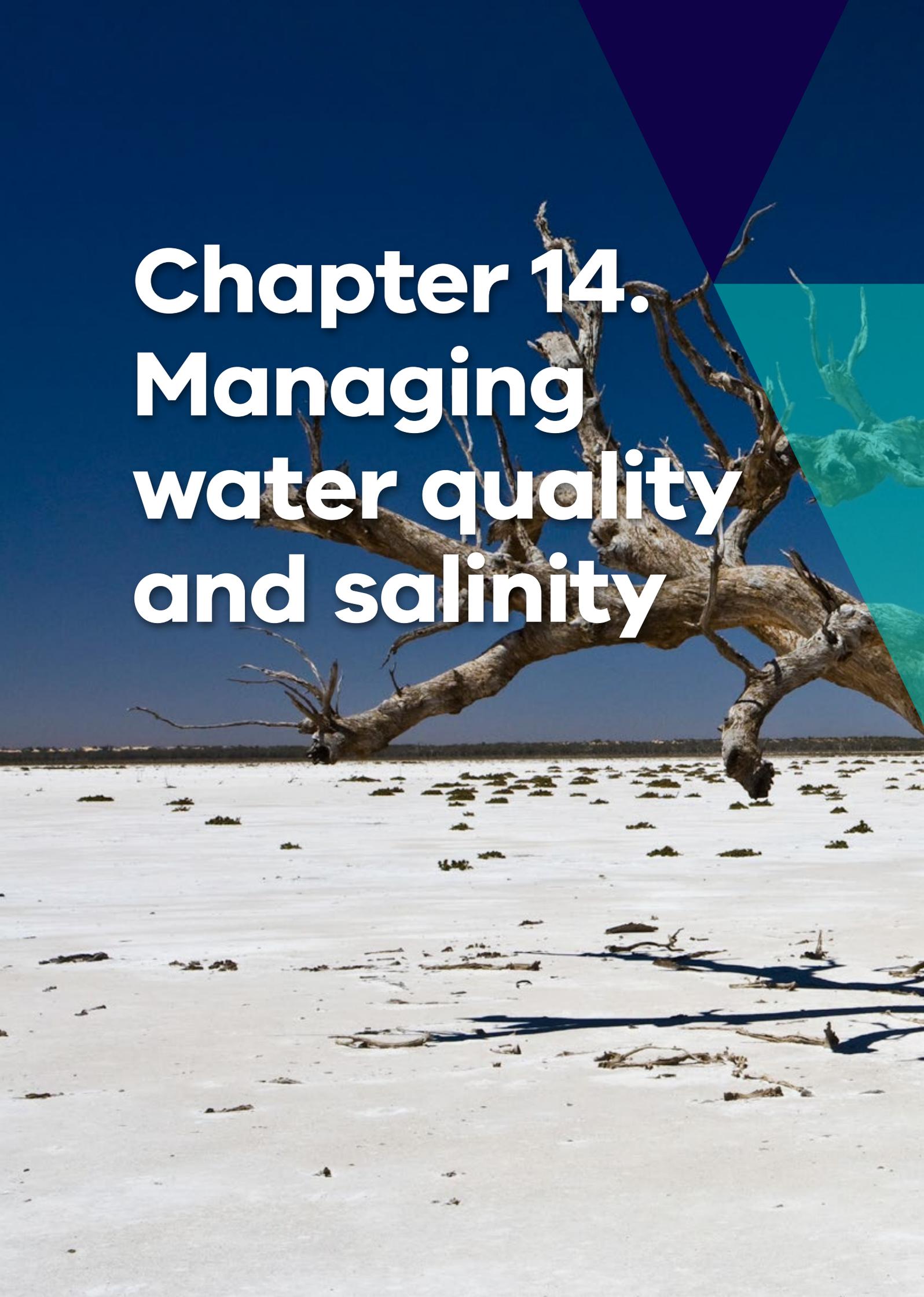


# Chapter 14. Managing water quality and salinity





# 14. Managing water quality and salinity

This Chapter explains how Victoria manages water quality and salinity of surface water and groundwater in Victoria's North and Murray water resource plan area. It also shows how Victoria has met the Basin Plan requirements to prepare a Water Quality Management Plan ([Appendix A](#)).

## 14.1 Water quality management in the Basin Plan

Part 7 of Chapter 10 of the Basin Plan requires a water resource plan to establish a water quality management plan. This plan should be developed with consideration of the impacts of wider natural resource management and land management on water quality within the water resource plan area.

Victoria's North and Murray Water Quality Management Plan ([Appendix A](#)) may specify alternative values provided that they give the same or better levels of protection as those set out in Chapter 9 of the Basin Plan. A key requirement is that water quality management plans incorporate cost effective measures that contributes to the achievement of the water quality objectives provided in Chapter 9 of the Basin Plan. The Basin Plan's overall objective for water quality and salinity is to maintain appropriate water quality, including salinity levels, for environmental, social, cultural and economic activities in the Murray-Darling Basin.

The outcome is that the Murray-Darling Basin water resources remain fit-for-purpose (section 5.04 of the Basin Plan). The water quality management plan must reproduce the water quality objectives for Murray-Darling Basin water resources set out in Chapter 9 of the Basin Plan.

Water quality management plans are concerned with the ongoing maintenance and improvement of water quality to ensure that water is fit-for-purpose and supports a range of beneficial uses. The water quality management plan identifies objectives and targets for water quality and measures to achieve these aims over time.

The management of extreme water quality events such as a blue-green algae outbreaks or blackwater events are covered in [Chapter 10](#).

### 14.1.1 Water quality objectives under the Basin Plan

The Basin Plan sets out six qualitative water quality objectives for maintaining and minimising impact on water quality. These objectives are listed here in [Table 14-1](#).

Basin states are required to identify measures that will contribute to the achievement of these objectives while considering the cause or likely causes of water quality degradation and identified water quality target values. The key measures that contribute to achieving water quality objectives are the State Environment Protection Policy (Waters) (EPA, 2018) and Victoria's commitment to implementing the Basin Salinity Management 2030 (Murray-Darling Basin Ministerial Council, 2015). These are discussed in detail in [Section 14.4.3](#).

Table 14-1: Water quality objectives in the Basin Plan

Use	Objective
<b>Fresh water-dependent ecosystems (section 9.04 of the Basin Plan)</b>	<ul style="list-style-type: none"> <li>• <i>For Ramsar wetlands:</i> Quality of the water is sufficient to maintain the ecological character of those wetlands</li> <li>• <i>For other fresh water-dependent ecosystems:</i> Quality of the water is sufficient to: <ul style="list-style-type: none"> <li>– protect and restore the ecosystems</li> <li>– protect and restore the ecosystem functions of the ecosystems</li> <li>– ensure that the ecosystems are resilient to climate change and other risks and threats</li> </ul> </li> </ul>
<b>Raw water for treatment for human consumption (section 9.05 of the Basin Plan)</b>	<ul style="list-style-type: none"> <li>• To minimise the risk that the quality of drinking source water results in adverse human health effects</li> <li>• To maintain the palatability rating of drinking source water at the level of 'good' as set out in the Australian Drinking Water Guidelines (2011)</li> <li>• To minimise the risk that quality of drinking source water results in odour of drinking water being offensive to consumers</li> </ul>
<b>Irrigation water (section 9.06 of the Basin Plan)</b>	<ul style="list-style-type: none"> <li>• That the quality of surface water, when used in accordance with best irrigation and crop management practices and principles of ecologically sustainable development, does not result in crop yield loss or soil degradation</li> </ul>
<b>Recreational water (section 9.07 of the Basin Plan)</b>	<ul style="list-style-type: none"> <li>• To achieve a low risk to human health from water quality threats posed by exposure through ingestion, inhalation or contact during recreational use of Basin water resources</li> </ul>
<b>Maintaining good levels of water quality (section 9.08 of the Basin Plan)</b>	<ul style="list-style-type: none"> <li>• If the value of a water quality characteristic (e.g. salinity, nutrients, pH) is at a level that is better than the target value for water quality (in Part 4 of Chapter 9 of the Basin Plan), an objective is to maintain that level</li> </ul>
<b>Salt export (section 9.09 of the Basin Plan)</b>	<ul style="list-style-type: none"> <li>• For the River Murray System: To ensure adequate flushing of salt from the River Murray System into the Southern Ocean <ul style="list-style-type: none"> <li>– This objective is expected to be achieved by the discharge of an average of two million tonnes of salt from the River Murray System into the Southern Ocean each water accounting period, and takes into consideration cyclical climate influences, existing works and measures like salt interception schemes that prevent substantial quantities of salt entering the River Murray System, and which complement this approach</li> </ul> </li> </ul>

### 14.1.2 Basin Plan requirements

Part 7 of Chapter 10 of the Basin Plan requires Victoria's North and Murray Water Quality Management Plan to address these requirements:

- key causes or likely causes of water quality degradation for surface water and groundwater
- address risks arising from water quality degradation
- identify water quality targets for surface water and groundwater
- identify measures that contribute to the achievement of Basin Plan water quality objectives for surface water
- identify rules to manage water quality in groundwater SDL resource units against elevated salinity or other types of water quality degradation

## 14.2 Victoria's water quality management framework

Victoria has well-established water quality planning mechanisms and frameworks. Surface water quality, groundwater quality and land salinity is affected by many processes and sources including:

- natural catchment processes such as runoff from uncleared catchments and groundwater discharges to waterways
- licensed point source wastewater discharges
- small dispersed point source discharges such as septic tanks
- diffuse sources, including runoff from dryland farms, drainage from irrigated land and stormwater from roads and towns
- changes in catchment water balances such as dryland salinity
- naturally occurring minerals present in aquifers that dissolve in groundwater

The water quality management framework in Victoria addresses these issues and will be used to deliver on the water quality and salinity requirements of the Basin Plan.

The Victorian water quality management framework includes a multifaceted arrangement of regulation, policy and strategy to protect water quality (see [Figure 14-1](#)).

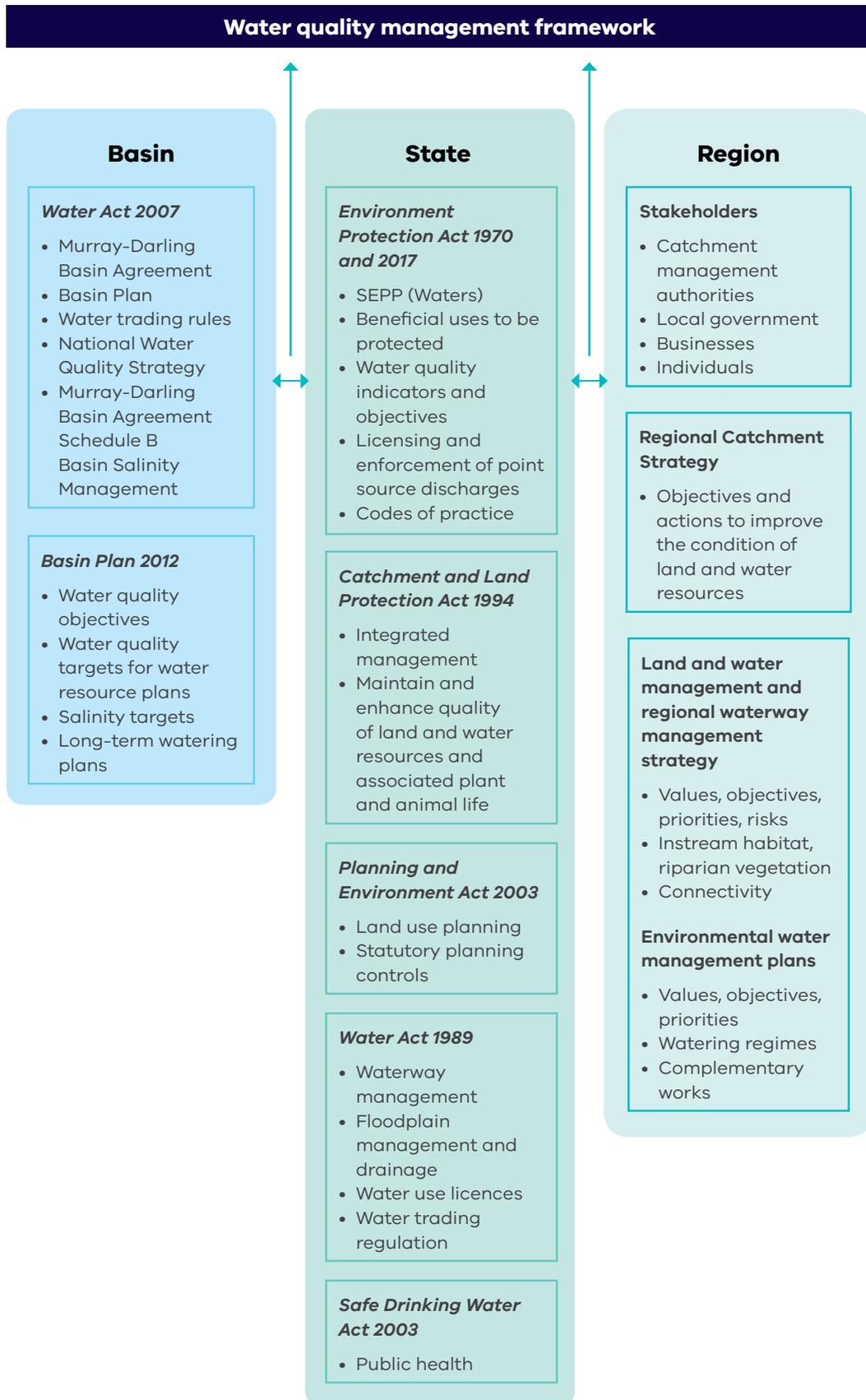


Figure 14-1: Victoria’s water quality management framework

### 14.2.1 Roles and responsibilities

In Victoria the Department of Health and Human Services (DHHS), Department of Environment, Land, Water and Planning (DELWP), Environment Protection Authority (EPA), municipal councils, water corporations, local government and catchment management authorities all have a role in managing water quality.

DHHS, DELWP and the EPA work to regulate water quality requirements and respond to impacts on water quality. In regulating water quality, DHHS sets standards for drinking water quality and matters of public health. The EPA implements the State Environment Protection Policy (Waters) (SEPP (Waters)) and regulates discharges into and pollution of the environment. SEPP (Waters) also influences planning schemes administered by municipal councils.

DELWP administers the Victorian Water Act and the *Catchment and Land Protection Act 1994* and supports water corporations and catchment management authorities to carry out their obligations and functions. Water corporations have a major role in managing Victoria's water resources to help meet water quality targets and objectives and respond to water quality events. Catchment management authorities support this role through land management activities.

**Figure 14-2** shows how various agencies and the community use SEPP (Waters) to inform decision making.



Figure 14-2: Applications of SEPP (Waters) in different areas of the water sector

### 14.3 How Victoria's water quality management aligns with the Basin Plan

**Figure 14-3** shows how the Basin Plan requirements are linked to and inform water quality and salinity management in Victoria. The left-hand side of the figure shows the requirements of a water quality management plan as specified in the Basin Plan. The right-hand side of the figure shows the Victorian framework and how the two are connected.

Victoria's water quality framework and the National Water Quality Management Strategy are consistent. The Basin Plan water quality and salinity management plan has been developed using this nationally-agreed framework for water quality planning and management. As a result, Victoria can meet the requirements of the Basin Plan through its existing water quality management arrangements.

SEPP (Waters) environmental quality objectives and load-based reduction targets applied in Victoria are similar to, or more stringent than, those listed in the Basin Plan. Therefore the implementation of Victoria's environmental protection policy will have positive outcomes for the water quality of the shared waters of the River Murray and ultimately on South Australia and New South Wales. Victoria's activities will have no effect on Queensland and the Australian Capital Territory.

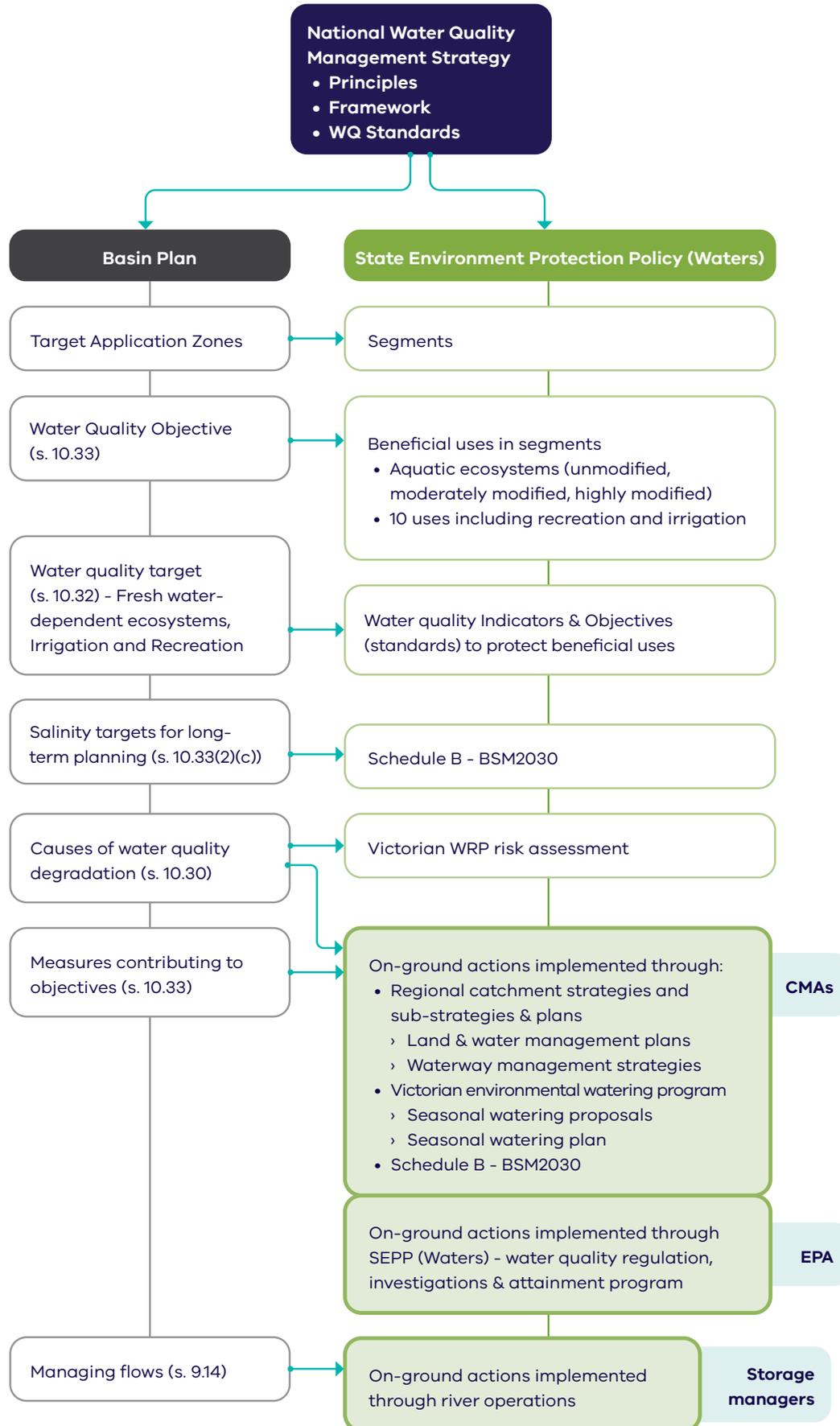
### 14.4 Surface water - water quality degradation, risks and targets

Surface water quality across the Victorian Murray and Northern Victoria water resource plan areas is highly variable spatially and temporally, but there is a general trend in decreasing water quality from east to west in the River Murray and from south to north in the tributary valleys.

These trends are associated with high yielding forested areas at the headwaters of catchments which contribute significant runoff and base flows, and the intensively developed areas on floodplains which receive less rain and contribute lower volumes to streamflows.

The trend in decreasing water quality from east to west is most evident in salinity concentrations along the River Murray as shown in **Figure 14-4**, with major increases in concentration occurring between the Torrumbarry Weir and Swan Hill resulting from lower inflows and higher salt loads. Increasing gradients also occur from east to west for other water quality parameters such as dissolved organic carbon, filterable reactive phosphorus, total Kjeldahl nitrogen, total phosphorus and turbidity (Henderson, Liu, & Baldwin, 2013).

Like all water quality characteristics in a dynamic river system, salinity varies within the year and from year to year. However, there is irrefutable evidence that the wide range of management actions implemented through the Basin Salinity Management Strategy and the Murray-Darling Basin Agreement have reduced salinity levels in waterways across Victoria's North and Murray water resource plan area. This is shown in **Figure 14-5**.



**Figure 14-3: Alignment between Basin Plan water quality requirements and Victoria’s water quality management arrangements in the water resource plan areas**

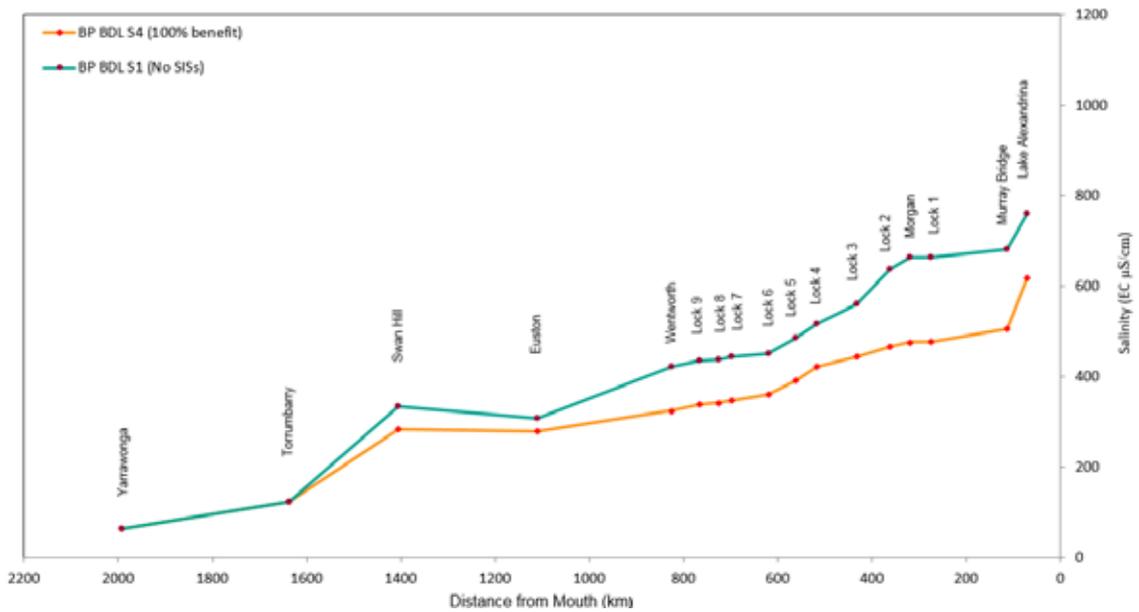


Figure 14-4: Average daily salinity along the River Murray over the 1975-2000 Benchmark Period with 2013 levels of development and salt interception

Source: MDBA (2014)

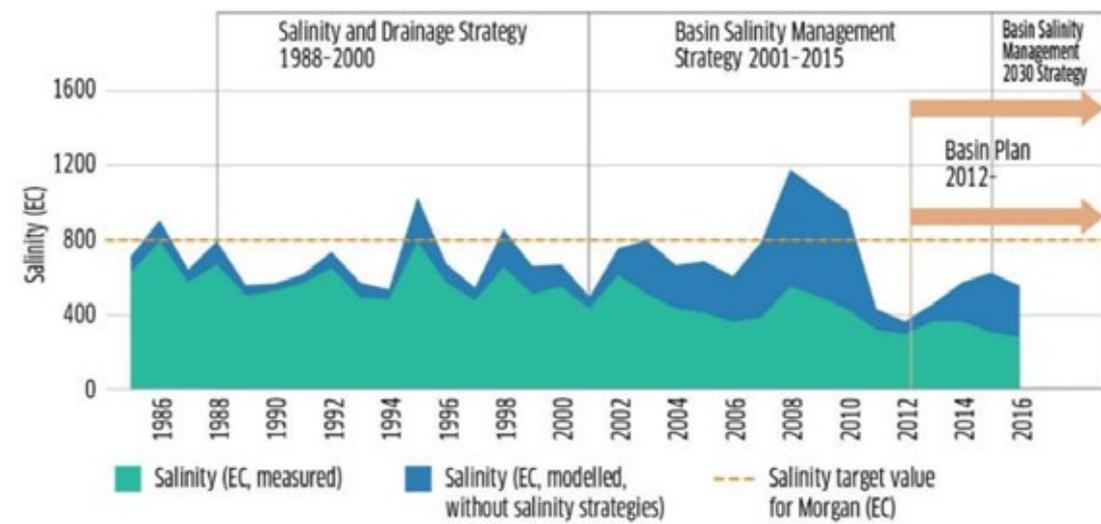


Figure 14-5: River Murray salinity at Morgan and impact of management strategies

Source: Source: MDBA (2017)

#### 14.4.1 Causes or likely causes of water quality degradation

Section 10.30 of the Basin Plan requires Victoria's North and Murray Water Quality Management Plan to identify the causes, or likely causes, of water quality degradation of water resources in the water resource plan area. In identifying the causes or likely causes of degradation, there must be regard to the key causes identified in Chapter 9 of the Basin Plan. The Basin Plan identifies nine types of water quality degradation in the Murray-Darling Basin and their causes, including elevated salinity, suspended matter and nutrients. More details are in the Basin Plan Schedule 10.

**Appendix A** details the types of water quality degradation in the Victorian Murray and Northern Victoria water resource plan areas. In identifying this list, the Risk Assessment (**Appendix B**) was considered and there was consideration of the Basin Plan Schedule 10 list of causes of water quality degradation. Victoria also reviewed the state's strategies and plans and consulted with regional agencies.

Degradation or decline in water quality, either from natural occurring events like drought and fire or human-induced impacts from land clearing and land use change, can significantly impact on beneficial uses. Sections of the catchments that retain a large amount of native vegetation like the mountains and highlands have been less affected by water quality degradation than flat lands that have been highly modified.

Some of the degradation in the northern sections that has occurred through a major shift in catchment land use and water use has led to a 'step change' in water quality. While there have been actions to alleviate or reduce these impacts, water quality cannot be returned to that experienced before European settlement.

Many risks and causes of water quality degradation occur at a local level and do not affect the overall condition at a water resource plan scale. The water quality management plan for Victoria's North and Murray water resource plan area considers both system-wide and local risks and causes of water quality degradation as identified in **Appendix A**.

#### 14.4.2 Risks to water quality

The Risk Assessment (**Appendix B**) for the Victoria's North and Murray water resource plan area assessed risks to the condition of surface water. It outlined the risks, the level of risk, description of medium to high risks, and strategies to address each medium to high risk as required in sections 10.41-10.43 of the Basin Plan.

Section 10.31 of the Basin plan requires Victoria's North and Murray water quality management plan to identify measures to address the risks arising from elevated levels of salinity or other types of water quality degradation as outlined in the Basin Plan and identified as a result of the Risk Assessment. See **Appendix B**.

The Risk Assessment (**Appendix B**) identified the current and future risks to water quality for surface water and groundwater. The Risk Assessment outlines:

- the risks
- the level of risk
- description of medium to high risks
- strategies to address each medium to high risk as required in 10.41-10.43 of the Basin Plan

**Table 14-2** shows the consolidated risks to water quality that rank medium or higher across the three water resource plan areas. Climate change, extreme drought, failure to continue to invest in best practice land use, earth resource development and pests and weeds generated the highest levels of risk. All risks which were rated as medium or higher require a strategy to be identified to address the risk, these risks and strategies are outlined in **Appendix B**.

Detailed summaries of the risks, the causes of degradation and the impact on water users and measures to address water quality are contained in [Appendix A](#).

The risks to consumptive and Aboriginal uses of groundwater are addressed by a range of strategies described in the Risk Assessment ([Appendix B](#)).

**Table 14-2: Consolidated medium or higher-level water quality risks in the water resource plan areas**

Cause	Condition (water quality)										
	Northern Victoria (surface) water resource plan area					Victorian Murray (surface) water resource plan area					Goulburn-Murray groundwater
	Environment	Consumptive	Recreational	Aboriginal	Aboriginal	Environment	Consumptive	Recreational	Aboriginal	Consumptive	Aboriginal
Climate change	High	High	High	High	High	High	High	High	High	High	High
Extreme drought	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Extreme wet period	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Flooding and overbank inundation	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Bushfires	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Land use changes affecting condition	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Failure to continue to invest in improved land use practices	High	High	High	High	High	High	High	High	High	High	High
Farm dams	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Increased utilisation of water access rights	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium

Cause	Condition (water quality)													
	Northern Victoria (surface) water resource plan area						Victorian Murray (surface) water resource plan area						Goulburn-Murray groundwater	
	Environment	Consumptive	Recreational	Aboriginal	Environment	Consumptive	Recreational	Aboriginal	Consumptive	Recreational	Aboriginal	Consumptive	Aboriginal	
Increases in the number of entitlements leading to increased take														
Non-compliance with the <i>Water Act 1989</i>														
Changes to the timing and location of demands														
Earth resource development														
Point source discharge														
Major asset failure														
Pests and weeds														

Legend	5	4	3
	Very high risk	High risk	Medium risk

### 14.4.3 Measures to address water quality degradation

Section 10.31 of the Basin Plan requires Victoria's North and Murray Water Quality Management Plan to identify measures to address the risks arising from elevated levels of salinity or other types of water quality degradation (section 10.41(2)(d)) identified as a result of the Risk Assessment (see [Appendix B](#)).

The measures to address these risks are:

- BSM2030 which protects the waters of the Murray River and its tributaries
- the implementation of SEPP (Waters)

It is not considered any other measures are necessary to meet Basin Plan requirements on the basis that all risks identified have been addressed in Victoria's North and Murray water resource plan area through:

- strategies identified in the Risk Assessment as outlined in [Appendix B](#) and
- the measures contributing to the achievement of water quality objectives as outlined in [Appendix A](#)

This section provides details of the key measures to achieve water quality objectives in Victoria relevant to the Basin Plan. These are the State Environment Protection Policy (Waters) and the Basin Salinity Management Strategy. More detail is provided in [Appendix A](#).

#### 14.4.3.1 State Environment Protection Policy (Waters)

The primary regulatory mechanism for protecting Victoria's water environments from pollution and waste is the *Environment Protection Act 1970* and *2017* (the EP Act). The EP Act defines high-level objectives for protecting Victoria's water environments and gives the Environment Protection Authority and other duty holders their roles, responsibilities and powers for environmental protection.

State Environment Protection Policy (Waters) (SEPP (Waters)) was updated in 2018 and ensures that Victoria has a contemporary statutory policy for the protection and management of surface water and groundwater in Victoria. This is achieved by establishing in law the uses and environmental values to be protected, defining the level of environmental quality required for their protection and setting rules and obligations to make sure management actions are taken to protect water quality.

The State Environment Protection Policy (Waters) objective is to protect and improve the quality of Victoria's waters while providing for economic and social development.

SEPP (Waters) works in parallel with a number of tools used by Victoria's environment and resource managers, industry groups and the broader community to protect our water environments and the health of Victoria's waters. The most prominent of these are the Victorian Water Act and associated regional waterway strategies.

By aiming to improve the health of Victorian waters, SEPP (Waters) is aiming to enhance the quality of shared waters, and so it has regard to possible impacts on the ability of another Basin State to meet water quality targets.

State environment protection policies are subordinate legislation under the Environment Protection Act. The State Environment Protection Policy (Waters) supports protection of Victoria's waters in two key ways:

- it outlines the beneficial uses or public values to be protected in different water bodies and associated environmental quality indicators and objectives required to support these beneficial uses
- it provides the rules for the regulator, the Environment Protection Authority (EPA), and obligations on industry to protect and improve water quality. The rules and obligations typically include:
  - obligations on duty holders — detailed expectations and requirements for a range of activities that impact on water quality, such as setting the standards for sewerage infrastructure containing flows
  - decision rules for the regulator and processes to be followed when managing scheduled premises, including that there must not be any direct discharge of waste to any aquifer except for specific purposes, and where specified conditions are met, such as where the EPA may approve a mixing zone when issuing a licence

The environmental quality indicators and objectives in SEPP (Waters) have been developed to conform with and complement the nationally-agreed approach outlined by the Australian and New Zealand Environment Conservation Council.

The SEPP (Waters) rules and obligations collectively make up a program of actions through which environmental quality objectives are to be achieved or 'attained' to protect beneficial uses.

By highlighting these legal obligations in the State Environment Protection Policy (Waters), duty holders can understand their legal obligations to manage water quality.

SEPP (Waters) has an implementation plan that outlines the Government's priorities and drives work priorities and budgeting. This policy is also used to inform regional and local strategies and plans that aim to improve environmental quality objectives (EPA, 2018).

#### **14.4.3.2 Basin Salinity Management 2030 Strategy**

The second measure identified is Implementation of Victoria's obligations under the Basin Salinity Management Strategy 2030 (BSM2030) (Murray-Darling Basin Ministerial Council, 2015). The salinity levels of the River Murray historically have been the highest priority water quality issue.

BSM2030 protects the waters of the River Murray and its tributaries by requiring all Basin states including Victoria to monitor and report on any action taken after 1988 that changes the salinity concentration of the River Murray at Morgan in South Australia by 0.1 electrical conductivity (EC) or greater, and to maintain the balance of their actions as a net credit.

Implementation of this strategy monitors and manages any causes of salinity water quality degradation.

Each year Victoria monitors and reports on the end-of-valley salinity targets recorded in Division 4 of Part 4 of Chapter 9 of the Basin Plan and Appendix 1 of Schedule B of Schedule 1 of the *Commonwealth Water Act (2007)*. This provides a valley-scale context to the identification and management of salinity risk to the shared water resources and assets within valleys.

The end-of-valley targets are to be reviewed by each Basin state before the BSM2030 mid-term review in 2026, to make sure these target values represent the contemporary understanding of valley catchments.

The Salinity and Drainage Strategy (1988) provided an interstate management agreement between Victoria, South Australia and New South Wales to reduce river salinity and protect irrigated land. It was a pollutant-trading framework based on a register of actions that earned

salinity credits and debits and was supervised by the Murray-Darling Basin Ministerial Council and administered by the Murray-Darling Basin Authority.

The Salinity and Drainage Strategy was formalised as Schedule B of the Murray-Darling Basin Agreement which enabled the construction of salt interception schemes.

Victoria planned its salinity management activities to comply with this agreement and on the understanding that salinity credits were scarce and needed to be carefully rationed.

In 2000 all Basin states became signatories to the Basin Salinity Management Strategy 2001-2015 (BSMS) (MDBA, 2001) which continued the beneficial work of the Salinity and Drainage Strategy. The BSMS focused on managing the impact of irrigation development before 1988 and continues to address the impacts of salinity on the River Murray.

The register of salinity credits and debits is subject to regular reviews and independent audits. These audits have confirmed that Victoria has consistently complied with the requirements of Schedule B of the Basin Plan.

Salinity management activities in Victoria will continue to comply with these requirements, and as such have positive effects on South Australia and New South Wales. Victoria's activities will have no effect on Queensland and the Australian Capital Territory.

#### **14.4.3.3 Water quality targets for surface water**

To help maintain appropriate water quality for environmental, social, cultural and economic activities, the water quality management plan identifies water quality target values for fresh water-dependent ecosystems, irrigation water and recreational water for the water resource plan area. Establishment of these target values provides the framework for addressing the causes of water quality degradation and maintaining or improving water quality in the water resource plan area.

The Basin Plan presents water quality target values for water resource plans (sections 9.15-9.18 of the Basin Plan) which are to be considered in the developing measures for each water resource plan area.

These are identified as water quality targets for:

- fresh water-dependent ecosystems
- irrigation water
- recreational water

These targets must be identified for each water resource plan area, or alternative targets may be identified (section 10.32(4) of the Basin Plan).

For the purposes of section 10.32 of the Basin Plan, Victoria identifies alternative targets for the Northern Victoria and Victorian Murray water resource plan areas for fresh water-dependent ecosystems, irrigation water and recreational water.

#### ***Fresh water-dependent dependent ecosystems***

In October 2018 Victoria gazetted the State Environment Protection Policy (Waters) (EPA, 2018). The review process involved considerable scientific analysis of water quality data and stakeholder consultation to revise the environmental quality objectives.

Specific water quality objectives for water-dependent ecosystems and species for the Northern Victoria and Victorian Murray water resource plan areas are listed in [Appendix A](#). Using the indicator and objective values of water-dependent ecosystems, species and segments<sup>8</sup> from

<sup>8</sup> Segment is a term used to identify parts of the policy area that have common features in terms of environmental

SEPP (Waters), as distinct from the Basin Plan targets for freshwater dependent ecosystems, means the environmental quality objectives are more relevant to the local Victorian conditions. The application of each target value to the Northern Victoria water resource plan area and the Victorian Murray water resource plan area are provided in [Appendix A](#).

The Victoria's North and Murray Water Quality Management Plan applies the SEPP (Waters) segments and sub-segments. These targets will not only provide more targeted levels of protection but will also support effective management as they form part of Victoria's current water quality management framework.

### ***Irrigation water***

Victoria's water quality target for irrigation water for the Northern Victorian water resource plan area and the Victorian Murray water resource plan area is:

*That the quality of water distributed by Rural Water Corporations for the primary purpose of irrigation is representative of the quality of source water which is managed for quality through intergovernmental agreements, and Victoria's water quality management framework.*

This target is an alternative to the Basin Plan target and recognises Victoria's commitment to water quality protection for irrigation by protecting source water quality through the state's water quality management framework, both in the shared waters of the Murray and in Victorian waterways.

Victoria's recognises that a single numerical figure to protect all irrigation in multiple districts is not an approach recognised by the Australian and New Zealand Environment Conservation Council guidelines, nor are there indicators and environmental quality objectives for irrigation included in Victoria's SEPP (Waters). There are many factors relevant to whether water of a particular quality is suitable for irrigation, including matters such as crop selection, irrigation method and soil type.

Rather than stating what quality of water in a waterway is suitable for irrigation, Victoria's water quality target encourages the need for crop selection and irrigation practices to consider the quality of available water and likely quality of that water in changing conditions.

### ***Recreational water***

The Basin Plan specifies the blue-green algae (cyanobacteria) values according to the National Health and Medical Research Council (NHMRC) Guidelines for Managing Risk in Recreational Water.

The State Environment Protection Policy (Waters) include indicators and objectives for primary and secondary contact recreation that are mostly based on the National Health and Medical Research Council guidelines:

- E. coli or enterococci can be used for freshwaters. Water managers can select either indicator but are recommended to use E. coli if they have been doing this previously, to maintain a historical dataset

As the National Health and Medical Research Council guidelines do not provide objective values for E.coli, values from the New Zealand Government Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas were used for SEPP (Waters).

SEPP (Waters) also includes objectives for secondary contact recreation which are not provided for in the NHMRC Guidelines. SEPP (Waters) was largely based on the NHMRC guidelines but departed from these guidelines in some aspects. To provide confidence for this process, three

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condition, aquatic ecosystem type and a range of current and future beneficial uses.

international experts were invited to peer review the work done to develop the draft SEPP (Waters). These experts were Graham McBride from the National Institute of Water and Atmosphere Research in New Zealand, Timothy Wade from the US Environment Protection Authority and Professor Charles Gerba from the University of Arizona. The reviewers' feedback supported the Victorian EPA's work and the reviewers considered it was sound in substance, rational and scientifically defensible.

The Basin Plan water quality targets for water used for recreational purposes are the values for cyanobacteria cell counts or biovolume in Chapter 6 in (National Health and Medical Research Council, 2008).

The water quality management plan will apply the SEPP (Waters) water quality objectives for recreational water, noting that these are based on a rigorous scientific review process.

## 14.5 Groundwater - water quality degradation, risks and targets

Like surface water quality, good quality low salinity groundwater statewide is generally found in the upland areas of the north east and ranges to the south. Water quality declines to the west and north especially in the shallow (water table) resources. Groundwater salinity in these areas is naturally very high where the water table is shallow, and evaporation is higher than recharge. Saline groundwater may occur above and beside aquifers containing relatively much fresher groundwaters. The areas of elevated salinity are considered natural and do not reflect degradation of the resource.

### 14.5.1 Causes or likely causes of water quality degradation

Section 10.35A of the Basin Plan requires Victoria's North and Murray Water Quality Management Plan to identify the causes, or likely causes, of water quality degradation of water resources in the water resource plan area. Victoria undertook an assessment of groundwater quality and identified that there has been no degradation of groundwater. Because there has been no degradation of water quality of groundwater in the Goulburn-Murray water resource plan area there has thus been no causes, or likely causes, of water quality degradation of groundwater. Areas of high groundwater salinity in the and around the Shepparton Irrigation District and in the west of the state are not a matter of degradation, but rather the natural state of the system. This is explained further in [Part 5 of Appendix A](#).

In assessing degradation regard was had to causes identified in Part 2 of Chapter 9 of the Basin Plan. Also, the risks identified in the Risk Assessment ([Appendix B](#)) outlined below.

### 14.5.2 Risks to the quality of groundwater resources

#### 14.5.2.1 Summary of regard to the Basin Plan

Part 2 of Chapter 9 of the Basin Plan and Schedule 10 of the Basin Plan identifies the type of water quality degradation and their causes. These are:

- Elevated levels of salinity:
  - the process of mobilisation of salt stores in the landscape and geological predisposition to salinity development by irrigation at high salinity risk locations without adequate drainage management  
Example: Locations where there is a high risk of recharge to groundwater resulting in saline discharges to surface waters.
  - the use of groundwater for irrigation purposes at locations where highly saline upper aquifer water drains to the lower aquifer
- Elevated levels of pesticides and other contaminants:

- allowing pesticides or other contaminants to leach into groundwater

### ***Elevated levels of salinity***

In areas where salt stores in the landscape have shifted due to the application of irrigation water without adequate drainage this has an impact on land and surface water, and there is no impact on groundwater as it is naturally saline.

The areas where groundwater use occurs in the Goulburn-Murray water resource plan area, where highly saline upper aquifer water is found overlying a higher quality lower aquifer, is in an area where the Shepparton Irrigation Region overlies the Katunga water supply protection area and Lower Campaspe water supply protection area. Management plans for these areas have identified the potential for this to occur and provide for salinity monitoring as part of the requirements of the plan. Due to these measures there this has not caused, nor it is likely to cause a degradation of groundwater by elevating the levels of salinity in the groundwater.

There are significant low transmissivity clays and silts that underlie the Shepparton Irrigation Region, which limits drainage of saline groundwater into the deeper aquifer. In the central area of the Lower Campaspe water supply protection area, monitoring of the water quality has found a trend towards increasing salinity in some extraction bores in the Calivil formation, but a trend has not been observed in nearby monitoring bores.

The salinity levels of groundwater are considered with regard to the suitability of the resource for its intended purpose, and as described in [Section 14.5.3](#) there has been no water quality degradation or groundwater and salinity is naturally occurring.

### ***Elevated levels of pesticides and other contaminants***

Victoria undertakes monitoring of groundwater quality in areas where potential degradation of groundwater may occur. Specifically, these are the Lower Campaspe and Katunga water supply protection areas and Mid-Loddon groundwater management area where sampling for water quality occurs at both State Observation Bores and groundwater users' bores. Results are reported annually and in Victoria's Water Information Management System. Monitoring indicates there has been no degradation of groundwater. Because there has been no detected degradation of water quality of groundwater in the Goulburn-Murray water resource plan area there has thus been no causes or likely causes of water quality degradation of groundwater.

#### **14.5.2.2 Summary of risk assessment**

The Risk Assessment ([Appendix B](#)) for the Goulburn-Murray water resource plan area assessed risks to the condition of groundwater. It outlined the risks, the level of risk, description of medium to high risks, and strategies to address each medium to high risk as required in sections 10.41-10.43 of the Basin Plan.

In summary, the Goulburn-Murray water resource plan area risk assessment identified these areas of medium or higher risk.

Risk of impacts on consumptive uses from:

- climate change (elevated salinity)
- land use changes which affect water condition (elevated salinity and toxicants)
- earth resources development (elevated salinity and toxicants)
- point source discharges (elevated salinity and toxicants)

These risks were identified with a low level of confidence. No risks to environmental uses were identified.

Risk of impacts on Aboriginal uses of water were identified from:

- climate change, bushfires, extreme drought, extreme wet, flooding and overbank inundation, point source discharges, major asset failure, increase in farm dams, earth resources development, failure to continue to invest in best practice land use initiatives, land use change which affects water condition, non-compliance with the Victorian Water Act, increase in the number of entitlements leading to increased take, increased utilisation of water access rights (elevated salinity and toxicants, and other water quality impacts).

It is recognised that in Victoria there is limited confidence about understanding of Aboriginal values of groundwater and the ability to manage for those values. For this reason, high risks were identified for Aboriginal use of water across all potential causes until there is greater understanding of local values and the ability to assess these more accurately. A range of strategies is being employed to manage and minimise these risks. Importantly, *Water for Victoria* (DELWP, 2016) commits to a process of information gathering and understanding of Aboriginal water values and uses to better inform the strategies and measures around water quality.

The risks to consumptive and Aboriginal uses of groundwater are addressed by a range of strategies described in the Risk Assessment ([Appendix B](#)). A risk does not constitute a cause or likely cause, and as there has been no degradation of groundwater quality observed it is clear that these risks have not eventuated.

#### **14.5.3 Water quality targets for groundwater**

The following water quality target approach for fresh water-dependent ecosystems have been considered in line with State Environment Protection Policy (Waters).

##### ***Fresh water-dependent ecosystems***

The quality of groundwater must be prevented from degradation so that:

- a) groundwater does not cause receiving waters to be affected to the extent that the level of any environmental quality indicator is greater than the level of that indicator specified for surface waters in Victoria's North and Murray Water Quality Management Plan. The indicators are the alternative water quality targets for freshwater dependent ecosystems explained in [Part 4.6.1](#) of [Appendix A](#), that are consistent with Victoria's SEPP (Waters).
- b) groundwater quality must not adversely affect the maintenance of environmental values that depend on groundwater

The target ensures that groundwater degradation is prevented by ensuring that groundwater discharge to surface water, does not result in the surface water quality indicators in Victoria's North and Murray Water Quality Management Plan not being met. A key parameter for which groundwater quality may impact on surface water is salinity (EC/TDS) and so this is the focus of rules and measures to protect groundwater from degradation.

##### ***Irrigation water***

Water quality targets do not apply as no groundwater is distributed by an irrigation infrastructure operator for irrigation.

##### ***Recreational water***

Water quality targets do not apply as no groundwater is used for recreational purposes.

#### 14.5.4 Measures for the Goulburn-Murray: Sedimentary Plain SDL resource unit

Section 10.35D of Basin Plan requires that a measure or rule is provided for the Goulburn-Murray: Sedimentary Plain SDL resource unit to ensure that requirements in section 10.35C of the Basin Plan are met. These requirements relate to rules for:

- the time, place and rate of take for groundwater
- limits and restrictions on groundwater take
- maintenance of a register of bores used for monitoring water quality and salinity

Victoria meets these requirements for all SDL resource units in the Goulburn-Murray water resource plan area through prescriptions in statutory plans and local management plans and maintaining the State Observation Bore Network. This is explained further in [Part 5.5](#) of [Appendix A](#) and through Victoria's accredited response to section 10.35D and 10.35C of the Basin Plan.

### 14.6 Monitoring water quality

Victoria manages its freshwater and groundwater systems through a range of long-term monitoring programs. Various water quality indicators are monitored, depending on the objectives of the monitoring program.

The Department of Environment, Land, Water and Planning (DELWP) carries out monitoring programs across the state with the help of catchment management authorities and water corporations using physio-chemical, bacteriological and biological indicators.

DELWP is responsible for carrying out long-term assessment of the state's water resources under the Victorian Water Act. DELWP monitors Victoria's environmental water quality through its Victorian Water Quality Monitoring Network, largely through regional water monitoring partnerships and partnering with the EPA for biological monitoring.

Monitoring in the Northern Victorian water quality management plan applies the general principles for monitoring set out in section 13.04 of the Basin Plan.

The regional water monitoring partnerships and State Observation Bore Network have been established to collect data on water quality and water quantity for surface water and groundwater respectively to satisfy legislative and regulatory compliance, performance monitoring, policy development and operational decision-making as set out in the Victorian Water Act for more information see [Chapter 15](#).

Victoria has a range of reporting initiatives that are being implemented to improve water quality monitoring and are described here.

Data collected primarily through the regional water monitoring partnerships, State Observation Bore Network and salinity management program is made available for a variety of data sources and reports including:

- Water Management Information System: data collected on water quality and quantity is held in this system, which is made available on the DELWP website
- annual Victorian Water Accounts: document key water management data for Victoria and provide a summary of water availability, water allocation and use of bulk water for surface water and groundwater
- Victorian Environmental Water Holder: VEWH publishes its annual report and various other reports about outcomes of the use of environmental water allocations
- Basin Salinity Management 2030: monitors and documents salinity management, including analysing and modelling to quantify, validate and review accountable actions to delayed salinity impacts. BSM2030 supports river managers, environmental holders and other water managers

Victoria also reports on streamflow and salinity for end-of-valley target sites annually. Every second year, a comprehensive report is provided to the Ministerial Council on progress against BSM2030 objectives. Every other year, a status report is provided for the Basin Officials Committee along with a summary report for the Ministerial Council.

Schedule 12 of the Basin Plan requires the Basin states to report on water quality targets on a five-yearly basis. The Basin Plan water quality objectives in Chapter 9 are consistent with Victoria's beneficial uses for protecting drinking, industrial and aquatic ecosystems that a waterway and waterbody can support.

Implementing the State Environment Protection Policy (Waters) is designed to:

- protect beneficial uses
- make sure that actions in the catchments do not have a detrimental impact on the quality of freshwater
- ensure that different water uses and values, including for drinking, agricultural, recreational and aquatic ecosystems, are suitable for their purpose consistent with section 5.04 of the Basin Plan

For further detail see [Appendix A](#).