinking water quality issues
- leading the Victorian Government's emergency response during emergencies related to contaminated drinking water supplies.

Water agencies

The Act requires water agencies to provide safe, good-quality drinking water. In 2021–22 there were 23 water agencies[4] regulated by the department, with the Act distinguishing between two types of water agencies: water storage manager and water supplier. The Act applies to all water agencies involved with water storage, water treatment and distribution of drinking water and regulated water. Appendix 1 provides a list of water agencies.

Water agencies, depending on whether they are a water storage manager or a water supplier, have a range of obligations under the Act including:

- preparing, implementing, continuously reviewing and revising a plan to manage risks in relation to drinking water and having the risk management plan audited
- ensuring the drinking water they supply meets drinking water quality standards specified by the Regulations
- notifying the Secretary if drinking water it is supplying does not comply with a water quality standard
- reporting to the Secretary any known or suspected contamination of drinking water
- providing an annual report related to the quality of drinking water and regulated water to the Secretary no later than 31 October each year.

4 As of 1 July 2021, there are 23 water agencies following the amalgamation of City West Water Corporation and Western Region Water Corporation to form the Greater Western Water Corporation.

Water storage managers

Water storage managers store and supply water to water suppliers (Figure 1).

There are four water storage managers: Melbourne Water supplies untreated and treated drinking water to water suppliers, while Goulburn-Murray Water, Southern Rural Water and Grampians Wimmera Mallee Water supply untreated water to water suppliers.

Grampians Wimmera Mallee Water operates as both a water storage manager and a water supplier.

Figure 1: Water storage managers

- Water storage manager head office location

* Grampians Wimmera Mallee Water is both a water supplier and water storage manager

Water suppliers

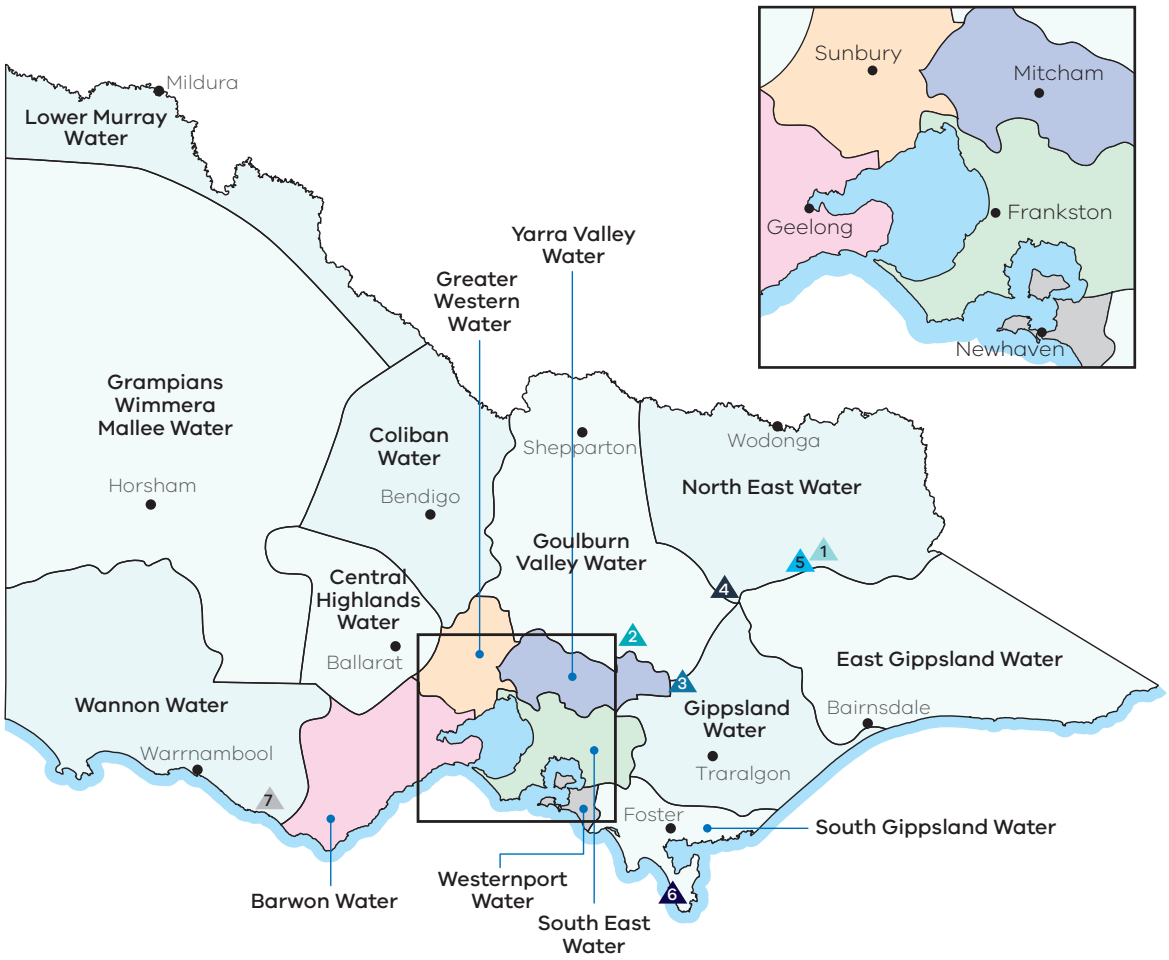
Most Victorians receive reticulated drinking water supplied by a water supplier. Each water supplier covers a discrete geographic area where drinking water supply areas are defined as water sampling localities under the Regulations (Figure 2).

In this reporting period there were 20 water suppliers in Victoria, all responsible for ensuring water meets drinking water quality standards. The three metropolitan water suppliers receive treated drinking water from Melbourne Water (water storage manager) and apply additional treatment (secondary chlorination). Eighteen water suppliers apply primary and secondary treatment to untreated water to ensure all customers receive safe drinking water.

Seven water suppliers also manage regulated water supplies (water that could be mistaken for drinking water. For example, untreated reticulated water for irrigation, stock use or non-drinking domestic uses). Specific provisions for managing the risks associated with these water supplies are included in the Act and the Regulations.

Greater Western Water came into operation from 1 July 2021, created from the merger of City West Water and Western Water. The merger will ensure continued reliable, efficient and affordable water services are maintained to meet the demands of customers and the community in the rapidly growing outer west region of Melbourne.

Figure 2: Water suppliers



- Water supplier head office location

1. Falls Creek Alpine Resort Management Board
2. Southern Alpine Resort Management Board (Lake Mountain)
3. Southern Alpine Resort Management Board (Mount Baw Baw)
4. Mount Buller and Mount Stirling Alpine Resort Management Board
5. Mount Hotham Alpine Resort Management Board
6. Parks Victoria (Tidal River)
7. Parks Victoria (Twelve Apostles)

Better regulation

The department is committed to contemporary regulatory practice and is actively involved in initiatives that aim to increase regulator efficiency and effectiveness, and to reduce the burden on regulated entities. These initiatives include participating in the Ministerial Statement of Expectations and the department's *Better regulatory practice framework*.

Ministerial Statement of Expectations

The Victorian Government developed the Statement of Expectations Framework for Regulators (Figure 3). This whole-of-government initiative requires each minister to establish clear expectations for regulator performance and improvement within their respective portfolios. This framework aims to promote greater efficiency and increase the effectiveness of administration and enforcement of regulation.

The previous Statement of Expectations Framework for Regulators was in effect until 30 June 2021, and the framework outlining new requirements for the Statement of Expectations is not due to commence until after this reporting period on 1 July 2022. Therefore, arrangements for the transition period in 2021–22, prior to the new framework taking effect, included:

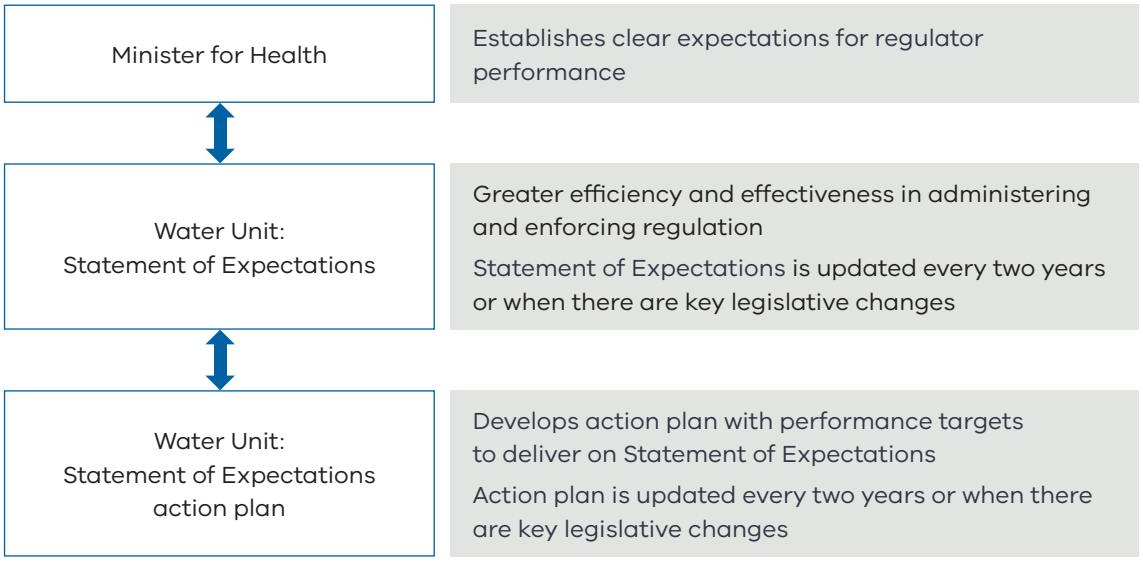
- self-evaluating the *Statement of Expectations 2019–21* to consider whether performance and governance objectives have been met; and
- continuing activities identified in the *Statement of Expectations 2019–21* (where they are not already completed) until 1 July 2022, when the new framework will take effect.

The Minister for Health issued the Water Unit with the *Statement of Expectations 2019–21*. The Statement of Expectations identified the following performance objectives and opportunities to drive continuous improvement in regulatory business processes and practices:

- compliance-related assistance and advice
- risk-based strategies
- stakeholder consultation and engagement
- timeliness
- transparency and accountability

The Water Unit responded to the Minister's *Statement of Expectations 2019–21* by committing to a *Statement of Expectations action plan* that clearly outlines actions and performance targets. The *Statement of Expectations 2019–21* and the *Statement of Expectations action plan* can be viewed on the department's website <https://www.dhhs.vic.gov.au/ministerial-statements-expectations-regulators>.

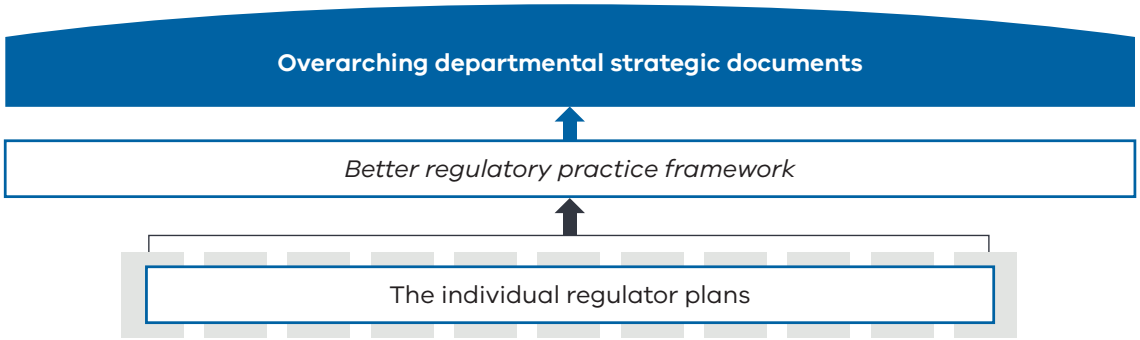
Figure 3: Statement of Expectations framework



Better regulatory practice framework

The department's *Better regulatory practice framework* provides clarity and consistency across the department's regulators (Figure 4). It provides a focus on regulatory outcomes, demonstrates a risk-based approach to regulation, and informs organisational improvements and stakeholder engagement activities.

Figure 4: Better regulatory practice framework



The *Better regulatory practice framework* ensures the Water Unit continuously improves its performance as a regulator. The framework has guided development of the *Water Unit regulator plan,* which outlines:

- the regulatory outcomes sought
- key regulatory risks to achieving the outcomes
- regulatory tools at the disposal of the Water Unit to influence compliance
- measurement of regulatory performance.

The Water Unit provides guidance to support water agencies to meet their legislative and regulatory outcomes to protect and improve the health of Victorian communities.

The *Better regulatory practice framework* and the *Water Unit regulator plan* can be viewed on the department's website <https://www.health.vic.gov.au/better-regulatory-practice-framework>.

Continuous improvement

Safe Drinking Water Inter-agency Strategic Group

Each water agency has an important role and responsibility for protecting, monitoring, and continuously improving the supply of safe drinking water to our communities. That all water agencies put public health and public value at the centre of their decision making.

The Inter-agency Strategic Group (IASG) was established in early 2021 to strengthen improvements to water quality and improve public confidence in drinking water. The IASG is a high-level non-statutory interagency group that operates under the chairship of the department's Deputy Secretary of Public Health with executive representation from water agencies and the Department of Energy, Environment and Climate Action.

The primary purpose of the IASG is to improve the protection and management of drinking water quality in Victoria through continuous improvement practices in the face of a changing risk profile. In doing so, the IASG aspires to reduce the occurrence of water quality incidents across the water sector through proactive improvement. It aims to collectively position water agencies to deliver water that consistently meets the requirements of the Act and the Regulations, and is safe and aesthetically pleasant to drink.

During the 2021–22 financial year, the IASG agreed on a process to progress strategic priorities and ratified the final terms of reference.

Drinking water advisories and protocols: draft guidance for issuing and rescinding drinking water advisories

Prevention is a key component of a risk-based approach to protect the public from contaminated drinking water. However, in recognition that prevention strategies are not infallible, mechanisms to support appropriate and rapid responses to a suspect or known contaminations are essential to reducing the potential public health harm arising from a drinking water contamination event. In such scenarios it is important for stakeholders to have a shared understanding of how to respond to each unique incident, for issuing and rescinding drinking water advisories. This facilitates rapid decision making and response processes.

To support this shared understanding, the department commissioned industry experts to develop the *Drinking water advisories and protocols: draft guidance for issuing and rescinding drinking water advisories*. This draft guidance document was issued to water agencies in December 2020. Since issuing the draft guidance, the department and water agencies have applied the criteria to respond to and manage drinking water contamination incidents, including those described for 2021–22 in the 'Emergency preparedness and incident management' section of this report. Application of the guidance has improved the communication about incidents, the efficiency of responses and provided a greater consistency of approach to drinking water advisories. The department will continue to encourage water agency practices to align with the *Drinking water advisories and protocols: draft guidance for issuing and rescinding drinking water advisories*.

Guidance for preparing drinking water quality annual reports

The department's *Guidance: Water quality annual report (June 2017)* is in the process of being revised. Updated guidance will assist the department to better capture water agency regulatory performance reporting. The revised guidance will also better support water agencies to meet their annual reporting requirements under the Act and the Regulations. Once finalised, the guidance will be published in the Government Gazette under s. 26(3) of the Act, which will require water suppliers or water storage managers to include specific details in their reports as required by this section.

Collaboration with the Essential Services Commission

The department has strengthened its relationship with the Essential Services Commission (ESC), working together to ensure water agencies provide their essential services effectively and efficiently as they strive to achieve the best outcomes for Victorian communities while meeting their regulatory obligations.

The department has collaborated with the ESC on the following:

- developing the *Department of Health guidance for the 2023 Water Price Review,* which was issued to water agencies on 13 October 2021
- reviewing water agencies' price submissions, particularly regarding water agencies meeting their regulatory obligations within the proposed revenue allowance
- drinking water contamination incidents and advisories including cause, preventive measures, customer impacts and regulatory obligations
- ESC water performance indicators for water agencies, which includes a verifiable number of non-compliance events and the scope of customer impact.

Water sector liaison

The Water Unit, in collaboration with water agencies, provides guidance and support to achieve regulatory outcomes to protect and improve the health of Victorian communities. A key aspect to this is designated liaison officers assigned to each water agency.

All parties have navigated ongoing challenges flowing on from the pandemic environment, to ensure communication with water agencies remained a priority and actively continued at all levels. This included continued regular liaison meetings between the department and water agencies to discuss regulatory compliance, and to provide guidance and support. Water agencies were also encouraged to regularly contact the department via their liaison officers to allow open and transparent discussions, especially for clarity on any regulatory issues. This resulted in some positive change, with more proactive engagement from both parties as they collaborated in providing safe drinking water and the protection of public health.

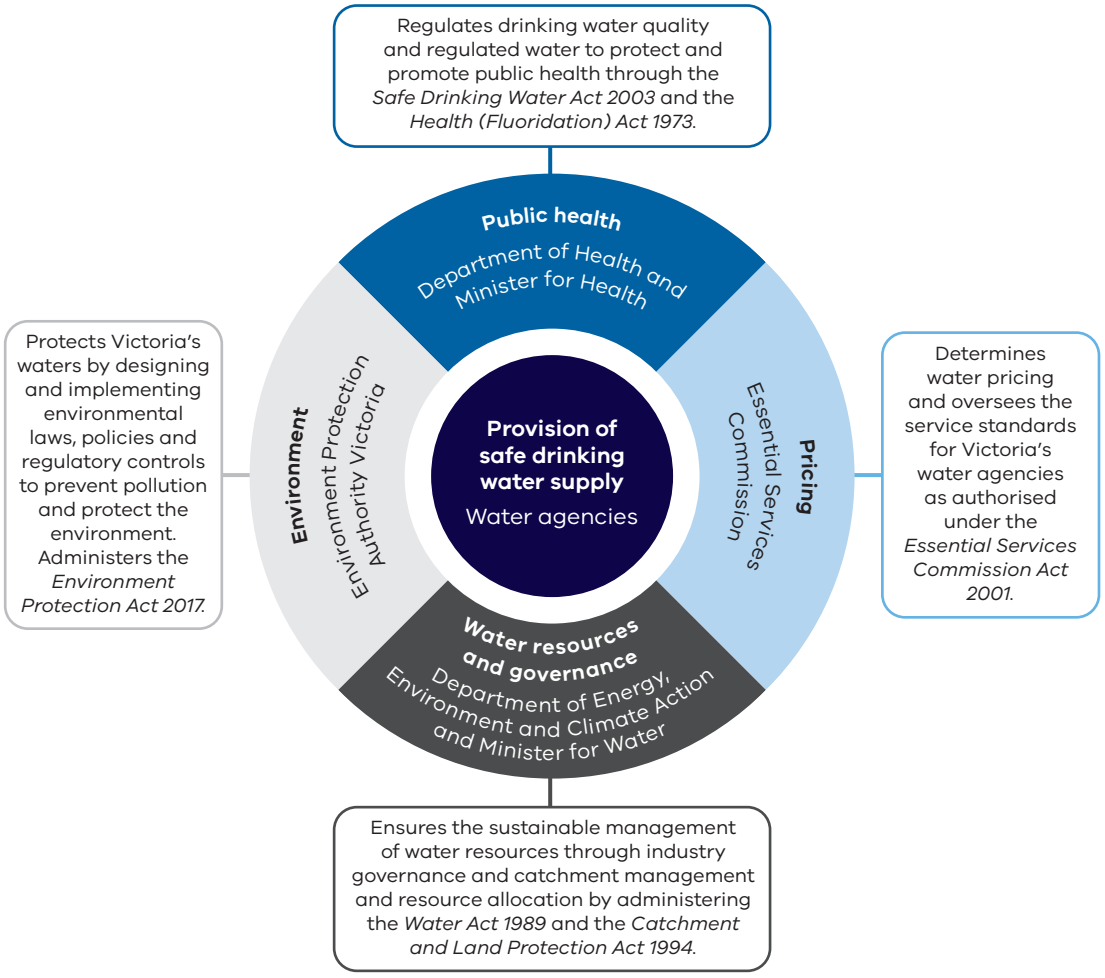
Water sector liaison is further enhanced through a whole-of-government approach including meetings with interdepartmental stakeholders and with other regulatory partners (Figure 5).

Whole-of-government approach to drinking water regulation

Four government agencies are involved in planning, managing, and regulating Victoria's water agencies. While each agency has a clearly defined regulatory role, there is significant interagency collaboration, as shown in Figure 5.

The department encourages a whole-of-government approach to safeguarding drinking water quantity and quality, including through source water protection. The health of the natural environment is paramount to providing safe drinking water and can be achieved through better catchment management strategies and maintaining controls to reduce and prevent contamination. This interagency collaboration ensures an integrated and collaborative approach in delivering safe drinking water for the health, safety, and prosperity of Victorian communities.

Figure 5: Victoria's drinking water regulatory system



Safe drinking water administration levy

In accordance with s. 51 of the Act, water agencies pay an administration levy to assist in covering the costs of administering the Act. The meaning of *costs of administering the Act* is detailed in s. 52 of the Act. The proportion of levy that each water agency pays is based on a methodology that the Minister for Health considers fair and has been through consultation with stakeholders as required under s. 53(d) of the Act.

For 2021–22 there was no change to the levy methodology. Key steps in its calculation were:

1. The department estimates its annual cost of administering the Act.
2. The rural water storage managers, Parks Victoria and Alpine Resort Management Boards are levied a flat rate of 0.15% of the department's annual cost estimate.
3. The balance of the department's annual cost estimate is apportioned to each of the state's water suppliers proportional to their number of customer connections previously approved by the minister.
4. The levy for the three metropolitan water suppliers is discounted by 25%, and this proportion is allocated to Melbourne Water, which supplies their treated drinking water.

On 1 July 2021, City West Water and Western Water merged to form Greater Western Water. Greater Western Water paid the combined administration levy for City West Water and Western Water.

Department expenditure associated with administering the Act

The administration levy for the 2021–22 financial year was $1,330,480. It was $1,310,817 in 2020–21. The levy is slightly higher due to a 1.5% increase for cost indexation based on the Department of Treasury and Finance's annual rate for 2021–22.

Table 1 shows the department's expenditure associated with administering the Act in this reporting period, along with a comparison with the previous two financial years.

Table 1: Department expenditure to administer the Safe Drinking Water Act, 2019–20 to 2021–22

Expenditure type	2019–20	2020–21	2021–22	Variance to prior year
Salaries, allowances and salary-related on-costs	$902,729	$979,112	$929,748	-$49,364
Indirect costs	$101,139	$99,478	$114,688	$15,210
Operating costs	$110,397	$169,132	$225,899	$56,767
Communication and education	$2,482	$0	$0	$0
Research and development	$43,000	$20,000	$60,500	$40,500
Information technology	$4,005	$7,608	$22,259	$14,651
Total expenditure	**$1,163,752**	**$1,275,330**	**$1,353,094**	**$77,764**

Salaries, allowances, salary-related on-costs and indirect costs

During the 2021–22 period, the department's salaries and related on-costs were marginally less than the previous period due to recruitment vacancies. Indirect costs (overheads, depreciation and amortisation) were similar to the previous year.

Operating costs

The operating costs were higher in this period due to much of the investigation by independent experts into the Silvan drinking water quality incident (detailed later in this report) being conducted within the financial period of 2021–22. This investigation has resulted in the total expenditure for 2021–22 exceeding the administration levy. The department endeavours to maintain a strong knowledge base through its memberships with Water Research Australia (WaterRA), the Water Services Association of Australia (the peak body of the Australian water industry), the Australian Water Association and the Water Information Sharing and Analysis Centre.

Such activities included under operating costs are: attendances at conferences; professional association memberships; and the costs associated with engaging contractors to conduct technical appraisals and audits on fluoridation plants, developing technical guidance to assist water agencies and undertaking investigations and risk assessments.

Communication and education costs

Section 27(f) of the Act gives the Secretary the function of promoting industry and public awareness and understanding of drinking water quality issues. This includes informing the community and the water sector about drinking water and public health. In this reporting period there were no costs attributed to communication and education activities due to resources being focused on responding to drinking water quality incidents.

Research and development costs

The department is committed to improving the information on managing risks to drinking water quality and ensuring evidence-based decision making to provide better outcomes for public health in Victoria.

WaterRA coordinates and manages a structured program of collaborative research to advance water quality, and to ensure the knowledge generated is transferred to industry. The department aims to ensure public health priorities are considered in the development and delivery of the research agenda.

The department provides financial and in-kind support for research and development opportunities that will enhance available information, improve knowledge and understanding of various topical issues, and inform regulatory decisions. Several projects to which the department previously contributed funds saw outcomes delivered in the previous reporting period, including:

- the publication of WaterRA's *Good practice guide to sanitary surveys and operational monitoring to support the assessment and management of drinking water catchments* (Project 1109)
- the development of the Emerging Chemicals Database for National Awareness (ECHIDNA) to make contaminants of emerging concern (CEC) information and risk prioritisation available to water professionals and assist them with management and decision making for CEC in various water systems (Project 1127).

The department, through WaterRA, supported the following new projects during this reporting period:

- characterising the drivers of cyanotoxin production to embed into a Cyanobacteria risk management framework – Project 1146 ($16,500 GST inclusive)
- the Cooperative Research Centre for Solving Antimicrobial Resistance in Agribusiness, Food and Environments (CRC SAAFE) – Project 3051 ($16,500 GST inclusive)
- the Value of Operator Competency, Phase 2 – Project 1139 ($16,500 GST inclusive).

There were also several research projects ongoing throughout 2021–22 to which the department had contributed financial support in previous financial years:

- significance of the environment as a reservoir of antimicrobial resistance – Project 3040
- understanding impacts of recreational access to drinking water catchments and storages in Australia – Project 1124
- assessing the economic impact of harmful and nuisance algal blooms to the Australian water industry – Project 1125
- understanding water quality risks under low and variable water level conditions – Project 1133
- Catchment health metrics – Project 1140 (with continued funding support in 2021–22, $11,000 GST inclusive)
- guidance for integration of gene testing in cyanobacterial management – Project 1141.

Characterising the drivers of cyanotoxin production to embed into a Cyanobacteria risk management framework (Project 1146)

The department contributed $15,000 in the current reporting period.

Several cyanobacteria species are well known for their potential to produce cyanotoxins. However, not all genotypes of known toxin-producing species produce cyanotoxins, and of these there is significant variation in the spatial and temporal dynamics of toxin production. The water industry currently relies on observational measurement of the presence of 'potentially toxic species', toxin gene and toxin presence to inform management of cyanobacteria blooms in water supply storages. Predictive tools and preventive management are limited by a lack of simple environmental predictors to predict toxin production events. Understanding the drivers for toxin production that inform risk management frameworks would be of great benefit to water supply managers and to inform alternate management options. These tools will enable better responses to bloom events and allow pre-emptive measures to be established to minimise cyanotoxin production by targeted manipulation of environmental drivers.

This project will serve to identify key cyanobacteria metabolic functions (organism-specific biochemical metabolism events/expressed pathways) and environmental covariates that identify when toxin production is 'switched on' in cyanobacteria species and strains that are known toxin producers and quantify their environmental drivers to improve decision frameworks. This will give the water sector:

- A better understanding of the environmental covariates that trigger toxin production.
- Enhanced risk management frameworks.
- Guidance on both source and treatment operational responses to the presence of known toxin producing cyanobacteria.
- The ability to explore potential alternative monitoring technology based on detecting biochemical lead signals of toxin production.
- Potential to modify or manage source environmental conditions to prevent toxin production.

The project has an expected duration of two years.

CRC SAAFE – the Cooperative Research Centre for Solving Antimicrobial Resistance in Agribusiness, Food and Environments (Project 3051)

The department contributed $15,000 in the current reporting period.

The department is participating in the 10-year program of work in the CRC SAAFE through the WaterRA-led Water Industry Consortium.

Antimicrobial resistance (AMR) is the ability of microorganisms to resist antibiotics, antifungals, and antivirals. AMR is one of the greatest health threats of the 21st century. It also presents a major challenge to agricultural industries, with significant impacts for biosecurity, productivity, food safety and quality, and market access. Through focused collaboration between researchers and industry, CRC SAAFE will lead the AMR response for the Australian water, waste, agribusiness, and food sectors, anticipating and addressing future challenges and capitalising on emerging opportunities.

The CRC establishment planning is now well underway. WaterRA facilitated the first workshop with the CRC team and the Western Australian partners in July 2021. The eastern states will be meeting in early September 2022. These workshops aim to introduce the CRC SAAFE project including its purpose, structure, and approach, as well as presenting the state of knowledge and mapping milestones against water sector and cross-sector priorities such as agriculture, viticulture and fisheries.

The Value of Operator Competency Phase 2 (Project 1139)

The department contributed $15,000 in the current reporting period.

This project proposes to bring industry and regulators together, to develop minimum standards that facilitate a more consistent approach towards technical competency and the implementation of learning and development programs for frontline water industry operations.

The project will:

- develop a nationally recognised technical competency benchmark that includes aligning training to roles and responsibilities and the water quality risks managed
- benchmark to include technical competencies from catchment to consumer consistent with the ADWG and Australian guidelines for water recycling approach
- benchmark to be sufficiently flexible so it can be implemented effectively regardless of location or size of the water utility, including remote communities
- integrate accredited training and certification into the guidance including minimum competency requirements.

The project has an expected duration of 12 months.

Significance of the environment as a reservoir of antimicrobial resistance (Project 3040)

The department made a financial contribution of $10,000 when the project began in 2018–19, with no further contributions made in the current reporting period.

This project is a collaboration between the water, environment, health and agriculture sectors that aims to investigate the diversity and abundance of pathogenic bacteria and AMR genes in Victorian environments, with a focus on agricultural effluents and run-off inputs. This project aims to answer the following questions:

- Is the environment a significant reservoir for AMR?
- Do animal industries contribute significant antibiotic-resistant bacteria and gene loads to adjacent waterways?
- What monitoring and enforcement targets may be useful for monitoring and surveillance?

In 2020–21 the study collected data and baseline information about the microbial communities and types and amounts of AMR genes in Victorian environments present in manure, as well as water and sediment from several rivers and waterbodies. This surveillance data will help guide (i) future sampling campaigns, (ii) antibiotic-resistant bacteria and gene monitoring investments, and (iii) analytical approaches. It embodies the One Health approach to AMR mitigation and management called for by the World Health Organization and represents an important step towards fulfilling Australia's first *National antimicrobial resistance strategy* (2015–2019).

This study provides further indication that the environment, humans and animals are intrinsically linked and underpins the importance of the need for multi-sector AMR stewardship and surveillance. It highlights that actions in one sector/area can potentially have impacts on the others.

This reporting period saw the completion of data collection assessing AMR genes in the environment. Project partners have been working closely to ensure results are adequately presented. The project advisory committee was provided with a two-page summary document in 2021.

An abstract, titled *Environmental antimicrobial resistance in rural Victoria,* was accepted to the 16th National Rural Health Conference in Perth (30 May to 1 June 2022) and was presented by EPA Victoria. The EPA also gave a presentation at the Testing the Waters Conference.

In addition to the conference presentation, researchers are currently working on a scientific journal paper and a short-form paper, incorporating new data on population density and other factors. The research will provide valuable information that will support the *Victorian antimicrobial resistance strategy* and provide a foundation for future research efforts proposed by the CRC-SAAFE. The research project and revised paper is expected to be completed in the first quarter of 2023.

Understanding impacts of recreational access to drinking water catchments and storages in Australia (Project 1124)

The project began in 2018–19, with the department contributing $20,000 in that year and another $18,000 in 2019–20. The department provided ongoing in-kind support to the project in this reporting period through reviewing key project reports.

Source water protection underpins the safety and affordability of drinking water supplies whereby prevention of contamination provides greater surety than removing contaminants. As part of the multiple barrier approach, the ADWG emphasises the protection of source waters to the maximum degree possible. Water agencies have been placed under increasing pressure to introduce or increase recreational access to drinking water catchments and water storages. There is a lack of consensus around recreational access approaches across Australia.

In recent years there has been a considerable change both in the demand for recreational access in drinking water catchments and storages across Australia, and in our understanding of drinking water risks (and risks to recreators) within catchments that have recreational access.

This project seeks the best available scientific, economic and risk management knowledge to inform current and future decision-making processes to support communication with recreational bodies, state/territory governments, influencers, lobbyists, regulators and their drinking water customers. This includes:

- focusing on the current state of play of recreational access around Australia
- documenting case studies and evidence-based information on risks associated with recreational activities
- case studies on treatment efficacy
- cost-benefit impact analysis
- lessons to date.

A tiered communication package delivering key messages to the general public, policymakers and industry partners will also be developed.

The last reporting period saw the completion of a cost-benefit review of recreation and source water protection in catchments. The cost-benefit review provides an industry-wide understanding of preventive risk management in drinking water supply systems. Future work will include developing a decision-making framework.

The researchers are currently working on collating the final report and peer reviewed chapters for inclusion.

Determining the cost of algal blooms to the Australian water industry (Project 1125)

The project began in 2018–19, with the department contributing $10,000. No other financial contributions were made in the current reporting period.

The prevalence and impact of harmful and nuisance algal blooms is a threat to the safety and security of drinking water supplies. In 2000 the Land and Water Resources Research and Development Corporation published a report, *Cost of algal blooms,* placing the cost to extractive users at approximately $95 million a year. In addition to standard escalation for inflation, this figure is likely to be significantly higher because the previous estimates did not account for the increased frequency and intensity of algal blooms as a consequence of climate change.

The project outcomes include completing a comprehensive assessment of the economic impact of harmful and nuisance algal blooms including cyanobacteria to the water industry. This assessment will provide an improved understanding on the economic risk posed by harmful and nuisance algal blooms, which in turn will provide an economic rationale for adopting control and/or treatment strategies.

A complete draft report was sent to all project partners for review in July 2022. Responses are expected by the end of August 2022. The report will be modified following receipt of project partner comments and the final report will be available before end of the 2022 calendar year.

Understanding water quality risks under low and variable water level conditions (Project 1133)

The department made a financial contribution of $20,000 when the project began in 2019–20, with no other contributions made in the current reporting period.

A continuing decline in rainfall and run-off in surface water catchments in many areas across Australia, including Victoria, has significant potential to impact on water quantity and quality. The impacts of declining reservoir levels are further compounded by factors such as increased water demands, intensification of recreation demands, and ensuring sufficient water levels to sustain ecosystem life supporting capacity in some cases.

Dams and reservoirs have long been recognised as important storage barriers that can assist in reducing water supply contamination hazards. These water supply assets also play a role in providing ecosystem services, which can effectively reduce levels of pathogens and other contaminants. The ecosystems services provided rely heavily on water levels. A reduction in water levels may see some of these services compromised.

Furthermore, there is potential for the water quality to be impacted by reduced and highly variable water levels. Reduced water quality can include increased algae blooms, elevated iron and manganese, and particulate (for example, inorganic sediment) and dissolved organic matter, including taste and odour-producing compounds. A change in water levels can also increase potential for short-circuiting of pathogens and other contaminants from inflows to dam and reservoir offtakes.

The previous reporting period saw the completion of a Bayesian network model of water quality impacts from low and variable reservoir levels. The model provides provide valuable knowledge to water agencies on how to better adapt and respond to a changing climate. Future work will include an expansion of data sources to make the model outputs more robust.

The project's final report and factsheet are now available on WaterRA's website <https://www.waterra.com.au/new-research-understanding-water-quality-risks-under-low-and-variable-levels-in-water-storages-2/>.

Catchment health metrics (Project 1140)

The department made a financial contribution of $10,000 to this project which began in 2020–21.

There is a lack of consensus on catchment health metrics within the water industry. Such a metric would provide decision-makers and regulators with a common language and an objective understanding of what is required to maintain and improve the health of any given catchment and improve the efficacy of catchment management initiatives. There is a need to value catchments as a natural asset. Healthy catchments are essential to protecting our water sources, thereby increasing water security and a catchment's overall resilience. A healthy catchment contributes to a region's economic health, enhances environmental protection and fosters thriving communities. A framework/tool is needed to quantify the benefits of investing in catchment management and thereby decreasing water treatment costs and improving water security.

This project aims to develop a catchment health metric tool that will provide catchment managers with the ability to have a live, continuous update of catchment health status. This is in contrast with updates every three years, as is currently the case. The project will provide an understanding of where the source water sits on the water safety continuum, and also provide the ability to undertake robust cost-benefit analysis and assess economic outcomes, measuring the cost-efficiencies of investment.

In addition to the tool, this project seeks to establish a common understanding and language for the analysis, review and acceptance of catchment management parameters, which would serve to increase acceptance of catchment management projects, increase efficiency of the investment process, allow for better benchmarking, and decrease cost to water utilities and other stakeholders.

This reporting period saw the completion of sponsorship and the hosting of an industry-wide workshop to develop the project needs. Requests for proposal went out in early 2022, and research proposals have now been received and are undergoing review.

Guidance for integration of gene testing in cyanobacterial management (Project 1141)

The department made a financial contribution of $10,000 when the project began in 2020–21, with no further contributions made in the current reporting period.

Cyanobacteria gene testing is used by some water utilities as a timely and efficient approach for cyanobacterial management. The gene testing is intended to determine the genetic potential of known toxin producers to produce toxins. However, the current guidelines only use speciation, counts and biovolume to determine the risk to consumers, recreational users and stock.

Some cyanobacteria species are well known for their potential to produce toxins. However, not all genotypes of known toxin-producing species produce toxins. Testing is available that detects and quantifies the presence of strains of cyanobacteria that have the potential to produce toxins. If these strains are present, then additional sampling and testing can be undertaken to confirm the presence of toxins in the water and appropriate management actions taken.

This project aims to develop guidelines (and a methodology) for including toxin gene testing in cyanobacteria management. This testing could improve the management of cyanobacteria blooms in water supplies by reducing the toxin risk and provide more accurate information of the toxin risks associated with cyanobacteria blooms.

The project is expected to be complete in 2023.

Information technology costs

In this reporting period the information technology costs were higher than the previous period. This variance is attributed to increased expenditure on IT equipment to support hybrid work arrangements due to the COVID-19 pandemic.

Drinking water quality performance and regulatory requirements in 2021–22

Water sampling localities

Water suppliers are required to collect samples of drinking water from water sampling localities that have been specified under r. 6 of the Regulations. A water sampling locality is a discrete geographical area where water samples collected are representative of the drinking water supplied to that area.

All locations supplied with drinking water must be within a water sampling locality boundary. This allows water suppliers to determine any issues with drinking water sources, treatment processes or distribution, and to identify customers receiving drinking water in the water sampling locality.

Water suppliers must submit sampling locality proposals to the Secretary to specify new drinking water distribution systems, including when regulated water supplies are to be upgraded to drinking water supplies. Proposals by water suppliers to vary and/or revoke existing water sampling localities may be required due to redefining of boundaries, merging or dividing current water sampling localities, or changes to supply arrangements.

With the merger of City West Water and Western Water to form Greater Western Water coming into effect on 1 July 2021, the department completed a review and gazettal in 2020–21 of a proposal to vary Greater Western Water's[5] water sampling localities by incorporating Western Water's 19 water sampling localities into City West Water trading as Greater Western Water (Table 2). This came into effect on 1 July 2021.

As of 30 June 2022, there were 476 water sampling localities across the state, remaining unchanged from the previous reporting period.

Table 2: Water sampling locality gazettal in 2021–22, effective 1 July 2021

Water agency	Water sampling localities affected by notice	Reason for Government Gazette notice	Government Gazette number	Date notice takes effect
Greater Western Water	Bulla, Darley, Diggers Rest, Eynesbury, Gisborne, Lancefield, Lerderderg, Macedon, Maddingley, Melton South, Merrimu, Mount Macedon, Myrniong, Riddells Creek, Rockbank, Romsey, Sunbury, Toolern Vale and Woodend	Substitution of the water supplier in Government Gazettes S 14 on 25 January 2007 and S 251 on 17 July 2009 from Western Water to City West Water (trading as Greater Western Water) was required for Western Water's 19 water sampling localities due to the merger of City West Water and Western Water to form Greater Western Water effective on 1 July 2021.	S 360, Thursday, 1 July 2021	1 July 2021

5 The gazette notice No. S 360 was published on Thursday 1 July 2021 and coincides to when the s. 88 determination under the *Water Act 1989* to abolish Western Water took effect.

Drinking water quality standards

Section 17 of the Act requires water suppliers to ensure all drinking water supplied complies with quality standards. The drinking water quality standards are specified under r. 12 of the Regulations, which states that drinking water supplied within a water sampling locality must not:

- exceed the standard set out in Schedule 2 of the Regulations (r. 12(a))
- contain any algal toxin, pathogen, substance or chemical, whether alone or in combination with another toxin, pathogen, substance or chemical, in such amounts that may pose a risk to human health (r. 12(b)).

Schedule 2 of the Regulations prescribes three parameters for which drinking water samples must be analysed, along with the required frequency of analysis and to meet the respective water quality standard (Table 3).

Table 3: Safe Drinking Water Regulations Schedule 2 drinking water quality standards

Parameter	Sampling frequency	Quality standard
E. coli	Weekly	No *E. coli* per 100 mL, with the exception of any false-positive sample
Total trihalomethanes	Monthly	≤ 0.25 mg/L
Turbidity	Weekly	The 95th percentile of results for samples in any 12-month period must be ≤ 5.0 Nephelometric Turbidity Units

For parameters not specified in Schedule 2 of the Regulations, the ADWG is the authoritative reference for health-based guideline values and is used to determine compliance with r. 12 (b) of the Regulations.

Section 18 notifications

In the Act, s. 18 refers to a notification required if non-complying water is supplied. Section 18 of the Act states 'A water supplier must notify the Secretary in writing if it becomes aware that the drinking water it is supplying to another person does not comply, or is not likely to comply, with any relevant water quality standard and must do so within 10 days after it becomes aware of that fact'. Notification under s. 18 ensures the department is aware of non-compliant drinking water and that the respective water agency implements corrective measures to mitigate any potential public health impacts and undertakes actions to prevent future recurrence.

In this reporting period, drinking water samples were collected from 476 water sampling localities around Victoria. The samples were tested for water quality parameters to determine compliance with water quality standards.

In 2021–22, six water suppliers submitted to the department a total of eight notifications about water that did not meet a standard under either r. 12(a) (compliance with Schedule 2 drinking water quality standards) or r. 12(b) (compliance with any other drinking water quality standards). This is a decrease compared with 2020–21 when 13 notifications were made to the department by 10 water suppliers.

Of the eight notifications in 2021–22, four were about non-compliance under r. 12(a) and four related to non-compliance with any other drinking water quality standards under r. 12(b) as outlined in the sections below. One locality, Parks Victoria at Tidal River, failed to meet a water quality standard on more than one occasion.

Appendix 2 lists all s. 18 notifications for the year.

Regulation 12(a): Compliance with Schedule 2 drinking water quality standards

To demonstrate compliance with r. 12(a), drinking water samples must be analysed for the parameters required under the Schedule 2 water quality standards of the Regulations as shown in Table 3 above.

Table 4 and Figure 6 are interlinked and refer to compliance with Schedule 2 drinking water quality standards. Table 4 represents the actual number of **water samples** that did not meet r. 12(a) drinking water quality standards, and Figure 6 illustrates the percentage of **water sampling localities** that complied with r. 12(a) drinking water quality standards.

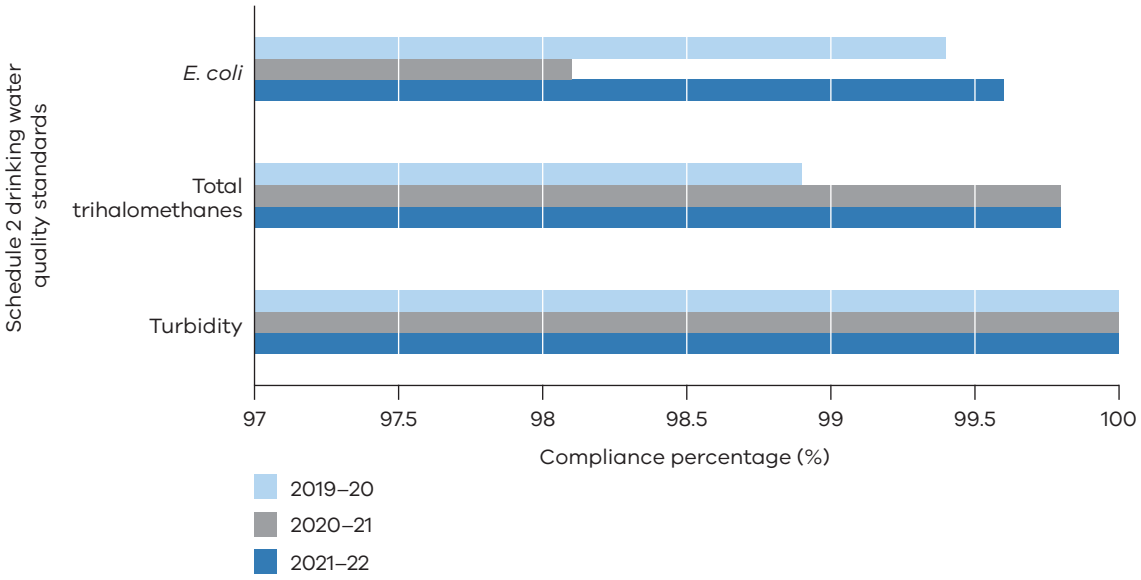
In this reporting period, there were four notifications by three water suppliers representing three water sampling localities that did not meet either the *E. coli* or trihalomethane parameter of the Schedule 2 drinking water quality standards, a reduction from 10 notifications from nine water suppliers in 2020–21. There was a three-fold reduction in the number of *E. coli* samples not meeting the drinking water quality standard, while the trihalomethane standard not being met on one occasion was the same as last year.

For the fifth consecutive reporting period, water suppliers were fully compliant with the water quality standard for turbidity.

Table 4: Water samples not meeting Schedule 2 drinking water quality standards, 2019–20 to 2021–22

Parameter	Water samples not meeting the quality standard		
	2019–20	2020–21	2021–22
E. coli	3	9	3
Total trihalomethanes	5	1	1
Turbidity	0	0	0
Total	**8**	**10**	**4**

Figure 6: Percentage of water sampling localities compliant with Schedule 2 drinking water quality standards, 2019–20 to 2021–22



Escherichia coli

E. coli is a microbial indicator of drinking water quality. Schedule 2 of the Regulations require that all drinking water samples collected are found to contain no *E. coli* per 100 mL of drinking water, with the exception of any false-positive samples. The detection of *E. coli* can signal microbial contamination and therefore any detection is immediately reported to the department under s. 22 of the Act.

When *E. coli* is detected in drinking water, an investigation is undertaken by the water supplier, in accordance with the department's *Guidelines for the investigation and reporting of E. coli detections,* to determine the cause, undertake corrective actions and implement procedures to prevent the issue from recurring. If the investigation concluded that the sample taken was representative of the drinking water supplied in the relevant water sampling locality, a notification is made to the department under s. 18 of the Act.

Two water agencies made *E. coli* notifications under s. 18 of the Act in 2021–22. Parks Victoria submitted two notifications for the Tidal River locality and Grampians Wimmera Mallee Water submitting one notification for the Donald locality.

These non-compliance notifications related to possible contamination at the sample tap, treatment failure due to a fault in equipment calibration and inability to provide NATA accredited laboratory results during an investigation due to the water samples getting lost in transit. However, these *E. coli* detections did not lead to any 'boil water' advisories.

Water agencies have been encouraged to establish strategies to ensure chlorine residual levels are kept at target operating ranges, and to sample from more than one sample point within the same locality every week to maintain confidence in the drinking water quality across the network, including in the extremities of the system. The department also emphasised the importance of following the Secretary's guidance for investigating and reporting on *E. coli* detections.

With the decrease in *E. coli* detections, there was an increase in the number of water sampling localities complying with the *E. coli* drinking water quality standard; 99.6% in 2021–22 compared with 98.1% in the previous year (Figure 6).

Total trihalomethanes

Total trihalomethanes are by-products of disinfection, formed when chlorine comes into contact with organic matter in water. Schedule 2 of the Regulations require drinking water to be tested for total trihalomethanes to ensure the result complies with the standard of less than or equal to 0.25 mg/L.

South Gippsland Water made one notification for exceeding total trihalomethanes at the Fish Creek water sampling locality in 2021–22 (Table 4). South Gippsland Water undertook an investigation which concluded that the exceedance was contributed to by a seasonal increase in trihalomethanes compounded by slow water turnover in the Fish Creek clear water storage basin and affected water main supplying the non-compliant sampling site.

Responsive action included flushing the affected main and revised chemical dosing. Follow-up testing confirmed restoration of compliant levels. To prevent recurrence, South Gippsland Water intends to complete additional monitoring in the high risk summer-autumn period.

All water agencies in Victoria are monitoring for total trihalomethanes as required by the Regulations, including those that only use ultraviolet (UV) disinfection for primary treatment.

The percentage of water sampling localities that complied with the total trihalomethanes standard remained the same as the previous year at 99.8% (Figure 6).

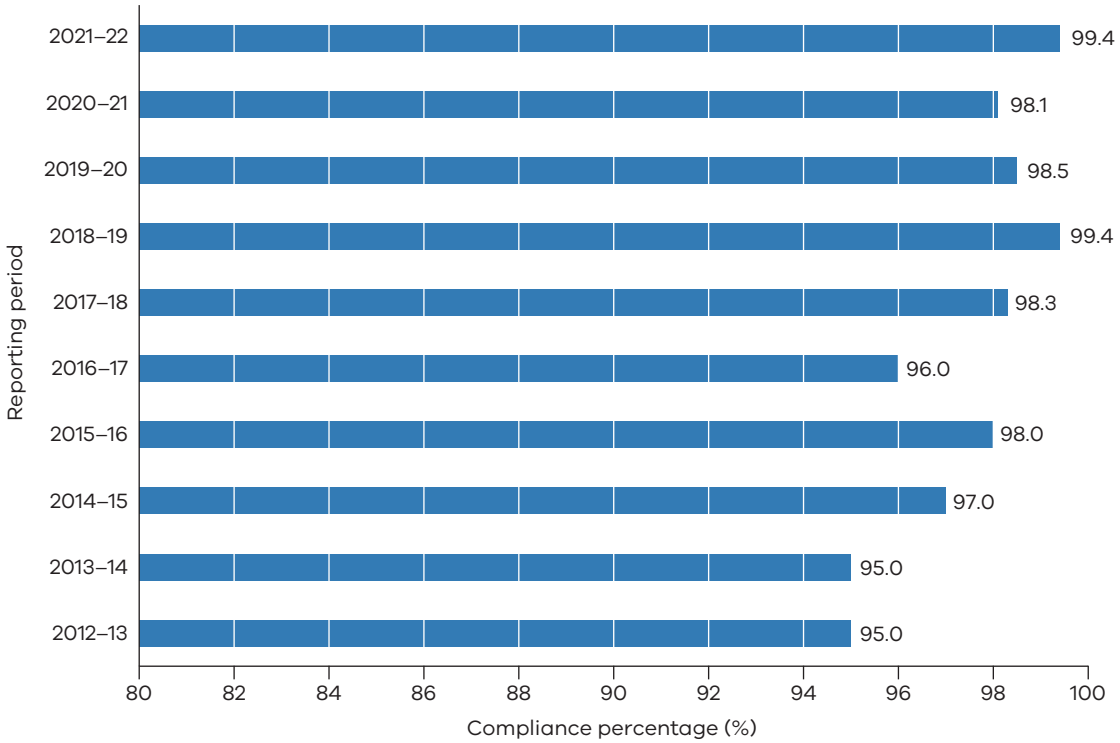
Turbidity

Turbidity is the cloudiness of water caused by the presence of fine, suspended matter in drinking water. Schedule 2 of the Regulations requires the 95th percentile of results for samples in any 12-month period to be less than or equal to 5.0 Nephelometric Turbidity Units. In the 2021–22 reporting period, all water agencies were 100% compliant with the turbidity water quality standard (Table 4 and Figure 6), a result that has been consistently achieved since 2017–18.

Performance summary of Schedule 2 parameters

Figure 7 presents the past 10 years of performance of water sampling localities continuously compliant with Schedule 2 parameters. During the reporting year, of the 476 sampling localities, 473 continuously met Schedule 2 drinking water quality standards, achieving an overall compliance of 99.4%. This represents a slight increase from the 98.1% of compliant localities in the 2020–21 reporting period.

Figure 7: Percentage of water sampling localities continuously compliant with Schedule 2 drinking water quality standards, 2012–13 to 2021–22



Regulation 12(b): Compliance with other drinking water quality standards

To demonstrate compliance with r. 12(b), and as part of their water sampling program, water suppliers use a risk-based approach to determine the water quality parameters, water sampling locations and frequency of testing in their risk management plans. Water suppliers and each water supply system face different risks depending on factors such as the condition of the water supply catchment, treatments applied and supply system arrangements. Water suppliers' water sampling programs are commensurate with this risk and tailored to each water sampling locality and supply system.

Three water suppliers notified the department of a total of four parameters that did not meet a water quality standard under r. 12(b) (compliance with any other drinking water quality standards).

As Table 5 shows, there was a minor increase, of one instance, in water samples not meeting other drinking water quality standards in 2021–22 compared with the previous reporting period.

Table 5: Water samples not meeting other drinking water quality standards, 2019–20 to 2021–22

	Water samples not meeting the quality standards		
Parameter	**2019–20**	**2020–21**	**2021–22**
Chlorine+	2	0	1
Bromate*	0	0	1
Chloral hydrate*	3	0	0
Dichloroacetic acid*	0	0	0
N-Nitrosodimethylamine*	2	1	0
Trichloroacetic acid*	0	1	0
Aluminium**	2	0	0
Lead	0	0	1
Manganese	0	1	1
Nickel	0	0	0
Total	**9**	**3**	**4**

\+ Refer below to s. 22 reports of known or suspected contamination, elevated disinfectants for discussion on the chlorine exceedance.

* Disinfection by-products

** Under the ADWG, no health-based guideline is set for aluminium at this time, but this issue will be kept under review.

However, in 2019–20, one water agency submitted two s. 18 notifications to the department.

Disinfection by-products

Production of safe drinking water and maintaining safety throughout the supply and reticulation system typically requires the addition of a disinfectant. Reactions of chlorine disinfectants with natural organic compounds in source waters can produce disinfection by-products. While long-term, high concentrations of disinfection by-products may increase risks to human health, short-term, low-level exceedances of the health guideline values do not present a risk to health. The ADWG states that:

> *Although the microbial quality of drinking water is of primary importance and must never be compromised, chlorine levels and the formation of chlorination by-products should be controlled to prevent any adverse health effects that may eventually be found to be attributable to disinfection by-products.*

While total trihalomethanes are addressed in the Schedule 2 standards, water agencies also sample for other disinfection by-products where relevant. In 2021–22 Central Highlands Water made one notification for the water sampling locality Clunes, which did not meet the standard for bromate (Table 5 and Appendix 2).

Metals

Metals may be present in drinking water for several reasons including:

- those naturally present in source waters and insufficient removal via treatment
- leaching from metal pipework and fittings
- their use in treatment processes (such as alum coagulant).

Central Highlands Water made one notification in which the Fishville/Glenmore water sampling locality did not meet the standard for lead. Gippsland Water made one notification in which the Mirboo North water sampling locality did not meet the standard for manganese (Table 5 and Appendix 2).

Variations of aesthetic standards

Section 19 of the Act allows the Minister for Health to vary aesthetic standards on application by a water supplier as it applies to drinking water supplied by the water supplier. During the year there were no applications by water suppliers to vary aesthetic standards.

Exemption from water quality standards

Section 20 of the Act allows the Minister for Health to exempt a water supplier from the obligation to comply with a drinking water quality standard for a specified period, provided that adequate measures are proposed to eliminate or minimise any risks to public health.

During the year there were no applications from water suppliers to be exempted from meeting a drinking water quality standard under the Regulations. There are no existing exemptions from meeting a water quality standard.

Section 22 reports of known or suspected contamination

Under s. 22 of the Act, an officer of a water supplier, water storage manager or council is required to immediately report to the Secretary if they believe, or suspect on reasonable grounds, that water supplied, or to be supplied, for drinking purposes either:

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

The requirement to report immediately to the department enables:

- rapid assessment of risk to determine if there may be or is a threat to public health
- timely response measures to prevent harm including issuing of a drinking water advisory to affected customers by the relevant water agency where necessary
- assurance to the department that the incident is being managed to protect public health
- water agencies to seek guidance from the department in managing incidents
- the department to identify trends or emerging issues that may not be adequately addressed in a water agency's risk management plan.

In the absence of immediate reporting to the department, there is a risk that the incident may lead to harm that could have been avoided or minimised. As such, there are penalties associated with a water agency not meeting the requirement of s. 22 of the Act to immediately report any known or suspected contamination to the department.

The department works with water agencies to ensure all relevant corrective actions are taken to reduce risks to acceptable levels and that preventive actions are implemented to minimise recurrence of the issue.

Understanding trends in s. 22 reports helps identify potential systemic issues or emerging threats to the supply of drinking water, enabling a strategic response.

In 2021–22 there were 43 reports made under s. 22 of the Act by 16 water agencies compared with 63 reports the previous year (Table 6), a decrease of approximately 32%, and 51 in the 2019–20 reporting period.

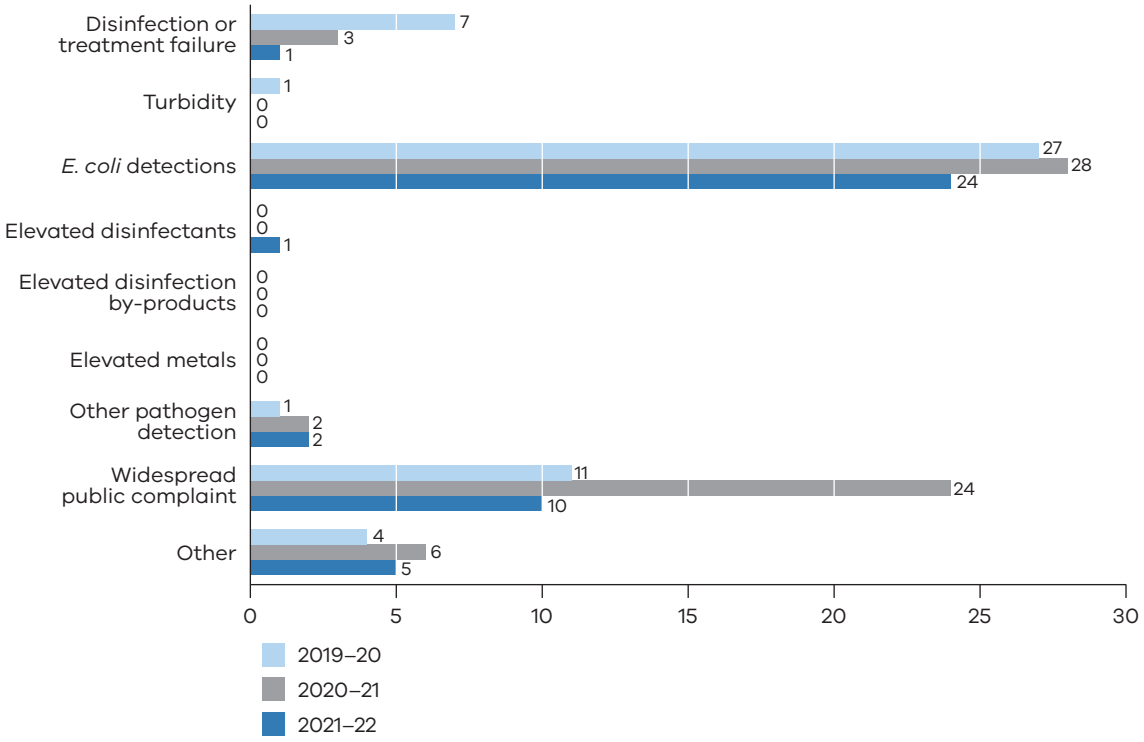
While some of the circumstances underpinning these events were due to extreme climatic conditions, many were preventable, indicating that water agencies need to improve their proactive management of foreseeable risks to their drinking water quality, rather than reacting when an incident occurs.

These reported issues are broadly grouped into various categories in Figure 8. *E. coli* detections and widespread public complaints dominated the primary cause for s. 22 reports this year. These reports are discussed in detail below and some are further discussed in the 'Emergency preparedness and incident management' section of this report.

Table 6: Number of reports made under section 22 of the Act, 2019–20 to 2021–22

Reporting period	Number of s. 22 reports
2021–22	43
2020–21	63
2019–20	51

Figure 8: Categories of reports made under section 22 of the Act, 2019–20 to 2021–22



Escherichia coli detections

During this reporting period there were 24 reports of *E. coli* detections compared with 28 in the previous year, a decrease of 14% (Figure 8). Of the 24 reports, 21 met the criteria of false positive samples under the *E. coli* standard, while three non-compliant samples required s. 18 notifications to be submitted by water suppliers during 2021–22. Although 2021–22 showed a reduction in *E. coli* detection reports compared with 2020–21 and 2019–20, the total number of *E. coli* detection reports this year (24) remains high and is of concern to the department. This concern has been raised with the respective water agencies to identify gaps in their systems and to implement measures to rectify the number of false-positive samples detected.

Investigations into these detections attribute many to sampler error or issues with sampling procedures or analysis.

Twelve water agencies reported *E. coli* detections, with Wannon Water reporting detections on five occasions, and North East Water and Greater Western Water reporting on three occasions (Appendix 3).

Widespread public complaints

Regulation 16(j) requires water suppliers to provide in their annual reports a summary of complaints received by the water supplier relating to the quality of drinking water supplied, and a summary of the responses and analysis of the issues arising from the complaints. Where water supplied, or to be supplied, may cause widespread public complaints, the water agency must inform the department in line with s. 22 of the Act.

There were 10 reports of widespread public complaints in this reporting period, which is consistent with the levels reported (9 to 11 reports per year) by water suppliers since 2016–17. The 24 reports for widespread public complaints in 2020–21 was an exception to this trend. Coliban Water reported four instances of widespread public complaints with the quality of drinking water.

Widespread public complaints in the 2021–22 reporting period were due to the presence of taste and odour compounds (2-Methylisoborneol and geosmin), manganese levels in raw water following bushfire, blackwater events due to heavy rainfall, resuspension of sediments following burst mains and commissioning of a water basin following replacement of basin linear.

Elevated disinfectants

There was one report of elevated disinfectants during 2021–22. Gippsland Water reported elevated chlorine levels in the Seaspray locality, resulting from a pump wiring control issue. Gippsland Water published messaging on social media and flushed and tested the supply system. The messaging was removed when the chlorine levels in drinking water supplied to Seaspray returned to normal.

Other reports

There were five 'Other' category of reports during 2021–22 that included two 'boil water' advisories issued by respective water agencies. The types of incidents included compromised tank integrity, tears in basin floating covers and a vehicle found submerged in a raw water storage. There were two further incidents categorised under 'Other pathogen detection', with one leading to a 'boil water' advisory. Both incidents involved a bird carcass found in the water supply system. In one incident, the bird was found in the clear water storage. Since the treated water was contaminated, a 'boil water' advisory was issued. In the second incident, a bird was found in the filter balance tank located before chlorine disinfection treatment. The plant was shut down as a response with the balance tank emptied and super chlorinated. Because chlorination occurs after the filter balance tank, it was assessed that this was adequate to address the microbial risk and as such did not result in a 'boil water' advisory.

Some of these reports are described in more detail in the 'Emergency preparedness and incident management' section of this report (see Appendix 3 for all s. 22 reports the department received in 2021–22).

Drinking water quality complaints

In 2021–22 there were 6,452 drinking water quality complaints received by 15 water suppliers, a 19% decrease on the previous year. Overall, three water suppliers reported an increase in drinking water quality complaints in 2021–22, and 12 reported a decrease in complaints. Appendix 4 presents details of each water supplier's drinking water quality complaints.

A drinking water quality complaint may be due to undesirable aesthetic water quality issues that do not necessarily represent a direct human health risk. Taste and odour issues may, however, result in the consumption of alternative, less healthy drinks, such as sugar-sweetened beverages or more costly bottled water. The most common drinking water quality complaint was for discoloured/dirty water reported by 14 water suppliers, followed by taste and odour. A range of factors can result in drinking water tasting, smelling and appearing unpleasant. Overall, three water suppliers reported an increase in drinking water quality complaints, which is fewer than the previous year, with no water suppliers reporting consecutive increases.

Central Highlands Water reported the largest increase in drinking water quality complaints compared with the previous year. This was not due to any particular incident, and Central Highlands Water has reported consistently lower customer complaints in the four previous reporting periods prior to 2021–22. Both East Gippsland Water and North East Water reported increases in customer complaints, however there were minimal changes to complaint numbers. Twelve water agencies reported a decrease in drinking water quality complaints, which is more than last year, with Yarra Valley Water, Goulburn Valley Water, Grampians Wimmera Mallee Water and Lower Murray Water reporting consecutive decreases. Westernport Water had a 72% reduction in drinking water quality complaints (due to a specific incident in 2020–21 causing a large increase in complaints), followed by Wannon Water with a 50% decrease in complaints compared with the previous year.

All water suppliers are implementing appropriate actions to minimise the number of drinking water quality complaints.

Westernport Water's Ian Bartlett Water Purification Plant located in the Bass hills was awarded the IXOM's Best Tasting Tap Water in Victoria in 2021.

Risk management plan audits

Sections 7 and 8 of the Act require water suppliers and water storage managers to prepare, implement, continuously review and revise risk management plans. Section 10 of the Act requires risk management plans to be audited by an approved auditor to determine whether a water supplier or a water storage manager has complied with the obligations imposed by s. 7(1) or s. 8(1) respectively, during the audit period. Section 11 of the Act empowers the Secretary of the department to require the water supplier or water storage manager to have its risk management plan audited by a specified date. The audits are carried out about every two years, a timeframe that allows water agencies to drive continuous improvement and best practice, reinforcing and promoting the risk management principles of Victoria's water industry.

The risk management plan audits were completed over the 2019–21 period. Compliance with s.7 and/or s.8 of the Act was detailed in the department's 2020–21 annual report on Victoria's drinking water quality. In brief, the audits identified that four water agencies (Wannon Water, Barwon Water, East Gippsland Water and North East Water) were non-compliant with s.7 (1) during the audit period. Wannon Water was non-compliant for the second consecutive audit period. The minor non-compliance issues were addressed by three water agencies prior to 2021–22, while East Gippsland Water is still progressing actions related to the non-compliance with s. 7(1) (Table 7).

Collectively the risk management plan audits identified 132 opportunities for improvement (OFI). The OFIs spanned a breath of areas including (but not limited to): infrastructure and system maintenance and inspection, power supply, alarm systems, updates to Supervisory Control and Data Acquisition (SCADA), operational processes, sampling requirements, data collection and monitoring, workforce training, storage asset integrity, ingress protection, protection from environmental hazards, the appropriateness of documentation and risk management processes.

Since completing the audits, and as reported by the water agencies, at 30 June 2022, 111 of the OFIs have been completed. Of the remaining OFIs, the affected water agencies have advised the department that these 21 OFIs are either in progress, planned or pending funding. Regarding OFIs that are contingent on funding, the department collaborated with the ESC to develop and issue the *Department of Health guidance for the 2023 Water Price Review*. This guidance will help water agencies to prepare submissions for any necessary expenditure to continue to meet legislative and regulatory obligations. Progress against the OFIs identified in the audits is summarised in Table 8.

The next cycle of risk management plan audits will be conducted from 1 January 2023 to 30 April 2023 to assess water agencies risk management plan compliance during the audit period of 1 January 2021 to 31 December 2022.

Table 7: Water agencies risk management plan audit outcomes – non-compliance with section 7 (1) of the Act

Four water agencies were identified as non-compliant with s. 7(1) of the Act during the 2019–21 audit period. This table summaries the audit recommendations to address the minor non-compliances identified, and the water agency actions and progression of response to those recommendations. This information has been extracted from relevant water agencies annual reports.

Audit recommendations/actions	Response to recommendations	Status
Wannon Water audit in April 2020*		
• Review the risk associated with the waste return and consider establishing monitoring processes and limits on the quantity and quality of water returned to the head of the plant.	• Review of filter backwash and waste water system returns. • Ensure the waste water return is actually required. • Ensure that, if required, percentage return is consistently controlled at 5% of plant raw water inflow.	Complete 2019–20
• Review the implementation of the Critical Control Points (CCP) and critical limits to ensure they are consistent with the results of the Health Based Targets (HBT) assessment including: – critical limits for filtered water turbidity for all schemes with a protozoan risk – the disinfection critical limits, concentration (C) and the corresponding disinfectant contact time (t) (*C.t*) targets.	• Assess CCP's for filter outlet turbidity for all schemes with a protozoan risk to ensure the limit is set at an appropriate value for the target Log Reduction Value (LRV). • Ensure disinfection CCPs and *C.t* targets are assessed with consideration of turbidity values at the point of disinfection. • Review the optimiser tool to confirm calculations are consistent with the Water Services Association of Australia (WSAA) HBT manual.	Complete 2019–20
• Review time delays set in SCADA to ensure that they are consistent with the CCP plans.	• Hard code alarm time delays in SCADA to be visibly displayed on screen.	Complete 2019–20
• Review the HBT assessment to ensure consistency with the WSAA HBT manual.	• Recalibrate the Optimiser to identify the correct LRVs for each catchment. • Re-run all sanitary survey modelling through Optimiser software to confirm LRV for all scenarios. • Review sanitary survey data and monitoring program for catchments.	Complete 2019–20

* This is the second consecutive risk management audit that Wannon Water has been assessed to be non-compliant. Wannon Water submitted and implemented a plan to address its risk management plan audit noncompliance issues.

Table 7: Water agencies risk management plan audit outcomes – non-compliance with section 7 (1) of the Act (continued)

Audit recommendations/actions	Response to recommendations	Status
Barwon Water audit in August 2020		
• Establish a process for periodic review of the data alert system, specifically to verify that the sites and limits tables are current and set up correctly.	• Data alert process was reviewed and issues corrected. • Developed a three-way notification process as a further pathway for notification of data exceedances. • Data alerts review triggers are included in the Obligations Register at a two-year review frequency.	Complete 2020–21
• Review the progress and implementation of the Corrective Action Request (CAR) raised internally by external laboratory every six months from August 2020 until the CAR is appropriately closed out.	• External laboratory CAR has been closed out. This has been added to the external laboratory's annual auditing. • New process includes external laboratory and Barwon Water conducting scheduled sampling reconciliation monthly.	Complete 2020–21
• Verify status and take action as necessary to ensure that the current version of the checklist for receival of bulk chemical deliveries is used by the operators.	• Current form was re-issued to relevant teams.	Complete 2020–21

Table 7: Water agencies risk management plan audit outcomes – non-compliance with section 7 (1) of the Act (continued)

Audit recommendations/actions	Response to recommendations	Status
East Gippsland water audit in August 2020		
• Review the methodology used to assess catchment categories to ensure the nominated methodology has been consistently and transparently applied.	• Engaged Water Futures to review the methodology used to assess catchment categories, and to verify that the nominated methodology has been consistently and transparently applied.	In progress
• Review HBT assessments to ensure there is adequate treatment for all catchment categories.	• Water Futures independently reviewed the HBT assessment and catchment categories for the catchments identified by the auditor as an area of concern. This process is being extended to all other HBT assessments.	In progress
• Develop and implement *E. coli* monitoring programs to ensure a sufficient number of samples are taken weekly to inform the HBT assessment process.	• East Gippsland Water recently engaged Water Futures to review the drinking water sampling program. Changes have been implemented.	Complete 2021–22
North East Water audit in October 2020		
• The treated water storage tank at the Yarrawonga WTP was inadequately protected from ingress runoff.	• Action has been taken to eliminate the identified ingress point at Yarrawonga 2020–21. • Inspection of all 80 CWS was completed in 2021–22 with maintenance outcomes linked with the Asset Management Information System and updated asset management program.	Complete 2020–21

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)*

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2019–20				
Central Highlands Water	1	• Alignment of process flow diagram with actual system configuration.	1	**Completed OFI** • The one OFI was completed in the 2019–20 reporting period. The Forest Hill Process flow diagram was reviewed, with minor modifications made to the waste line configuration.
Falls Creek Alpine Resort Management Board	8	• Improvements to SCADA systems for water supply assets (high priority). • Improved alarms (high priority). • Review of protocols and training needs (high priority). • Supply system performance and resilience. • Improvements to hypochlorite dosing alarms. • Procedures for flushing pipework. • Installation of an emergency standby generator for water pumps.	7	**One remaining OFI** • In progress: in response to an OFI to consider leak detection technologies, a smart meter has been installed as a trial in a Falls Creek Alpine Resort Management Board building. Following a 12-month trial, this will be assessed for suitability of rollout of smart meters within the resort. **Two OFIs completed during 2021–22** • New bore was commissioned in May 2022 and was operational for the 2022 snow season. • Sanitary survey and vulnerability assessment was completed during a risk management plan review in February 2022. **OFIs completed in previous years** • Four OFIs completed in 2020–21 including installing a back-up generator, updated SCADA system, hypochlorite dosing system commissioned, and one OFI that required no action. • One OFI was to consider further upgrading water tank areas with more security cameras. A 2020–21 internal assessment of the camera network and water infrastructure, did not highlight any areas that would benefit from additional cameras, so additional cameras were not implemented. Falls Creek Alpine Resort Management Board recorded this OFI as complete.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2019–20 (continued)				
Lower Murray Water	19	• OFIs across different water supply assets. • Water storage asset integrity, including asset condition and vermin proofing.	18	**One remaining OFI** • In progress: the Water Quality and Environment team's log of monthly instrument checks to be updated to include a section for recording checks on individual filter effluent turbidity since this is a key monitoring point (this was scheduled to be implemented by 30 December 2022). **OFIs completed in previous years** • 17 OFI's have been implemented including: pesticides have been considered in the drinking water quality management plan and included in the quality monitoring program and engagement with stakeholders to ensure timely notification of incidents that may adversely impact raw water quality, locking chemical fill points, capacity for temperature control in the wet rack area, amended control limits summary sheet, maintenance and vermin and run-off entry proofing, review of CCP access levels, outdated stickers removed, reviewed storage inspection frequency, contractors are now on RapidGlobal and appointment of additional resources. • One OFI identified that at some sites (e.g., Kerang) alum was still being dosed whereas some operators advised that in many cases aluminium chlorohydrate (ACH) is preferred for River Murray water, and this could be reviewed where it may simplify coagulation and improve performance. Lower Murray Water indicated that ACH has been successfully trialled and is being used at Red Cliffs, and Piangil WTPs. A trial for ACH use at Koondrook WTP is planned for this winter. ACH has also been unsuccessfully trialled at Kerang in the past. Lower Murray Water recorded this OFI as complete.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2019–20 (continued)				
Mt Buller and Mt Stirling Alpine Resort Management Board	7	• Potential improvements to training of operations staff. • Enhancing SCADA systems. • Alarm inclusion in operating procedures. • Aligning UV intensity against water turbidity. • Review and upgrades to chlorine dosing. • Upgrades to water storage reservoirs. • Upgrades to security measures.	6	**One remaining OFI** In progress: one OFI which is the decommissioning of Burnt Hut Reservoir as part of upgrading the plant for treating water from Boggy Creek Reservoir. Project is in planning and design phase with indicative completion in May 2024. **Two OFIs completed in 2021–22** • UV system was programmed to ramp up and down the power automatically based on target UV intensity set point. • In response to an OFI to consider security camera upgrade integrated with installing additional security signs, a security and signage review was conducted, with extra signage installed. **OFI completed in previous years** • Four OFI's have been implemented including a cross-training program, upgrade to SCADA system, inclusion of additional alarms in standard operating procedures and revised chlorine dosing.
Parks Victoria	1	• Develop a schedule for scenario testing of incident and emergency management procedures.	1	**Completed OFI** • In 2021–22 scenario testing of water related emergency response procedures has been integrated into risk management plans. The requirement is for annual scenario testing via actual incident response or planned scenarios.
Southern Alpine Resort Management Board	2	• Improve the SCADA system. • Upgrade the Lake Mountain supply (currently regulated water) to potable water supply standard.	0	**Two remaining OFIs** • In progress: the OFI for implementing the SCADA system is partially complete. Implementation occurred at Mt Baw Baw in 2020–21. The Lake Mountain SCADA system implementation is planned for completion by December 2022. • In progress: the OFI for Lake Mountain upgrade to a potable water supply standard is planned for completion by December 2022.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2019–20 (continued)				
Wannon Water	2	• Establishing the regular review of all risks identified in the risk assessment, which includes analysing available water quality data. • Establishing a process in the risk assessment methodology for assessing residual risk.	2	**Completed all OFIs** The OFI's were reported as complete in the Wannon Water 2019–20 annual report, with actions taken as follows: • Create a plan to conduct regular risk assessment reviews for all Wannon Water regulated and potable water systems to ensure system changes, catchment events etc. have not increased the risk associated with the delivery of safe and compliant water. • Review current risk processes within the business and determine an alternate risk assessment process for drinking water risk assessments.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21				
Barwon Water	12	• OFIs were identified for a range of risk management processes and asset inspection improvements. • Need to address potentially systemic issues that could lead to future noncompliance.	12	**Completed all OFIs** • During 2021–22 the final OFI was completed. The Tank Visual Inspection Form was reviewed and key water quality related aspects confirmed, where appropriate. Basin Visual Inspection form reviewed to ensure consistency with the Tank Visual form. **OFIs completed in previous years** • One OFI was to inspect the Lorne water treatment plant clear water storage basin for vermin-proofing and action as required; the inspection occurred with no issues identified. Barwon Water recorded this OFI as complete. • Relevant staff were trained on the new platform for managing the backflow program. • To document the process of monthly health based target report generation and review, a health based target process flow chart was developed and implemented. • The Chemical Quality Assurance Program document was updated to reflect current suppliers, and annual checks for chemical supplier accreditation scheduled in management system. • Risk management documentation was updated for risk assessment matrices and methods, approach to review risk assessments, matrix to assign priority level to improvement actions, references updated, and the link between *Scheduled sampling program verification strategy* and the change log has been clarified with risk-based reasoning added.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
Greater Western Water (formerly City West Water)	2	• Consider the reintroduction of water quality awareness training for staff. • Monitor and develop a plan to minimise the high number of dirty water complaints from customers.	2	**Completed all OFIs** Both OFIs were implemented during the 2021–22 reporting period: • Water quality awareness training was held for Greater Western Water staff in September 2021. Water quality awareness material was also updated in 2021–22 as part of integration activities. • A work plan was developed in 2021 aimed to address the high number of dirty water complaints received from customers. Key actions in the plan undertaken by Greater Western Water during 2021–22 include a pilot cleaning program in the Taylors Lakes water sampling locality, ongoing analysis of all water quality complaints and improvements to the water quality complaints handling process.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
Coliban Water	13	• The OFIs spanned risk management plan auditable elements such as identification and management of risks to water supply and development and implementation of preventive strategies (including appropriate control and monitoring measures).	10	**Three remaining OFIs** In progress: three OFI's are scheduled for completion by 30 November 2022, including: • Review the approach and documentation for the Inglewood chlorination point and consider having it as a CCP. • Review the CCP target, alert and critical limits for all booster chlorination stations. • Review the drinking water quality risk management plan to ensure it shows the operational philosophy, the reticulation system and the chlorination system as per the SCADA screen for all booster chlorination systems. **OFIs completed in previous years** • Three OFIs were implemented with the development and resumption of training, and ensuring a COVID-19 business continuity plan was in place. • Several interconnected OFIs have been completed with the *Drinking water quality risk management plan* and risk register updated as necessary following review of: risk source assessment hazardous events table, booster chlorinator and tank descriptions and schematics, expanded risk register to enable each basin/tank to be individually risk assessed and including booster chlorinators as appropriate. • OFI for capturing historical work and inspection reports was considered with a review of the asset management system for possible/practical to access historical information. • OFI for review of the document control process, to identify what changes are made, when they are made and by whom. Coliban Water's action was to include the 'rationale' information into the Water Quality Surveillance Monitoring Program spreadsheet.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
East Gippsland Water	3	• Updating the emergency contact list. • Implementing a process for progressing preventive and reactive maintenance. • Keeping records of maintenance work completed. • Assessments for catchments that may have anomalous microbial indicator concentrations.	1	**Two remaining OFIs** • In progress: in response to the OFI to develop a formal process for progressing preventative and reactive maintenance and keeping records of maintenance work. East Gippsland Water is implementing an Asset Management Improvement Project spanning asset lifecycle and including maintenance. This has begun and will be rolled out across the business over the next three years. • In progress: East Gippsland Water has commissioned Water Futures to review health based target assessments. East Gippsland Water will consider implementing the OFI for undertaking Tier 2 assessments for catchments that may have anomalous microbial indicator concentration, if the health-based target review recommends it. **Completed OFIs** • The OFI relating to updating the emergency contact list was completed prior to 2021–22.
Gippsland Water	1	• Consider raising work orders for reactive mains flushing in response to network monitoring results.	0	**One remaining OFI** In progress: several actions are being taken to address this OFI, including: • Scoping work was completed and software development commenced in 2021–22. • Testing and deployment are scheduled and expected completion in 2022–23.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
Goulburn-Murray Water	3	• The audit OFIs relate to incident criticality assessments to ensure appropriate management of incidents. • Documenting a process to assess risk management plan adequacy after incidents. • Contractor inductions to lease holders operating on Goulburn-Murray Water land.	3	**Completed all OFI** Completed in 2021–22: • Incident criticality assessment (as linked to the Goulburn-Murray Water *Incident response and recovery plan*) was included into IRIS (Incident Reporting System) for environmental incidents. • The annual incident summary document was modified to include a review of the adequacy of the risk management plan (including water quality risk assessment and key programs) to manage any risks identified from the incidents. Additionally, the incident review process was documented into the risk management plan and/supporting documents. • The content of contractor inductions was compared with existing information provided to lease holders regarding environmental requirements. Also, a link was added to the Goulburn Murray Water Safe Drinking Water Act factsheet on the Recreational Clubs webpage for each relevant storage and added the factsheet to the leaseholder information package.
Goulburn Valley Water	3	• Review options for roofing the clarifiers and filters at the Shepparton Water Treatment Plant. • Means to better house outdoor instruments. • Means to further protect treated water storages from vegetation build-up on roofs and in gutters including a review of inspection frequencies for sites vulnerable to such build-up.	3	**Completed all OFIs** • In 2020–21 a working group was established and trial work to improve storage assessment. Additionally, Goulburn Valley Water continues to assess storages routinely and provided its operators with a licence to assess, evaluate, clarify, repair and replace where appropriate, targeting a December 2022 completion date. The Goulburn Valley Water 2021–22 annual report indicates that all OFIs are now complete. **OFIs completed in previous years** • Roofing was constructed over the Shepparton Water Treatment Plant filters. • Action was taken in 2020–21 to improve the siting and ventilation of instruments. Goulburn Valley Water installed some instruments within lined, well ventilated, shipping containers, and has instrument boxes located as close as possible to the offtake points, with added weather protection to mitigate against instrument inaccuracies.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
Grampians Wimmera Mallee Water	10	• Simplify drinking water management systems. • Improve identification of risks and tracking of risk reduction measures. • Continue to develop and implement the Draft Drinking Water Mains and Service Repairs and Installations Work Instruction. • Develop a stakeholder management plan. • Review the risk management plan and update content such as schematics. • Update the water sampling program. • Quantify microbial hazards.	9	**One remaining OFI** • In progress: OFI relating to tracking risk reduction measures is yet to be implemented, with the 2021–22 Grampians Wimmera Mallee annual report stating a full module for managing risk in TechnologyOne is currently being commissioned. **OFIs completed in previous years** • Revised operational response procedure to include review of water quality risks following an incident. • Revised frequency to review water quality document. • Two OFI related to risk management plan has been updated to simplify navigation and revise schematics. • A stakeholder management plan is being developed. • Water quality management plans updated to include detail on events and response. • WaterRA health based targets have been reviewed against Grampians Wimmera Mallee Water's current treatment processes. • Updated catchment-to-tap risk assessment to include cybersecurity, tanker fill points and workforce. • Procedure for mains repairs and installation is complete.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
Melbourne Water	10	• The OFIs cover several auditable elements including source water protection, water treatment plants, treated water storage reservoirs, documentation and verification monitoring. • Two OFIs relating to treated water storage reservoirs are repeat findings from the 2017–18 risk management plan audit. • It was noted that four of the 10 OFIs identified by the auditor could progress to non-compliances if not adequately addressed.	9	**One remaining OFI** • In progress: the remaining OFI to be completed in 2022–23 relates to the planned transition to digital forms to improve logbook clarity. **Completed OFIs in 2021–22** • In response to the OFI to consider benchmarking chlorate and organic disinfection by-products against global norms, a project to review the dataset and benchmark it against both Australian and international guidelines has been completed. The review found no detections of disinfection by-products above relevant Australian guideline values in the Melbourne Water network. • OFI for improvement to maintenance program for aqueduct catch drains has been addressed with review and enhancement of existing programmed maintenance regimes. • Improved catchment security measures implemented. • To ensure outdated reagents and standards are not used, expired reagents were disposed of, and standard operating procedures require operators to check expiry before use. • A new launder cleaning method for clarifiers has been established, with a determined cleaning frequency. • The OFI to set metrics relating to Winneke clear water storage protection against ingress. Melbourne Water recorded this OFI as complete based on an existing condition assessment program that sets inspection dates based on risk. • Two OFIs relating to enhancing inspections to protect from, and manage, ingress and vegetation were addressed via updated standard operating procedures. **OFIs completed in previous years** • HACCP set points and targets were reviewed and updated at all treatment plants to standardise the controls and verify risk management plan documentation is accurate following the audit completed in December 2020. Also established three yearly preventative maintenance tasks, to compare SCADA set points and documentation to prevent recurrence of this issue.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
Mt Hotham Alpine Resort Management Board	6	• Upgrading the old storage tanks (high priority). • Inclusion of additional sampling points (high priority). • Integration of the OHS system into the *Drinking water management plan* (high priority). • The remaining three OFIs relate to record keeping and training.	4	**Two remaining OFIs** • In progress: planning is underway for integration of the OHS system into the *Drinking water risk management plan*. Expected completion of OFI by December 2022. • In progress: currently seeking planning permit and have engaged engineering services to address OFI relating to the upgrade of the clear water storage tank. **Completed OFIs** • OFI for sampling points has been addressed with two new sampling points installed in 2021–22. • Three OFIs relating to record keeping and training were completed prior to 2021–22.
North East Water	4	• Consideration of roofing clarifiers and filters. • Maintenance of water treatment plant railings. • Improved systems for ensuring standard and reagent turn over. • Review processes, systems and resourcing for quality assurance, verification and record keeping associated with new water mains and subdivisions, this OFI is carried over from the previous audit.	4	**Completed all OFIs** • One OFI recommended consideration of roofing of clarifiers and filters. North East Water, following a risk assessment in 2020–21 deemed the risk was acceptable and a lower priority. North East Water proposed that it may be included within the water treatment plant upgrade requirements specification. • OFI related to railing condition, assessment and repainting was completed, with ongoing condition assessment as part of internal audits program. • Refresher campaign was developed and implemented to all Operations Teams in 2020–21 on importance of in-date standards and reagents. • In 2020–21 the internal audit program scope was broadened to include new infrastructure and remains a focus for both the Drinking Water and Subdivision Teams.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
South East Water	7	• Clearing vegetation around fences to reduce fire risk. • Improvements to databases to enable tracking of monitoring program samples. • Enhancing functionality and reliability of backflow information. • Increasing field audits to monitor correct sample handling processes due to an increase in *E. coli* false positives. • Consideration should be given to whether field technician training needs to be yearly, for High Range Free Chlorine Method DR890. • Formalising documentation to capture improvement actions from debriefs and audits. • Updating the risk management plan framework.	7	**Completed all OFIs** • In 2021–22 OFI related to improving the backflow database system, was completed with an upgrade implemented to improved reliability, ease of use, and efficiency of ongoing backflow management. **OFIs completed in previous years** • Five OFIs were recorded as complete in 2020–21 including, clear up of site vegetation, the Monitoring Program functionality in the water quality database has been enhanced, increased field audits and all sample taps inspected and yearly maintenance schedule in place, the risk management plan framework was updated. Audit and debrief action items are entered into an 'audit tracking system' and are approved by management once approved. • The OFI related to field technician training was considered with respect to instrumentation, it was determined that field technicians receive hardcopy instructions during training, which they can refer to at any time. Annual refresher training is not required. South East Water recorded this OFI as complete.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
South Gippsland Water	7	• Improvements in water treatment and quality. • Consider means to keep analytical instrumentation reagents and standards within their appropriate operating temperature range. • Parts and fittings storage. • Clearer signage. • Resilience planning. • The roofing of the Leongatha Water Treatment Plant. • Tracking of emerging issues relating to microbial pathogens and disinfection by products given continuing use of floating covers.	4	**Three remaining OFIs** • In progress: two OFIs relating to labelling of sampling points and storage of parts and fittings, are in progress, with various expected completion dates in December 2022 and July 2023. • Pending funding: the OFI relating to the roofing of the Leongatha Water Treatment Plant will be considered in South Gippsland Water's 2023 pricing plan, with the draft plan due for submission to ESC in September 2022. **Completed OFIs in 2021–22** • Resilience planning was included in the South Gippsland Water *Urban water strategy* produced in April 2022. • Signage on temporary water trailers complete in December 2021. **OFIs completed in previous years** • OFI related to tracking emerging issues was completed prior to 2021–22, with commitment of South Gippsland water to keep abreast of issues. • One OFI relating to keeping analytical instrumentation reagents and standards within their appropriate operating temperature range was deemed not applicable, based on a misunderstanding during the audit. South Gippsland Water recorded this OFI as complete.
Southern Rural Water	1	• Improve ability to clearly interpret Southern Rural Water's response to identified hazards within its risk management plan.	1	**Completed OFI** • The overall readability of Southern Rural Water's risk management plan has been improved with the whole plan review completed.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
Greater Western Water (formerly Western Water)	3	• Tighter specifications to improve identification of dual reticulation parts and fittings. • Establish a formal position on setting critical limits. • Capturing batch and lot IDs for infrastructure.	1	**Two remaining OFIs** • In progress: actions to improve the identification of dual reticulation parts and fittings during 2021–22 included ongoing discussions with an industry working group, development of preferred fittings list and recommended parts with low risk of fading. • In progress: actions to improve capturing batch and lot identifiers for infrastructure during 2021–22 included incorporation of new mains details into the GIS and asset management system. Asset maintenance records continued to be maintained by depot teams with plans to record these in the asset management system in future. **OFI completed in previous years** • A formal position on setting critical limits was established in 2020–21.
Westernport Water	4	• Consider standard of parts and fittings. • Consider implications to use a floating cover for one tank. • Clearer labelling and commissioning processes.	4	**Completed all OFI** Two OFIs were completed in 2021–22: • All existing and new tankers were labelled. • The commissioning process was reviewed and augmented to ensure clarity for contractors with respect to commissioning and water quality criteria for main-to-meter connections. **OFIs completed in previous years** • The OFI regarding the floating cover was considered with respect to future disinfection by product compliance implications, sampling program, analysis and monitoring regime. • Compliance of parts and fittings are assessed as part of the procurement process.

* The information in this table has been extracted from relevant water agencies annual reports.

Table 8: Water agencies risk management plans audit outcomes – identified opportunities for improvement (OFI)* (continued)

Water agency	Key OFIs identified from the audit		OFI implementation status at 30 June 2022 (Status is as reported by the water agency)	
	No. of OFIs	Key OFI explanation	No. of OFIs done	OFI implementation explanation
Audits completed in 2020–21 (continued)				
Yarra Valley Water	3	• Role-specific training enhancements for all staff. • Technology research and development. • Standardised advice to plumbers on backflow prevention management.	2	**One remaining OFI** • In progress: the standardised training program for plumbers and water business staff is being developed in consultation with other Melbourne retail water businesses. It is anticipated that the remaining back flow prevention training program and related activities will be completed by December 2022. **Completed OFIs** • The OFI related to training enhancements was progressed in 2021–22 with another training module developed, this module targets customer facing roles. This follows the 'all staff water quality awareness module developed in 2020–21. • The technology research and development OFI has been addressed through local and global networking opportunities.

* The information in this table has been extracted from relevant water agencies annual reports.

Regulated water declarations

Some water agencies supply untreated water directly to communities through a piped distribution system. This water is not intended for human consumption; rather, it is used for purposes such as watering gardens, flushing toilets and other non-drinking domestic uses. If it is considered that this water could be mistaken for drinking water, the Minister for Health may, under s. 6 of the Act, declare the water to be regulated water.

Regulated water declarations are a mechanism for managing these non-drinking water supplies within the safe drinking water regulatory framework. A water agency supplying regulated water must have a risk management plan for that water supply. It must take all reasonable steps to ensure the community is made aware of the nature of the water, and it must provide information about the health risks associated with drinking the water.

The process for considering whether a particular supply is declared as regulated water involves consultation between the water supplier and the affected community.

Regulated water declarations can also be made if a water supply intended for drinking water deteriorates to the point where drinking water quality standards cannot be met. This has occurred when extreme weather events significantly changed the characteristics of source water quality.

No variations were made to regulated water declarations during this reporting period. Appendix 5 lists regulated water supplies for this reporting period.

Undertakings

Under s. 30 of the Act, the Secretary may accept undertakings to address water quality issues and deliver permanent water quality improvements. A water agency may enter into an undertaking with the Secretary when the department or the water agency identifies a contravention under the safe drinking water regulatory framework. The undertaking describes what the water agency will do to resolve the issue and how any public health risks are managed while the agency resolves the contravention within a specified timeframe. During this reporting period, there were no undertakings in place.

Annual reports

Under s. 26 of the Act, all water agencies must provide an annual report on the quality of drinking water and regulated water for every financial year. Water agencies must give the report to the Secretary no later than 31 October of each year. Reports must be made available to the public on the respective water agency website by the next business day. Part 5 of the Regulations outlines the details to be included in the annual reports, and the department's *Guidance: Water quality annual report* assists water agencies in meeting the annual report requirements under the Act and Regulations.

As part of the *Better regulatory practice framework,* the department has enhanced its internal review process of water agencies' annual reports to ensure a consistent approach to determining that water agencies have met the requirements of the Act, the Regulations and the guidance note.

All water agencies submitted their annual reports to the department within the required timeframe for this reporting period, except for Falls Creek Alpine Resort Management Board. Individual water agency's drinking water quality annual reports can be viewed on their websites. Appendix 1 lists the contact details for each water agency.

Emergency preparedness and incident management

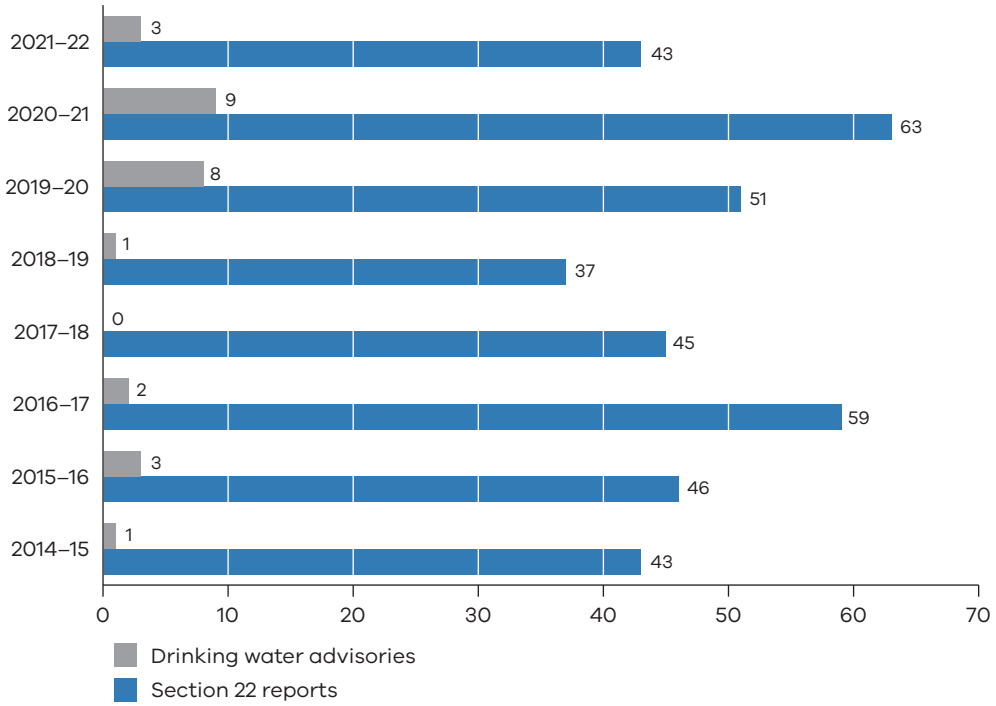
There were several drinking water quality incidents requiring significant departmental involvement. Eight drinking water quality incidents between 1 July 2021 and 30 June 2022 have been captured in this section. Most of these incidents related to clear water storage (CWS) integrity issues resulting in the potential for ingress of contaminants and dead bird entry. Incidents also involved widespread public complaint due to a 'plastic-like' taste and odour following essential liner and cover replacement works, a submerged vehicle in a raw water storage, and undisinfected water.

In this reporting period there were three 'boil water' advisories issued by three water suppliers following: structural damage to a CWS during a storm event with the potential for contamination; failure of backup generator controls and alarms for a disinfection system; and the presence of dead birds in a CWS. Figure 9 demonstrates that since 2018–19 there has been an increase in advisories, with a total of 20 advisories over the last three reporting periods.

An update is also provided on the work following the Silvan drinking water quality incident that occurred in 2020–21. The incident involved the loss of disinfection at the Silvan Water Treatment Plant.

These incidents were preventable and highlight the need for water agencies to undertake routine and periodic inspections and maintenance of drinking water infrastructure including asset end-of-life replacement, better preparedness for extreme events and ensure preventive measures are effective. Reducing the occurrence of water quality incidents requires a mindset that focuses on forecasting risk, avoiding or reducing precursors and an ongoing commitment to quality assurance and continuous improvement to do as much as is practicable to reduce risk.

Figure 9: Trend of section 22 reports and drinking water advisories, 2014–15 to 2021–22



Boil water advisory incidents

The three incidents below resulted in the issuing of a 'boil water' advisory by the respective water agencies.

Boil water advisory for Wedderburn – Coliban Water

Causal factors that led to the incident

On the evening of 3 November 2021 there was a severe weather event involving storms and strong winds. Following the weather event on 5 November 2021, Coliban Water undertook an inspection of the treated drinking water storage tanks. The inspection found a sheet of iron dislodged from the roof of a 2.25 megalitre tank on the ground. The tank services the community of Wedderburn.

Actions undertaken by the water agency

Following consultation with the department, Coliban Water issued a boil water advisory due to possible ingress and contamination of the treated water storage. Coliban Water established an incident management team and developed a reinstatement plan which was reviewed and acknowledged by the department.

In reinstating the affected drinking water supply, on 6 November 2021 the roof of the tank was repaired with two new sheets, replacing the missing sheet of iron and also a damaged one that was found during the repair process. A visual inspection inside the tank confirmed that there were no animals or debris in the tank. The chlorine residual from the Korong Vale Water Treatment Plant (that supplies the Wedderburn Tank), the treated water storage tank and within the reticulation system remained stable. Following completion of the corrective actions, water quality verification samples were taken at the tank and within the reticulation system which included samples taken pre and post repairs of the roof. On 7 November 2021, water quality monitoring results including stable chlorine residuals and no detection of *E. coli,* verified the safety of the water. After consultation with the department and meeting the requirements of the reinstatement plan, Coliban Water lifted the 'boil water' advisory on 7 November 2021.

Preventive actions and lessons

Coliban Water concluded that the storm event on the evening of 3 November 2021 had caused the Colorbond sheet to dislodge and fall to the ground. Lessons from this incident include undertaking timely proactive checks when there are adverse weather events.

Boil water advisory for Falls Creek village – Falls Creek Alpine Resort Management Board

Causal factors that led to the incident

On 31 December 2021 an electrical storm created a power outage at Falls Creek. While the uninterruptible power supply (UPS) was operational, it cut off after its design capacity of 80 minutes due to the backup generator failing to auto start. This subsequently caused the ultraviolet (UV) disinfection systems to shut down and prevented the automatic changeover to online hypochlorite dosing. Additionally, the outage created a fault condition in the SCADA alarm server which meant relevant critical alarms were not issued to the on-call operator via notification system.

As a result, 8,000 L of untreated water from the water storage tanks entered the village network.

Actions undertaken by the water agency

The on-call operator received a notification of the water supply UPS low battery alarm just before 7:00 pm, about one hour after the mains power supply outage. At 7:13 pm the UPS ceased operation and untreated water was supplied to the Falls Creek village until the operator attended the site and manually restarted the backup generator which re-instated the UV disinfection system by 8:10 pm. The incident was immediately reported to the department.

Following consultation with the department, Falls Creek Alpine Resort Management Board (Falls Creek ARMB) issued a boil water advisory to the Falls Creek village in the evening of 31 December 2021 due to the supply of untreated water into the network.

Falls Creek ARMB developed a reinstatement plan that was reviewed and acknowledged by the department. In reinstating the affected drinking water supply, Falls Creek ARMB undertook a number of actions to review the operation of the system including reinstating the disinfection system; activation of the hypochlorite dosing system with a target dose of 2 mg/L; increasing flow through the system, confirmation of chlorine residuals within the distribution network; and electrical, SCADA and server faults investigations and rectification. Falls Creek ARMB took water quality verification samples at a point immediately following UV disinfection and within the reticulation system over two consecutive days which demonstrated the water was safe to drink. After further consultation with the department and meeting the requirements of the reinstatement plan, Falls Creek ARMB lifted the 'boil water' advisory on 3 January 2022.

Preventive actions and lessons

The investigations found that the generator main power switch was tripped when the emergency stop button was activated during a service. This caused the main power switch to remain in a fault position and the generator to be unavailable for any start command from the SCADA control system which serves as an additional protective measure in the event of an emergency. The status of the emergency stop and fault position of the generator has now been linked to SCADA and will alert an operator if the button is used.

While an alarm for the UV treatment plant was generated by the SCADA control system to the server, a secondary fault had also occurred with the alarm server preventing notification of the on-call operator as the server was down for two minutes, within design range, between the UPS ceasing and the start-up of the back-up generator to the server. The UPS is now part of the annual critical asset inspection.

Falls Creek ARMB identified other preventative measures including adding the emergency stop and main switch on the generator to the daily inspection checklist, testing all systems with controlled power outage to confirm operation, updating procedures and providing additional training for technicians servicing the generator.

Improvements relating to customer communications were also identified including preparing signage for public areas and investigating contacts and communication methods for issuing advisories along with updating relevant parts of the risk management plan.

During commissioning of system components, water agencies are encouraged that all operational modes are tested and captured in documentation. It is integral that critical thinking is applied when testing systems to capture different scenarios and consequences and then implement preventive actions.

Boil water advisory for Inverloch – South Gippsland Water

Causal factors

On 4 March 2022, South Gippsland Water engaged contract divers to undertake inlet nozzle replacement works and found three deceased birds at the bottom of the Inverloch CWS tank.

Actions undertaken by the water agency

Due to the microbial hazard associated with animal carcasses, and following consultation with the department, South Gippsland Water issued a 'boil water' advisory to customers in Inverloch.

South Gippsland Water established an incident management team and developed a reinstatement plan which was reviewed and acknowledged by the department. The reinstatement plan included providing potable drinking water trailers as an alternate water source for the community, removal of the deceased birds, cleaning and draining of the tank, and flushing the tank and reticulation system over two days to remove any potentially contaminated water.

Once these measures had been completed, South Gippsland Water took water quality verification samples at the tank and within the reticulation system over two consecutive days to verify the safety of the drinking water. Following consultation with the department, South Gippsland Water lifted the 'boil water' advisory on 9 March 2022.

Preventive actions and lessons learned

In January 2022, a tank inspection identified that an area of the tank roof required re-sealing and rib end caps needed to be replaced. South Gippsland Water suspected the birds gained entry when the roof was re-sealed on 19 January 2022.

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 roofs are being replaced with perforated aluminium grill. Other actions under consideration include reviewing the following:

- design and materials used for CWSs
- frequency and methods of existing storage inspection programs
- operational resilience of storages and water supply systems, including works to improve storage bypass systems.

Although emergency management protocols were enacted successfully in response to the incident, opportunities for customer communication improvements were identified. Mobile phone short message service (SMS) capability has been strengthened to enable more rapid alerts in future incidents with works underway to further enhance customer communications during an incident.

Other incidents

Some incidents, while recognising suspected contamination, did not result in the issuing of an advisory after the respective water agency undertook a rapid risk assessment and determined that the risk to public health was low. The nature of the incidents, the preventive actions taken and insights gained are reported below.

Tear in floating cover at Tyabb Service Reservoir (west basin) – Melbourne Water and South East Water

Causal factors

On 29 October 2021, there was a severe weather event involving storms and strong winds. Following the weather event, on 1 November 2021 Melbourne Water undertook a regular weekly inspection of the Tyabb Service Reservoir secondary dosing plant and at 4:30 pm found a 20 cm tear in the floating cover of the 108 megalitre west basin.

The cause of the tear was high winds dislodging equipment including the dewatering pump basket and foot valve assembly from the cover a few days earlier.

Actions undertaken by the water agencies

Melbourne Water isolated the west basin of the reservoir from the supply and reported the incident to South East Water due to potential contamination to the supply of drinking water to customers in Balnarring, Bittern, Dromana, Hastings, Mornington, Mount Martha and Shoreham water sampling localities. A joint incident management team was established.

A rapid risk assessment was conducted because of suspected contamination of the drinking water supply from surface water pooling on the cover, which may have entered the basin. The assessment confirmed that the reservoir fence was secure with no signs of animal ingress; concluded that physical and chemical hazards to water quality were unlikely to be present with the only likely cause of biological contamination being bacteria from birds; the secondary disinfection plant at Tyabb was operating normally over the last four days; the inlet and outlet chlorine residuals were within normal range with sampling verifying analyser outputs; and there was adequate *C.t* for inactivation of bacteria. Melbourne Water isolated the basin and worked with South East Water to collect water samples from the basin and across impacted water sampling localities.

Both Melbourne Water and South East Water reported the incident to the department via a section 22 report on 1 November at 7:35 pm. During a meeting both water agencies presented the department with the findings of the rapid risk assessment which demonstrated that the risk to public health was low, and no customer communication was required. The water agencies continued to monitor the situation in case the risk profile changed.

Melbourne Water in collaboration with South East Water developed a reinstatement plan for the basin which was reviewed and acknowledged by the department. The plan included repairing the floating cover, internal inspection of basin using a remotely operated underwater vehicle, lowering the basin level to allow for mixing with chlorinated water and verification sampling.

Verification samples taken from the basin by Melbourne Water and within the reticulation system by South East Water in the localities of Balnarring, Bittern, Dromana, Hastings, Mornington, Mount Martha and Shoreham supported the assessment, finding residual chlorine concentrations in the reticulation system between 0.9 and 1.0 mg/L, physical and chemical characteristics within the normal range and no detections of *E. coli* or coliforms.

Following repair of the cover, the west basin was returned to service on 17 December 2021.

Preventive actions and lessons learned

The risk of this fault recurring at other basins with a similar design was assessed and where required, modifications made to reduce the risk of recurrence. An additional protocol for service reservoir inspections following storm events has also been implemented by both Melbourne Water and South East Water.

The insights gained from this incident include immediate reporting to the department by water agencies as per the requirements of the legislation, as timeliness is essential when assessing potential consequences to public health and taking immediate measures such as issuing relevant advisories where deemed necessary to protect public health. A collaborative approach with the regulator at the onset of an incident enables the department to provide guidance to the water agencies, understand the possible threats to drinking water safety and ensure the response is proportional to the level of risk to avert harm to the affected community.

Water agencies should develop resilience and be prepared and responsive to the increased intensity and frequency of extreme weather events. They should undertake timely and proactive checks when these events occur because they can impact the quality of drinking water supplies and have an adverse impact on community health and wellbeing.

Tear in floating cover at Armagh Road basin – South East Water

Causal factors

On 29 October 2021, there was a severe weather event involving storms and strong winds. An initial inspection of the Armagh Road basin on this day found tree branches on the new floating cover, however further inspection of the cover and removal of the branches were hindered due to safety requirements relating to accessing the cover. A further inspection on 3 November 2021 to remove the tree branches found two tears approximately 20 cm and 30 cm long in the cover possibly caused by the fallen tree branches.

Actions undertaken by the water agency

South East Water immediately isolated the Armagh Road Basin with an alternative supply introduced from Humphries Road basin and reported the incident to the department. Sampling from the outlet and immediately downstream at customer sample taps occurred. South East Water conducted flushing at the ends of the reticulation network to ensure the water within the zone turned over and Humphries Road basin was supplying into the area.

There was suspected contamination of the basin and drinking water supply from possible ingress through the tears in the floating cover. South East Water undertook a rapid risk assessment that assessed the risk to public health remained low. The risk assessment took into consideration that there were no signs of animal presence on the cover or in the basin, the surrounding fence was secure restricting access from animals and/or people, likely contamination risk would be from bird faeces such as ducks, with associated pathogens like Campylobacter, free chlorine residual within the basin remained at approximately 0.5 mg/L due to secondary disinfection on outlet of Humphries Road basin which is adequate to treat any possible risks.

South East Water developed a reinstatement plan for the basin which was reviewed and acknowledged by the department. The plan included draining the basin to reduce the surface level to enable safe mobilisation of the repair crew with one crew working from above the floating cover and a dive crew working from within the basin to assist in hard-to-reach areas, both holes were repaired along with a pinhole identified by the dive crew, visually inspecting the cover for any additional perforations and undertaking verification sampling at the basin and within the Frankston South reticulation system.

The basin was brought back online on 16 November once verification monitoring confirmed clear microbiological results with sufficient chlorine residual and meeting *C.t* requirements.

Preventive actions and lessons learned

South East Water implemented a protocol for service reservoir inspections following storm events, with the requirement for notification of any fallen branches to be investigated immediately, noting that the fallen branch had been blown onto the cover from quite a distance away.

Learnings include that water agencies should develop resilience and be prepared and responsive to the increased intensity and frequency of extreme weather events and undertake timely and proactive checks when these events occur as they can impact the quality of drinking water supplies and adversely impact community health and wellbeing.

Clear water storage basin liner taste and odour issue at Wonthaggi – South Gippsland Water

Casual factors

The Wonthaggi Clear Water Storage basin was taken offline for geomembrane lining and cover replacement works needed to ensure the continuing safety and security of water supply. Upon completion of the works, the basin was refilled with treated water from the Lance Creek Water Treatment Plant and allowed to sit in the basin for adequate disinfection with the monochloramine residual in the water and then returned to service.

On 8 April 2022, there was the potential for widespread public complaint from Wonthaggi and Cape Patterson customers due to the detection of a 'plastic-like' taste and odour from the water in the basin. 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.

Actions undertaken by the water agency

South Gippsland Water reported the issue to the department on 8 April 2022. While South Gippsland Water advised that the geomembrane material has been previously used and complied with AS/NZS 4020:2018 standard for 'Testing of Products for Use in Contact with Drinking Water', the department was concerned about the safety of the drinking water due to possible leaching of substances from the material into the drinking water.

South Gippsland Water monitored with hydrocarbon testing, which detected trace levels of total petroleum hydrocarbons and total recoverable hydrocarbons from the Wonthaggi water tower on 9 April. There were no detections for any chemicals for samples of 12 April. Sensory tests for taste and odour were also conducted on samples taken from the inlets and outlets of the Wonthaggi water tower and the Cape Paterson standpipe. The plastic taste and odour subsided over the course of the ensuing week.

No complaints were received from customers in Wonthaggi or Cape Patterson over this period. Had there been complaints, South Gippsland Water would have isolated and bypassed the basin, and supplied customers directly via the temporary storage from the Lance Creek Water Treatment Plant.

Preventive actions and lessons learned

The potential for tastes and odours will be given greater consideration in relation to planning for future basin cover and lining renewals. This extends to implementing quality assurance processes including verification water quality monitoring to confirm that replacement materials used in renewals or part of routine maintenance do not adversely impact on the quality of drinking water.

Water quality incident within the Corryong Water Treatment Plant – North East Water

Causal factors

On 2 May 2022, a deceased bird was found in the uncovered clear water well (filtered water balance tank) inside the Corryong Water Treatment Plant (WTP) building. The clear water well is after the filtration step but before disinfection. The bird entered the building when the door was left open during a routine inspection.

Actions undertaken by water agency

On 2 May 2022, North East Water immediately notified the department that there was a potential contamination. North East Water assessed the risk as low based on the potential for contamination being before chlorine disinfection and that there was no interruption to disinfection. In addition, the potential contamination source was identified and removed quickly with no observed decay of the bird.

The WTP was stopped, the deceased bird removed, and the well was drained and washed down with high strength sodium hypochlorite solution and then flushed to waste for 30 minutes. Once the WTP returned to normal operations, the filtered water was transferred from the well to clear water storage with chlorine disinfection occurring in the transfer line at an increased concentration of 2.0 mg/L to ensure an elevated chlorine residual was maintained.

North East Water also undertook verification monitoring and sampling across the Corryong distribution and reticulation systems which demonstrated that the water remained safe to drink.

Preventive actions and lessons learned

North East Water installed a temporary cover over the well with a permanent cover to be installed by March 2023. North East Water also undertook an internal review of all sites that may have this similar design and engaged engineering services to assist on a program of works with fabrication and installation of covers.

Submerged car in Lake Glenmaggie – Southern Rural Water and Gippsland Water

Causal factors

On 14 October 2021, Victoria Police notified Southern Rural Water of a vehicle accident, resulting in a diesel 4WD rolling and becoming submerged in Lake Glenmaggie. The driver was taken to hospital. It was initially unknown if any fuel from the vehicle was released into the water storage.

Actions undertaken by the water agencies

Southern Rural Water reported the incident to Gippsland Water and the department due to the potential for hydrocarbons (fuel/oil) to contaminate the raw water, which may have impacted on the operation of the Coongulla and Maffra water treatment plants.

Southern Rural Water and Gippsland Water jointly assessed the risk to the safety of drinking water to be low. The risk assessment considered the volume of diesel in the fuel tank and its potential release into Lake Glenmaggie. It also considered the higher volumes of discharge from Lake Glenmaggie into the Macalister River on 13 October 2021 from 1,800 ML/d to 4,400 ML/d in preparation for predicted high rainfall forecast over the coming days. This flow release provided a significant dilution effect from Lake Glenmaggie to the Maffra offtake, approximately 34 km. The assessment also took into account the submerged raw water offtake at Maffra on the Macalister River which would have avoided any contamination floating on the surface.

The following actions by the respective water agencies further informed and validated the risk assessment:

- Visual inspections at Lake Glenmaggie on 14 October indicated no visible surface plumes which were confirmed by further inspections on 15 October along the Macalister River.
- As a precaution, the Coongulla Water Treatment Plant was turned off until 18 October 2021 with the CWS basin having sufficient supply for 15 days.
- Powdered Activated Carbon dosing at the Maffra Water Treatment Plant was increased by 50% and operators checked the taste and odour of the treated water.
- Samples taken on 15 October 2021 at Lake Glenmaggie and along the Macalister River were tested for hydrocarbons with results received on 16 October indicating less than detection or reporting levels.

The vehicle was retrieved and salvaged by a dive team on 16 October 2021 with its fuel tank completely intact.

Preventive actions and lessons learned

The immediate reporting of the incident by Southern Rural Water to Gippsland Water and the department enabled a collaborative approach. This ensured timely management of the potential risk to the safety of drinking water. While the risk was assessed as low, it was recognised that appropriate actions and evidence were required to validate the assumptions underlying the assessment.

Incident follow-up: Silvan drinking water quality incident and development of a joint action plan

Incident summary

A severe storm resulted in the loss of both the primary and backup power sources at the Silvan Water Treatment Plant in August 2020 and triggered a loss of disinfection for approximately seven hours. This was a significant drinking water quality incident, which resulted in boil water advisories issued to more than 100 suburbs, impacting over a quarter of a million Melbournians. This incident was reported in the department's 2020–21 annual report on drinking water quality.

Post-incident investigation

The department engaged independent experts to undertake an investigation into and report (the Investigation Report) on the Silvan drinking water quality incident and to make recommendations to improve the safety of drinking water in Victoria.

Response to investigation recommendations

In response to the recommendations in the investigation report, the department is coordinating a collaborative approach to develop the Silvan Drinking Water Quality Incident Joint Action Plan (JAP) with the Department of Energy, Environment and Climate Action, and the relevant Melbourne metropolitan water agencies: Melbourne Water, Yarra Valley Water, South East Water and Greater Western Water.

The objective of the JAP is to drive significant improvement in providing safe drinking water, in accordance with the safe drinking water legislative framework, for public health and the community. To help achieve this, the JAP aims to focus on:

- ensuring the currency, transparency and understanding of the evidence-base underpinning water agencies' drinking water quality risk management plans
- building the resilience of the Melbourne unfiltered water supply system, particularly in the face of increasing pressure from climate change and population increase
- improving water agencies' drinking water quality risk management plans
- improving incident/emergency preparedness across the water sector
- identifying insights for other Victorian drinking water systems to adopt, while acknowledging that not all of these will be applicable to all drinking water systems
- maintaining public confidence in Victoria's governance and management of drinking water.

Continuous improvement initiatives that have broader applicability to the water sector or relate to the safe drinking water regulatory framework are outside the scope of the JAP. These initiatives will be progressed via other mechanisms or forums, such as the Safe Drinking Water Inter-agency Strategic Group. Recommendations in the investigation report that are specific to the department and legislative framework are beyond the scope of the JAP and will be progressed through separate processes.

It is anticipated that implementation of the JAP will commence in early 2023.

Water fluoridation for healthy teeth

Having healthy teeth is important for eating, speaking, smiling, general health and quality of life. Oral disease is one of the most prevalent diseases in our community. Although there have been significant improvements in oral health over the past 20–30 years, there is still evidence of poor oral health among many Victorians. Preventing tooth decay, via a range of measures including community water fluoridation, has been shown to improve health and reduce dental treatment costs, for both individuals and the health system.

Fluoride is a naturally occurring mineral found in rock, air, soil, plants, and water. All fresh and sea water contains some fluoride. Many foods and drinks naturally contain fluoride. Fluoride is also added to:

- drinking water, where fluoride is added to the local water supply
- fluoride toothpastes, gels, and mouth rinses
- fluoride products painted on the teeth by a dental professional.

Fluoride acts as a constant repair kit for teeth. It makes teeth stronger and can reduce the risk of tooth decay or even reverse it in the early stages. Many studies have proven the safety and oral health benefits of water fluoridation. Water fluoridation involves adjusting the fluoride concentration in reticulated drinking water to reach a level that can help reduce tooth decay[6]. This effective intervention:

- significantly reduces tooth decay in people of all ages and reduces tooth decay rates by 26–44% in children and adolescents[7].
- reduces inequalities – children living in non-fluoridated communities experience higher rates of potentially preventable hospital admissions for dental conditions[8].
- reduces costs associated with tooth decay – oral disease is one of the costliest health conditions to treat and is among the most prevalent diseases in our community. For each dollar invested in water fluoridation, up to $18 is saved in avoided treatment costs[9].

More than 25 years after the first introduction of water fluoridation in metropolitan Melbourne in 1977, water fluoridation has saved Victoria an estimated $1 billion through avoided dental costs, days away from work or school and other costs.

Today about 97% of Victorians have access to fluoridated water, via reticulated water networks that reach 99% of Victorians living in metropolitan Melbourne, and 88% of Victorians living in rural and regional areas. However, approximately 200,000 people living in rural and regional Victoria are connected to reticulated water supplies that are not fluoridated.

6 In Victoria, fluoride in drinking water is adjusted to an optimal level of approximately 1 mg/L to provide a community oral health benefit

7 National Health and Medical Research Council (NHMRC) (2017), *NHMRC Public Statement 2017 – Water Fluoridation and Human Health in Australia* <https://www.nhmrc.gov.au/about-us/publications/2017-public-statement-water-fluoridation-and-human-health#block-views-block-file-attachments-content-block-1>

8 Rogers, J.G., et al., *Reducing Potentially Preventable Dental Hospitalizations of Young Children: A Community-Level Analysis* <https://pubmed.ncbi.nlm.nih.gov/30938599/>. JDR Clin Trans Res, 2018. 3(3): p. 272–278.

9 National Health and Medical Research Council (NHMRC) 2017, Information paper – Water fluoridation: dental and other human health outcomes (p. 69), report prepared by the Clinical Trials Centre at University of Sydney, NHMRC; Canberra. Available from <https://www.nhmrc.gov.au/about-us/publications/water-fluoridation-dental-and-other-human-health-outcomes>

Victorian action plan to prevent oral disease

The Victorian action plan to prevent oral disease 2020–2030 sets out a vision to achieve good oral health for all Victorians by 2030 and to reduce the gap in oral health for people who are at higher risk of oral disease. The action plan includes opportunities for oral health promotion across the life course. Priority actions and key goals relevant to the water sector include:

- increasing the proportion of rural and regional Victorians accessing fluoridated drinking water to 95% from a baseline of 87% by 2030
- collaborating with water businesses to promote the benefits of drinking water, preferably fluoridated water if available.

Health (Fluoridation) Act

Under the *Health (Fluoridation) Act 1973*, the department oversees the ongoing compliance and performance of existing water fluoridation plants in Victoria and increasing access to water fluoridation in areas with non-fluoridated water supplies. Before adding fluoride to any water supply, a water agency must submit plans and specifications to the department for consideration. The department then conducts a technical appraisal of the fluoridation plant in line with Victoria's *Code of practice for the fluoridation of drinking water supplies* (second edition) to ensure the fluoridation plant can operate safely and reliably. When the technical appraisal is complete and following the water agency satisfactorily addressing any issues relevant to the outcomes of the technical appraisal, the department issues a letter approving the plant's commencement. Fluoridation plant audits are arranged within approximately 12 months of operation to verify the non-essential recommendations of the technical appraisal and any other non-essential requirements at the time the approval was provided.

Key achievements and activities

In 2021–22 the key achievements and activities included:

- November 2021: Greater Western Water submitted a functional design report for an upgrade of the water fluoridation plant at the Merrimu water treatment plant.
- January 2022: The department approved the Wannon Water submission to commission the Camperdown water fluoridation plant, providing fluoridated drinking water to more than 5,000 residents of Camperdown, Lismore and Derrinallum, and connecting customers to the Camperdown rural pipeline.
- January 2022: The department commissioned a technical appraisal of Greater Western Water's upgraded Merrimu fluoridation plant. Transition to the upgraded plant is anticipated to occur in 2023. This will facilitate the continued provision of fluoridated drinking water to approximately 113,370 residents of Darley, Pentland Hills, Eynesbury, Bacchus Marsh, Merrimu, Coimadai, Maddingley, Parwan, Melton, Melton South, Brookfield, Hopetoun, Park, Toolern, Mount Cottrell, Plumpton, Melton West, Kurunjang, Long Forest, Rockbank and Toolern Vale.
- The department, via its partnership with Dental Health Services Victoria, will continue to monitor and review community oral health data. For example, local government area oral health profiles are available from the Dental Health Services Victoria website <https://www.dhsv.org.au/oral-health-programs/LGA-oral-health-profiles>.

88%
of rural and regional residents have access to **fluoridated water**

Wannon Water commissioned the **Camperdown** water fluoridation plant resulting in **more than 5,000 people** accessing fluoridated water

Water fluoridation plant performance

In the 2021–22 reporting period, Victoria had 51 water fluoridation plants operated by 15 water agencies and Aquasure (the Victorian desalination plant operator). The department's *Guidance: Water quality annual report* and *Code of practice for the fluoridation of drinking water supplies* (second edition) requires water agencies to report on water fluoridation plant performance including:

- the annual average, minimum and maximum fluoride concentrations at each water sampling locality, water supply and fluoridation plant
- a summary of incidents and emergencies reported during the year
- a summary of the fluoridation process and chemicals used at each fluoridation plant.

The *Code of practice for the fluoridation of drinking water supplies* (second edition) also requires water agencies to notify the department of emergencies and exceptional situations. During 2021–22 the department received 20 notifications (compared with 27 in 2020–21) from nine water agencies of fluoride concentrations of less than 0.6 mg/L for a continuous period of greater than 72 hours. These incidents related to plant shutdowns caused by issues in the dosing control system, sodium fluoride saturator sand media, bench analyser, transfer and dosing pumps, level sensor, storage tank and availability of fluoride chemicals.

These operational issues may have been prevented with adequate preventative routine system inspection and maintenance. The department continues to engage with Victorian water agencies to ensure all water fluoridation plants are performing at maximum efficiency 100% of the time, delivering the optimal fluoride concentration to provide a dental benefit for our community.

On the horizon

Revisions to the Australian Drinking Water Guidelines

Managing microbial quality of drinking water

In 2018 the National Health and Medical Research Council (NHMRC) consulted on the ADWG's revised Chapter 5 'Microbial quality of drinking water', incorporating a microbial health-based target. The microbial health-based target approach is consistent with the World Health Organization's approach for defining the microbiological safety of drinking water.

The department, through its representation on Australia's Environmental Health Standing Committee (enHealth) continued to work with the NHMRC to finalise the guidance.

In September 2022, the NHMRC published the updated guidance on microbial quality of drinking water to support the preventive risk-based management framework. Microbial health-based targets (HBTs) provide a quantitative measure of the microbial safety of drinking water. The definition of microbial safety included in revisions to the ADWG Chapter 5: Microbial Quality of Drinking Water is a health outcome target of $1x10^{-6}$ Disability Adjusted Life Year (DALY) (or 1 µDALY) per person per year. Microbial HBTs help inform measures (i.e. barriers) for managing risk and in particular informing critical control limits for such barriers to achieve the annualised health outcome target. HBTs are intended to support the multiple barrier approach in the ADWG; that is; they do not provide a licence to compromise the performance of existing barriers. Where barrier shortfalls are identified, HBTs provide a useful tool to prioritise improvements.

For more information refer to the NHMRC's website <https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines>.

In Victoria, the Regulations require water agencies to quantify microbial hazards, including the extent to which pathogenic microorganisms are present in water that enters the drinking water treatment process, and the extent to which that drinking water treatment process removes or reduces pathogenic microorganisms in the water.

Victorian water agencies have already integrated microbial HBTs into their risk management plans, based on other industry guidance, as a means of meeting their obligations under the Regulations.

The department will provide advice, as required, to support water agencies as they implement the latest guidance on the microbial quality of drinking water provided in the ADWG.

Updated guidance on radiological water quality

The NHMRC updated its information and terminology on radiological water quality to reflect current best practice in radiation protection and radiation measurement. The department, through its representation on the enHealth reviewed the draft guidance before and after public consultation, commenting on issues such as the terminology used, the applicability of changes to the specific dose criteria and other minor edits to improve clarity and accuracy.

Reducing lead content in plumbing products

Lead is a naturally occurring metal, however, exposure can cause significant adverse health effects. For public health protection from lead exposure, the level of lead in drinking water is monitored as part of the drinking water quality standards surveillance program.

Lead has traditionally been used in plumbing products, consequently a major source of lead in drinking water stems from leaching that may occur from these lead containing components. The department raised concerns with lead in plumbing products in the *Annual report on drinking water quality in Victoria 2017–18*. The department has worked at a state and national level, and with relevant plumbing regulatory bodies to address this important public health issue; including on initiatives to reduce the lead content in plumbing products.

The Australian Building Codes Board (ABCB) has recently moved to reduce the allowable lead content in plumbing products. From 1 September 2025 new requirements will come into effect, that restrict lead content in plumbing products, that are intended for use in contact with drinking water, to a weighted average lead content of not more than 0.25%. More information on the ABCB's decision can be found on its website <https://www.abcb.gov.au/resource/regulation-impact-statements/lead-plumbing-products-final-decision-ris>.

There will be a three-year transition period commencing 1 September 2022. To facilitate the transition, in January 2022 the ABCB published the *Lead in plumbing products implementation plan*, available at: <https://www.abcb.gov.au/sites/default/files/resources/2022/LiPP-Implementation-plan.pdf>.

To also support the community, building and asset managers to reduce exposure to lead and other metals from plumbing products, the department contributed to the development of enHealth's *Guidance on reducing exposure to metals in drinking water from plumbing products*. This guidance document, published in 2021, is available on the enHealth website <https://www1.health.gov.au/internet/main/publishing.nsf>.

Appendices

Appendix 1: Water agency contact details

Water agency	Telephone	Website
Barwon Water	1300 656 007	www.barwonwater.vic.gov.au
Central Highlands Water	1800 061 514	www.chw.net.au
Coliban Water	1300 363 200	www.coliban.com.au
East Gippsland Water	1800 671 841	www.egwater.vic.gov.au
Falls Creek Alpine Resort Management Board	03 5758 1200	www.fallscreek.com.au
Gippsland Water	1800 050 500	www.gippswater.com.au
Goulburn-Murray Water	1800 013 357	www.g-mwater.com.au
Goulburn Valley Water	03 5832 4800	www.gvwater.vic.gov.au
Grampians Wimmera Mallee Water	1300 659 961	www.gwmwater.org.au
Greater Western Water (formerly City West Water and Western Water)	13 44 99	www.gww.com.au
Lower Murray Water	03 5051 3400	www.lmw.vic.gov.au
Melbourne Water	131 722	www.melbournewater.com.au
Mt Buller and Mt Stirling Alpine Resort Management Board	03 5777 6077	www.mtbuller.com.au
Mt Hotham Alpine Resort Management Board	03 5759 3550	www.mthotham.com.au
North East Water	1300 361 622	www.newater.com.au
Parks Victoria	131 963	www.parkweb.vic.gov.au
South East Water	131 694	www.southeastwater.com.au
South Gippsland Water	1300 851 636	www.sgwater.com.au
Southern Alpine Resort Management Board	03 5957 7222	www.southernalpine.vic.gov.au
Southern Rural Water	1300 139 510	www.srw.com.au
Wannon Water	1300 926 666	www.wannonwater.com.au
Westernport Water	1300 720 711	www.westernportwater.com.au
Yarra Valley Water	1300 853 811	www.yvw.com.au

Appendix 2: Section 18 notifications for drinking water quality standards, 2021–22

No	Water agency	Water sampling locality	Water quality standard	Date
1	Central Highlands Water	Clunes	Bromate	Aug-21
2	Central Highlands Water	Fiskville/Glenmore	Lead	Jan-22
3	Coliban Water	Big Hill	Elevated chlorine	Apr-22
4	Gippsland Water	Mirboo North	Manganese	Sep-21
5	Grampians Wimmera Mallee Water	Donald	*E. coli*	Jan-22
6	Parks Victoria	Tidal River	*E. coli*	Aug-21
7	Parks Victoria	Tidal River	*E. coli*	Feb-22
8	South Gippsland Water	Fish Creek	Total trihalomethanes	Mar-22

Appendix 3: Section 22 reports, 2021–22

No	Water agency	Water sampling locality	Reason	Date
1	Coliban Water	Cohuna	Widespread public complaint	Jul-21
2	Coliban Water	Leitchville	Widespread public complaint	Jul-21
3	Coliban Water	Maldon	Widespread public complaint	Oct-21
4	Coliban Water	Wedderburn	Other incident (compromised tank integrity)*	Nov-21
5	Coliban Water	Echuca	Widespread public complaint	Feb-22
6	East Gippsland Water	Metung	*E. coli* detection	Nov-21
7	East Gippsland Water	Orbost	Widespread public complaint	Jan-22
8	Falls Creek Alpine Resort	Falls Creek	Disinfection/Treatment Failure*	Dec-21
9	Gippsland Water	Seaspray	Elevated chlorine	Oct-21
10	Gippsland Water	Briagolong	*E. coli* detection	Apr-22
11	Goulburn Valley Water	Shepparton	Widespread public complaint	Jan-22
12	Goulburn Valley Water	Katunga	*E. coli* detection	Mar-22
13	Goulburn Valley Water	Numurkah	*E. coli* detection	Mar-22
14	Grampians Wimmera Mallee Water	Donald	*E. coli* detection	Jan-22
15	Greater Western Water	Werribee South	*E. coli* detection	Jan-22
16	Greater Western Water	Richmond	*E. coli* detection	Mar-22
17	Greater Western Water	Eynesbury	*E. coli* detection	Apr-22
18	Lower Murray Water	Nyah	*E. coli* detection	Apr-22

* 'Boil water' advisory issued

1 Related section 22 reports

Appendix 3: Section 22 reports, 2021–22 (continued)

No	Water agency	Water sampling locality	Reason	Date
19	Melbourne Water[1]	Tyabb Service Reservoir (West Basin)	Other incident (tear in West Basin floating cover)	Oct-21
20	Melbourne Water	Montrose Reservoir	*E. coli* detection	Dec-21
21	North East Water	Tawonga and Mt Beauty	*E. coli* detection	Oct-21
22	North East Water	Glenrowan	*E. coli* detection	Oct-21
23	North East Water	Cudgewa	*E. coli* detection	Jan-22
24	North East Water	Chiltern, Kiewa, Springhurst, Tangambalanga, Wodonga Low Level, Wodonga High Level, Wodonga Logic Centre, Wodonga/Baranduda High Level	Widespread public complaint	Mar-22
25	North East Water	Myrtleford	Widespread public complaint	Mar-22
26	North East Water	Corryong High Level and Corryong Low Level	Other pathogen detection (dead bird found in clear water well)	May-22
27	Parks Victoria	Tidal River	*E. coli* detection	Aug-21
28	Parks Victoria	Tidal River	*E. coli* detection	Feb-22
29	South East Water	Mornington	*E. coli* detection	Aug-21
30	South East Water	Mordialloc, Brighton-Heatherton	Widespread public complaint	Sep-21
31	South East Water	Dandenong	*E. coli* detection	Oct-21
32	South East Water[1]	Melbourne Water's Tyabb Service Reservoir (West Basin) – Balnarring, Bittern, Dromana, Hastings, Mornington, Mount Martha, Shoreham	Other incident (tear in West Basin floating)	Oct-21

* 'Boil water' advisory issued

1 Related section 22 reports

Appendix 3: Section 22 reports, 2021–22 (continued)

No	Water agency	Water sampling locality	Reason	Date
33	South East Water	Armagh Road Basin – Frankston South	Other incident (tear in Armagh Road Basin floating cover)	Oct-21
34	South Gippsland Water	Inverloch	Other pathogen detection (3 dead bird carcasses found in clear water storage)*	Mar-22
35	South Gippsland Water	Cape Paterson, Wonthaggi	Widespread public complaint	Apr-22
36	Southern Rural Water	Lake Glenmaggie	Other incident (vehicle submerged into the lake)	Oct-21
37	Wannon Water	Paaratte	*E. coli* detection	Jan-22
38	Wannon Water	Port Fairy	*E. coli* detection	May-22
39	Wannon Water	Koroit	*E. coli* detection	May-22
40	Wannon Water	Noorat/Glenormiston	*E. coli* detection	May-22
41	Wannon Water	Camperdown (Urban)	*E. coli* detection	May-22
42	Yarra Valley Water	Ivanhoe	*E. coli* detection	Nov-21
43	Yarra Valley Water	Lyrebird Avenue	*E. coli* detection	Mar-22

* 'Boil water' advisory issued
1 Related section 22 reports

Appendix 4: Drinking water quality complaints reported by water suppliers

		Number of complaints				Type of complaints		
		2021–22	2020–21	Variance to 2021–22[a]	2019–20	Discolour/ turbidity/ dirty water	Taste and odour	Other
Metropolitan water suppliers								
1	Greater Western Water[b]	1,170	1,271	▼ -8%	906	***	**	*
2	South East Water	966	1,008[d]	▼ -4%	847[d]	***	**	*
3	Yarra Valley Water	3,081	4,004	▼ -23%	4,224	***	**	*
Regional water suppliers								
4	Barwon Water	201	242	▼ -17%	197	***	**	*
5	Central Highlands	88	70	▲ 26%	83	***	**	*
6	Coliban Water	181	232	▼ -22%	218	***	**	*
7	East Gippsland Water	53	51	▲ 4%	64	***	**	*
8	Gippsland Water	112	144	▼ -22%	136	***	**	*
9	Goulburn Valley Water	155	170	▼ -9%	179	***	**	*
10	Grampians Wimmera Mallee Water	51	88	▼ -42%	89	***	**	*
11	Lower Murray Water	26	28	▼ -7%	35	***	**	*
12	North East Water	170	169	▲ 1%	246	***	**	*
13	South Gippsland Water	51	81	▼ -37%	70	***	**	*
14	Wannon Water	101	203	▼ -50%	125[e]	***	**	*
15	Westernport Water	46	167	▼ -72%	14	**	***	*
Other water suppliers[c]								
Total		**6,452**	**7,928**	▼ **-19%**	**7,433**			

Notes:

a. Figures with a grey upwards arrow denote an increase in customer complaints to 2020–21. Figures with a blue downwards arrow denote a decrease in customer complaints to 2020–21.

b. Formally City West Water and Western Water, Greater Western Water was formed on 1 July 2021. Numbers for 2020–21 and 2019–20 include both City West Water and Western Water numbers.

c. Parks Victoria and the four Alpine Resort Management Boards did not have any water quality complaints during the reporting year.

d. Complaint numbers for South East Water's previous financial years have been updated for accuracy

e. Complaint numbers for Wannon Water in 2019–20 have been updated for accuracy.

*** most common

** second most common

* least common

Appendix 5: Regulated water supplies at 30 June 2022

Water agency	Water supply area
Central Highlands Water	Amphitheatre, Raglan, Redbank
Coliban Water	Borung, Dingee, Jarklin, Macorna, Mitiamo, Mysia, Wychitella
Goulburn Valley Water	Corop, Goulburn Weir, Kirwans Bridge, Molesworth, Strathbogie, Woods Point
Grampians Wimmera Mallee Water	Antwerp, Apsley, Berriwillock, Buangor, Chillingollah, Chinkapook, Cowangie, Culgoa, Dooen, Elmhurst, Glenorchy, Goroke, Harrow, Jung, Kaniva, Kiata, Lalbert, Lascelles, Lillimur, Marnoo, Miram, Moyston, Murrayville, Nandaly, Nullawil, Patchewollock, Pimpinio, Serviceton, Speed, Streatham, Tarranyurk, Tempy, Ultima, Waitchie, Walpeup, Watchem, Westmere, Wickliffe, Yaapeet Pipelines: Ararat-Lake Fyans pipeline, Mount Cole pipeline, Mount Zero pipeline, Moyston pipeline, Northern Mallee pipeline, St Arnaud pipeline, Stawell supply main, Wickliffe pipeline, Willaura pipeline, Willaura-Lake Bolac pipeline
Southern Alpine Resort Management Board	Lake Mountain Alpine Resort
Lower Murray Water	Millewa water supply system (Cullulleraine, Meringur, Werrimull), Mystic Park
Wannon Water	Darlington, North Otway pipeline

Glossary

Blue-green algae	Blue-green algae, or cyanobacteria, are a type of microscopic, algae-like bacteria that inhabit freshwater, coastal waters and marine waters. Blue-green algae in water bodies can potentially affect human health. Refer also to 'Harmful algal bloom'.
'Boil water' advisory	Advice issued by a water supplier that requires consumers to boil their drinking water supply before consumption (or for purposes connected to human consumption such as food preparation, tooth brushing or ice making) due to a deterioration in the quality of drinking water supplied to a level that has been assessed as posing an unacceptable risk to public health.
Catchment	An area of land that collects rainfall and contributes to surface water (streams, rivers, wetlands) or to groundwater.
Catchment-to-tap	A risk management approach based on the principle that multiple treatment barriers minimise or mitigate identified hazards in raw water and produce water that meets drinking water quality standards.
Chloral hydrate	A by-product formed in drinking water via a reaction between chlorine and naturally occurring organic material.
Corrective actions	Actions put in place following an incident or issue to alleviate immediate concerns.
Dichloroacetic acid	A by-product formed in drinking water via a reaction between chlorine and naturally occurring organic material.
Disinfectant	An oxidising agent (for example, chlorine, chlorine dioxide, chloramines or ozone) added to water in any part of the treatment process or distribution system to reduce microorganisms to acceptable levels.
Disinfection	The process designed to destroy or inactivate microorganisms in water, including essentially all pathogenic (disease-causing) bacteria. There are numerous disinfection processes including chlorination, chloramination, chlorine dioxide disinfection, ozonation and ultraviolet disinfection.
Disinfection by-products	Products formed from the reaction between disinfectants, particularly chlorine, and naturally occurring organic materials in water.
Distribution system	A network of pipes leading from a water treatment plant to customers' plumbing systems.

'Do not drink' advisory	Advice issued by a water supplier when water supply is suspected or is confirmed to have unacceptable levels of chemical contaminants present in the drinking water supply that can pose an unacceptable risk to public health if ingested. Consumers are usually advised to 'do not drink water or use affected water human consumption such as food preparation, tooth brushing or ice making'. In such cases boiling water will not make it safe for drinking and alternative drinking water source is required.
Drinking water	Water that is intended for human consumption or for purposes connected with human consumption, such as preparing food and making ice (excludes pre-packaged bottled water).
Drinking water quality standards	Drinking water quality standards specified in r. 12 of the Safe Drinking Water Regulations 2015 for the purposes of s. 17 of the *Safe Drinking Water Act 2003*.
Escherichia coli	*Escherichia coli* (also known as *E. coli*) is a type of faecal coliform bacteria. The presence of *E. coli* is an indicator of the presence of contamination from human or animal waste. Its presence most likely indicates a breach of a water quality treatment barrier or contamination during the distribution of the water. It is used an indicator for the presence of microbial pathogens.
False-positive sample	An investigation concluded that the detection of *E. coli* in a sample is not representative of the drinking water in the relevant water sampling locality. Refer to the meaning of 'false positive' in Schedule 2 of the Safe Drinking Water Regulations 2015.
Groundwater	Water contained in rocks or subsoil.
Harmful algal bloom	Naturally occurring algae that sometimes produce toxins that affect either aquatic life, such as fish, or human health. This includes blue-green algae and many other algae.
Hazard	A biological, chemical, physical or radiological agent that has the potential to cause harm. Physical and chemical hazards include heavy metals, trace organic compounds, total suspended solids and turbidity. Microbiological hazards include bacteria, viruses and protozoan parasites.
N-Nitrosodimethylamine	A by-product formed in drinking water via a reaction between chlorine and naturally occurring organic material.
Nephelometric turbidity units	A measure of clarity determined by a nephelometer that emits a light beam through water.
Notification	Verbal and written communication received by the department from water suppliers under s. 18 of the *Safe Drinking Water Act 2003* when drinking water supplied to the public does not (or is not likely to) comply with drinking water quality standards.

Parameters	Parameters for drinking water quality fall under four categories: physical, chemical, microbiological and radiological. Physical parameters include colour and turbidity. Chemical parameters include metals and organic compounds. Microbiological parameters include viruses, protozoa and bacteria. Radiological parameters include beta- and gamma-emitting radionuclides.
Pathogen	Disease-causing microorganism. Pathogen types include viruses, protozoa and bacteria.
Preventive actions	Actions put in place following immediate corrective actions to minimise the risk of a recurrence of an incident or issue.
Raw water	Water found in the environment – such as rainwater, groundwater, reservoir water and river water – that has not been treated.
Regulated water	Water that is not intended for drinking but that could reasonably be mistaken for drinking water.
Report	Verbal and written communication received by the department from water suppliers, water storage managers or council officers under s. 22 of the *Safe Drinking Water Act 2003* about known or suspected contamination of water.
Reticulated drinking water supply	The piped drinking water network.
Risk	The likelihood and consequence of a hazard causing harm in exposed populations in a specified timeframe.
Risk management	The systematic evaluation of the water supply system, the identification of present and potential hazards and hazardous events, the assessment of risks and the development and implementation of preventive strategies to manage those risks.
Risk management plan	A plan prepared by water agencies under the *Safe Drinking Water Act 2003* that details how risk is managed in relation to the storage or supply of drinking water and regulated water to the public.
Safe drinking water regulatory framework	The legislation used to regulate the supply of Victoria's drinking water is referred to as the safe drinking water regulatory framework. The framework consists of the *Safe Drinking Water Act 2003* and the Safe Drinking Water Regulations 2015. The safe drinking water regulatory framework supports the *Health (Fluoridation) Act 1973* and is consistent with the risk management approach in the *Australian drinking water guidelines*.
Section 18	Refers to a notification required if noncomplying water is supplied. The Act states that 'a water supplier must notify the Secretary in writing if it becomes aware that the drinking water it is supplying to another person does not comply, or is not likely to comply, with any relevant water quality standard and must do so within 10 days after it becomes aware of that fact'.

Section 22	Refers to an officer to report known or suspected contamination. The Act states that it 'applies if an officer of a water supplier, water storage manager or council believes, or suspects, on reasonable grounds, that water supplied, or to be supplied, for drinking purposes: • may be the cause of an illness; or • may be the means by which an illness is being, has been or will be, transmitted; or • may contain any pathogen, substance, chemical or blue-green algae toxin, whether alone or in combination, at levels that may pose a risk to human health; or • may cause widespread public complaint'. A section 22 must be reported immediately to the Secretary.
Surface water	Water naturally open to the atmosphere such as that in rivers, streams, lakes and reservoirs.
The Act	*Safe Drinking Water Act 2003*
The Regulations	Safe Drinking Water Regulations 2015
Trichloroacetic acid	A by-product formed in drinking water via a reaction between chlorine and naturally occurring organic material.
Trihalomethanes	Organic compounds formed when chlorine reacts with naturally occurring organic matter in water supplies.
Turbidity	The cloudiness of water caused by the presence of fine, suspended matter.
Ultraviolet (UV) disinfection	A method of water disinfection in which light in the 100–400 nanometre wavelength range is applied to inactivate microbial pathogens.
Water agency	Water storage managers and water suppliers are referred to collectively as water agencies.
Water fluoridation	The adjustment of the level of fluoride in drinking water to around 1 mg/L (also known as 1 part per million), a level that helps to protect teeth against decay.
Water sampling locality	A geographic area defined by the following criteria: an area supplied with drinking water; a discrete area of similar water quality, inclusive of all customers supplied with drinking water of similar water quality; and able to be described by its boundaries. Water samples are required to be taken and analysed from water sampling localities.

Water storage manager	The Melbourne Water Corporation constituted under the *Water Act 1989* or a water corporation within the meaning of the Water Act (other than Melbourne Water Corporation constituted under the Water Act) that supplies water to a water supplier; or any other person or body declared by the Regulations to be a storage manager for the purposes of the *Safe Drinking Water Act 2003*.
Water supplier	A supplier of drinking water or regulated water to the public; the holder of a water licence issued in Part 2 Division 1 of the *Water Industry Act 1994;* an authority within the meaning of the *Water Act 1989;* Parks Victoria established under the *Parks Victoria Act 1998;* an alpine resort management board established under the *Alpine Resorts (Management) Act 1997;* or any other person or body declared by the Regulations to be a water supplier for the purposes of the *Safe Drinking Water Act 2003*.