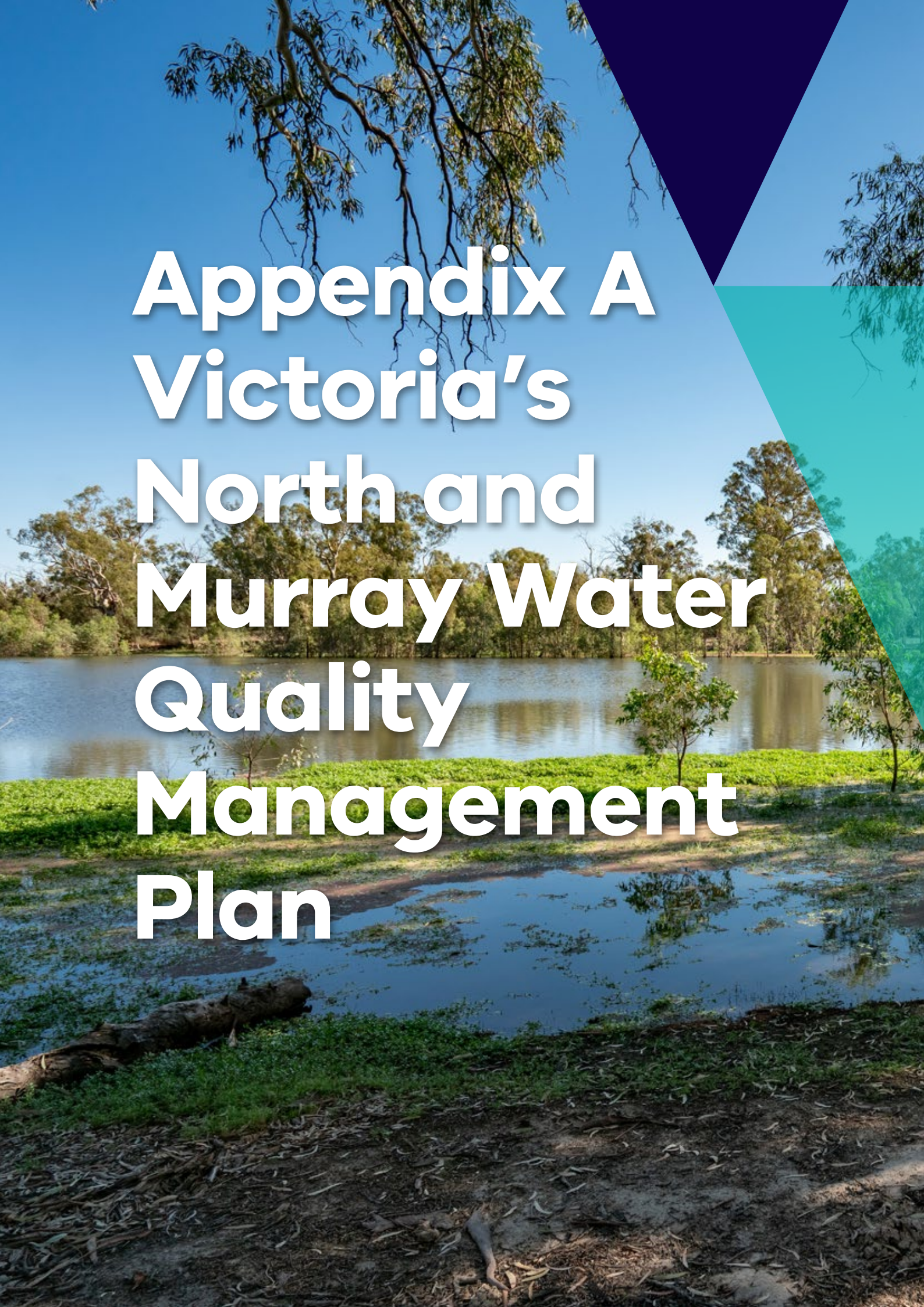

Appendix A Victoria's North and Murray Water Quality Management Plan

Appendix A Water Quality Management Plan

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1. Water quality and the Murray-Darling Basin Plan

This Appendix provides the Water Quality Management Plan for Victoria's North and Murray Water Resource Plan.

Victoria's North and Murray Water Quality Management Plan applies the State Environment Protection Policy (Waters) as relevant.

1.1 Water quality management under the Basin Plan

Chapter 10 of the Basin Plan sets out the requirements for water resource plans. Part 7 of Chapter 10 requires a water resource plan to include a water quality management plan.

Victoria's North and Murray Water Quality Management Plan applies to the following water resource plan areas:

- Victorian Murray water resource plan area (SW2)
- Northern Victoria water resource plan area (SW3)
- Goulburn-Murray water resource plan area (GW2)

Water quality management plans must:

- identify causes or likely causes of water quality degradation having regard to the key causes outlined in Schedule 10 of the Basin Plan for surface water (section 10.30) and groundwater (section 10.35A)
- set targets for fresh water-dependent ecosystems, irrigation water and recreational water, for surface water (section 10.32 of the Basin Plan) and groundwater (section 10.35B of the Basin Plan)
- for surface water, specify measures that contribute to the achievement of the Basin Plan's water quality objectives in Chapter 9 having regard to the causes or likely causes of water quality degradation, the salinity targets for long-term salinity planning and management of water quality target values identified for the water resource plan area (section 10.33)
- have regard to the impact of measures (or absence of measures) on another Basin State and any adverse impacts of measures on Basin water resources of another state (section 10.35 of the Basin Plan)
- for groundwater, consider and specify rules or measures that support the maintenance of water quality within groundwater SDL resource units against the effects of elevated levels of salinity and other types of water quality degradation (section 10.35C and 10.35D of the Basin Plan)

Also in relation to water quality:

- water resource plans must be prepared having regard to current and future risks to the condition and continued availability of the water resources in the WRP area (section 10.41 of the Basin Plan)
- a water resource plan must specify the monitoring of the water resources of the water resource plan area that will be done to meet obligations of section 13.14 to report on matters listed in Schedule 12 (section 10.46 of the Basin Plan). For water quality:
  - annual reporting is required for how Basin States have regard to the water quality targets for flow management as set out in Chapter 9 of the Basin Plan
  - every five years Basin States must report on their progress in implementing their measures to contribute to the achievement of water quality objectives that have been specified in water quality management plans

Water quality management plans are not required to outline how Victoria will respond to extreme water quality events such as an outbreak of blue-green algae. This matter is considered in response to Part 13 of Chapter 10 of the Basin Plan and discussed further in **Chapter 10** of Victoria's North and Murray Water Resource Plan Comprehensive Report.

A working group was established to comment on and assist in the preparation of the Water Quality Management Plan. See **Part 3.2.2** of **Appendix D**.

1.2 Water quality objectives in 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 activity in the Murray-Darling Basin.

The outcome is that Basin water resources remain fit-for-purpose (section 5.04) and reproduces the water quality objectives for Basin resources set out in Chapter 9 of 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 in **Table 1**.

Basin States are required to identify measures that will contribute to the achievement of these objectives while having regard to the cause or likely causes of water quality degradation and identified water quality target values.

Table 1: Water quality objectives in the Basin Plan

Use	Objective
Fresh water-dependent ecosystems (section 9.04 of the Basin Plan)	• *For Ramsar wetlands*: Quality of the water is sufficient to maintain the ecological character of those wetlands • *For other water-dependent ecosystems:* Quality of the water is sufficient to: – protect and restore the ecosystems – protect and restore the ecosystem functions of the ecosystems – ensure that the ecosystems are resilient to climate change and other risks and threats (parallels with Environmental Watering Plan Objectives)
Raw water for treatment for human consumption (section 9.05 of the Basin Plan)	• To minimise the risk that the quality of drinking source water results in adverse human health effects • To maintain the palatability rating of drinking source water at the level of good as set out in the *Australian Drinking Water Guidelines* (2011) • To minimise the risk that quality of drinking source water results in odour of drinking water being offensive to consumers
Irrigation water (section 9.06 of the Basin Plan)	• 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
Recreational water (section 9.07 of the Basin Plan)	• 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
Maintaining good levels of water quality (section 9.08 of the Basin Plan)	• 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 the Basin Plan), an objective is to maintain that level
Salt export (section 9.09 of the Basin Plan)	• For the River Murray System: To ensure adequate flushing of salt from the system into the Southern Ocean – 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 during each water accounting period (this takes into consideration cyclical climate influences, existing works and measures like salt interception schemes that prevent substantial quantities of salt entering the system and which complement this approach)

2. Victoria's water quality management framework

Surface water and groundwater quality and 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

Victoria has a well established water quality management framework to address these issues. This framework 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.

Important elements of the framework are discussed in this section. **Figure 1** provides a more detailed description of Victoria's water quality management framework.

2.1 Key entities in water quality management

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 and catchment management authorities all have a role to play in managing water quality.

DHHS, DELWP and the EPA all play a role in regulating water quality requirements and responding to impacts on water quality. In regulating water quality, the Department of Health and Human Services sets standards for drinking water quality and matters of public health.

The Environment Protection Authority implements State Environment Protection Policies, regulates discharges into, and pollution of, the environment. The State Environment Protection Policy (Waters), also referred to as SEPP (Waters), provides a framework for the protection and management of water quality in Victoria, covering surface waters, estuarine and marine waters and groundwaters across the State. SEPP (Waters) also influences planning schemes which are 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 of their obligations and functions.

Water corporations play a key role in managing Victoria's water resources to support meeting water quality targets and objectives and responding to water quality events.

Catchment management authorities support this role through land management activities.

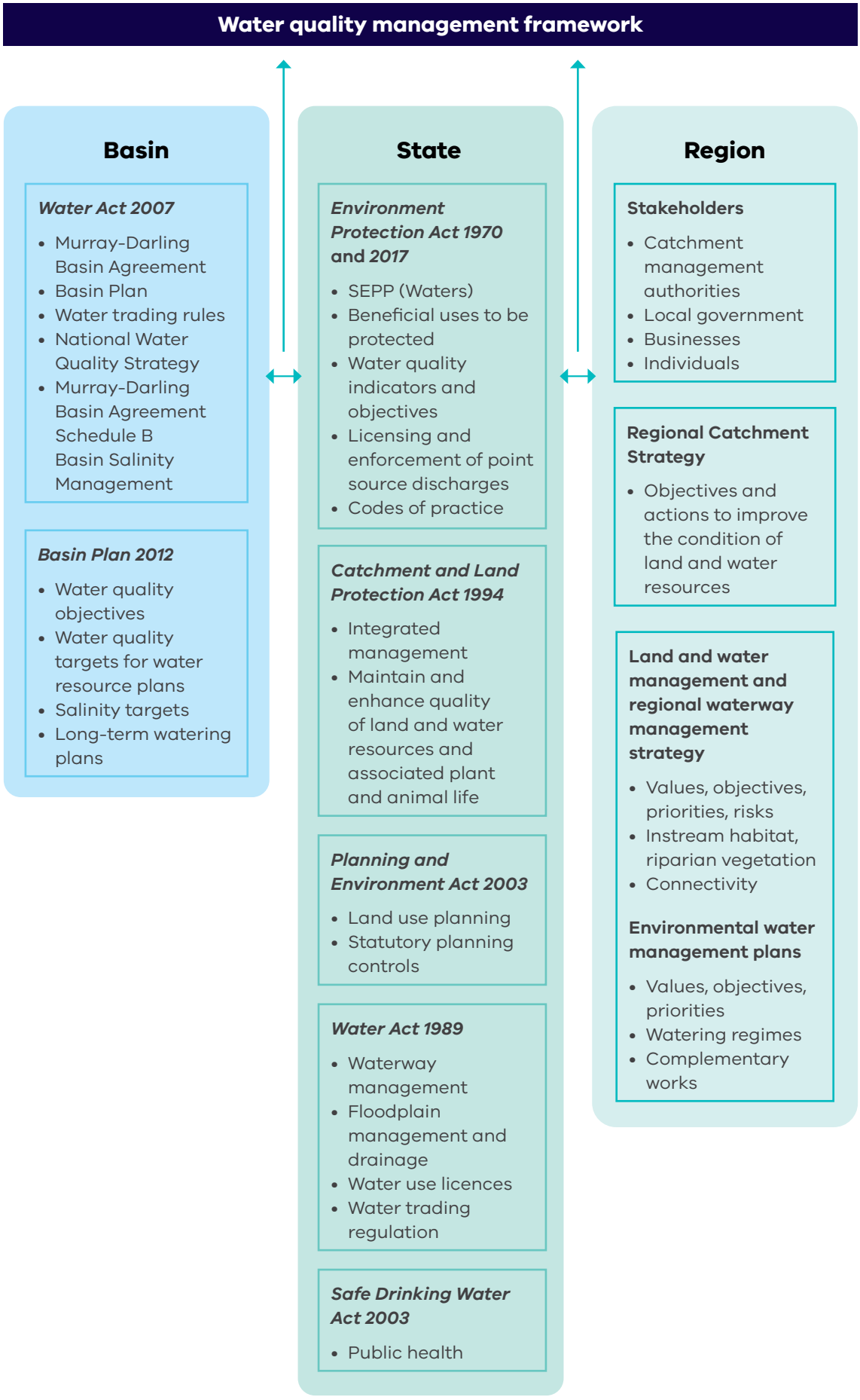

Figure 1: Victoria's water quality management framework

2.2 National Water Quality Management strategy and guidance

The National Water Quality Management Strategy (Australian Government, 2018) developed by the Australian Government in conjunction with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018 and 2000 collectively provide a national strategic direction for the management of Australia's surface, groundwater and coastal waters.

The strategy includes nationally agreed policies and principles for water quality management. It recognises the importance of understanding and protecting water quality by maintaining or improving it so that it is 'fit for purpose' and suitable for the desired values and uses and the specific local conditions.

Victoria was an active participant in strategy and guideline renewal process. This is consistent with the state's approach as well as the defined community values for aquatic ecosystem, cultural and spiritual values, drinking water, industrial water, primary industries and recreation and aesthetics.

2.3 *Environment Protection Act 1970* and *2017* and the *State Environment Protection Policy (Waters)*

Victoria's water quality protection framework was first established by the *Environment Protection Act 1970* (the EP Act). The EP Act was updated in 2017 and states that the objective of the Environment Protection Authority (EPA) is to protect human health and the environment by reducing the harmful effects of pollution and waste.

The EP Act establishes the powers, duties and functions of the Environment Protection Authority. These include the administration of the EP Act and any regulations and orders made according to it, administering State Environment Protection Policies (SEPPs) and industrial waste management policies, issuing works approvals, licences, permits, pollution abatement notices and implementing National Environment Protection Measures.

The EP Act has a basic philosophy of preventing pollution and environmental damage by setting environmental quality objectives and establishing programs to meet them in SEPPs. These policies aim to safeguard the environmental values and human activities (beneficial uses) that need protection from the effect of pollution and waste in the State of Victoria.

State Environment Protection Policy (Waters) 2018 is the instrument that formally defines the beneficial uses and environmental quality (water quality) objectives for the whole of Victoria, including Victoria's North and Murray water resource plan area. The SEPP (Waters) identifies legally enforceable rules for decision makers and obligations on industry to protect our water environments.

Obligations in the SEPP (Waters) include the requirements for the management of risks to beneficial uses, for example how municipal councils must manage their assets, and how water corporations and other industries manage waste and wastewater. Obligations to protect groundwater beneficial uses are also listed.

The SEPP (Waters) is also used to inform a range of strategies and plans that are prepared at varying scales.

Victoria's SEPP (Waters) defines segments[1] for Victorian waters, beneficial uses and the water quality indicators and objectives necessary to protect those beneficial uses.

These three elements align with the Basin Plan's target application zones, water quality objectives and water quality targets.

2.3.1 Water quality segments and beneficial uses

2.3.1.1 Surface water

State Environment Protection Policy (Waters) defines the beneficial uses and the water quality objectives required to protect them in defined segments.

The surface water segments that apply to Victoria's North and Murray water resource plan area are:

- Highlands
- Uplands A
- Uplands B
- Central Foothills and Coastal Plains
- Murray and Western Plains

For a comparison of how these surface water segments relate to the Victoria's North and Murray water resource plan areas (surface water) see **Figure S.1**, in Schedule 1 to this Appendix. The beneficial uses to be protected for all waters are:

- Water dependent ecosystems and species
  - largely unmodified
  - slightly to moderately modified
  - highly modified
- Traditional Owner cultural values
- Agriculture and irrigation
- Industrial and commercial
- Human consumption of aquatic foods
- Water based recreation
  - primary contact
  - secondary contact
  - aesthetic enjoyment
- Cultural and spiritual values
- Aquaculture
- Human consumption after appropriate treatment
- Navigation and shipping
- Groundwater specific
  - potable water supply
  - potable mineral water supply
  - buildings and structures
  - geothermal properties

1 Segment is a term used to identify parts of the policy area that have common features in terms of environmental condition, aquatic ecosystem type and a range of current and future beneficial uses.

Water quality indicators and environmental quality objectives are defined for each of the beneficial use listed in each segment.

The SEPP (Waters) beneficial uses are consistent with the Basin Plan uses, being: fresh water-dependent ecosystems, raw water for treatment of human consumption, irrigation water, recreational water, maintaining good levels of water quality and salt export (Part II, Division 1 of SEPP (Waters)).

2.3.1.2 Groundwater

Groundwater quality is considered in both the Victorian Water Act and SEPP (Waters).

SEPP (Waters) contains seven groundwater segments and the protected beneficial uses within those segments.

The beneficial uses are assigned to each segment based on the suitability of the environmental quality to support that use or value. The segments are classified based on the background level of total dissolved solids (TDS). The segments are shown in Table 2.

Table 2: Groundwater segments listed in SEPP (Waters)

Segment	A1	A2	B	C	D	E	F
TDS range (mg/L)	0 – 600	601 – 1,200	1,201 – 3,100	3,101– 5,400	5,401 – 7,100	7,101 – 10,000	>10,001

Part 5 of this water quality management plan addresses groundwater quality and in particular groundwater salinity.

Clause 7 of schedule 3 of SEPP (Waters) sets out the environmental quality indicators and objectives for groundwater in Victoria.

2.3.2 Managing discharges

2.3.2.1 Point source

The Environment Protection Authority regulates point source wastewater discharges to surface water from 'scheduled premises'[2] through a licensing and works approval regime. Direct disposal of waste to groundwater via a bore is prohibited, with few exceptions.

Industrial wastewater is either retained on site or discharged to wastewater treatment systems operated by Victoria's water corporations. Wastewater treatment systems require 'works approvals' issued by the EPA and a wastewater discharge licence if wastewater is discharged off site. The SEPP (Waters) objectives are one of the considerations in the Environment Protection Authority's regulatory decision making about point source wastewater discharges, as well as the existing environmental quality of the receiving environment and the results of a receiving water risk assessment.

SEPP (Waters) contains rules for decision makers and obligations on water corporations and industry in Part 3 Division 1 on waste and wastewater management and Division 3 on protecting groundwater beneficial uses.

The Environment Protection Authority requires water corporations to report compliance with wastewater discharge licences through annual performance statements. The statements are publicly available on the EPA's website. The EPA undertakes audits of declarations made through the annual performance statements. Other licence conditions require water corporations to notify the EPA if they determine a non-compliance with a discharge limit or licence condition.

2 Environment Protection (Scheduled Premises) Regulations 2017

The EPA inspects licensed premises and can issue remedial notices or directions where a non-compliance or likely non-compliance has occurred. This includes pollution abatement notices and clean up notices. Further sanctioning tools such as licence suspension or prosecution can be used where required.

Similar tools and inspections are used by the EPA to follow up pollution events from non-licensed point source discharges. For example, pollution from emergencies and accidental spills.

2.3.2.2 Diffuse source

Diffuse source discharges such as from septic tanks, stormwater runoff and agricultural runoff cannot be efficiently and effectively controlled by licensing regimes. SEPP (Waters) contains rules for decision makers and obligations on industry in Division 2's management of risks to beneficial uses in all waters. For example, SEPP (Waters) places obligations on industry to manage construction activities, forestry activities and urban stormwater in a way that minimises risks to the environment. The Environment Protection Authority can use the EP Act provisions to enforce SEPP (Waters).

In summary, implementation and enforcement of the State Environment Protection Policy (Waters) and the use of instruments/processes from the *Environment Protection Act 2017* will help to protect beneficial uses by managing risks and imposing processes, and protect the Basin Plan values at the same time.

2.4 Safe Drinking Water Act 2003

Victoria's safe drinking water regulatory framework ensures a consistent, reliable supply of safe, good quality drinking water. This regulatory framework is overseen by the Department of Health and Human Services and implemented by water suppliers.

It will be used to protect the Basin Plan 'drinking water value' and informs the requirements for raw water when it is treated and used to supply drinking water to communities.

Victoria's *Safe Drinking Water Act 2003* and the *Safe Drinking Water Regulations 2015* require all drinking water suppliers to implement, develop and review risk management plans to manage risks to drinking water. This includes the treatment and sampling of water. These risk management plans are subject to an independent audit at intervals determined by the DHHS.

Specifically the *Safe Drinking Water Act 2003* provides a regulatory framework that includes:

- a risk management framework 'from catchment to tap'
- a set of standards for key water quality criteria
- information disclosure requirements for water businesses
- community consultation processes

The *Safe Drinking Water Act 2003* applies to a range of designated water businesses like water suppliers and water storage managers and other statutory authorities supplying drinking water to the public, including water corporations, Parks Victoria and alpine resort management boards. The Department of Health and Human Services supports and works with the key stakeholders to make sure the *Safe Drinking Water Act 2003* is upheld across Victoria.

The drinking water provided by water suppliers must meet the objectives of the Australian Drinking Water Guidelines and be safe to drink. The water corporation is responsible for the main water infrastructure and quality of drinking water before it reaches the property meter. The property owner is responsible for maintaining internal plumbing from the property meter.

To protect the quality of Victoria's drinking water supply, water corporations may require property owners to install a backflow prevention device to limit the risk of contaminated water flowing back into a town's reticulated drinking water supply.

2.5 Victorian Water Act and the Victorian Waterway Management Strategy

The Victorian Water Act requires catchment management authorities (CMAs) to prepare regional waterway strategies. The Department of Environment, Land, Water and Planning (DELWP) makes sure the CMAs prepare and implement these strategies.

2.5.1 Regional water strategies

Catchment management authorities' regional waterway strategies identify priority waterways where environmental, social, cultural or economic values are threatened by poor water quality, and result in high or very high risk to these values. These are identified as 'regional hotspots'.

Where the sources of water quality issues for regional hotspots are known, high-level management activities to address these risks are included in the regional waterway strategies and this is aligned with the broad actions in the State Environment Protection Policy (Waters). If the sources are unknown or uncertain, risk assessments or other investigations need to be carried out to help guide further action planning.

Catchment-scale water quality plans are developed in special cases when risk assessments or other investigations indicate they are required.

Management activities typically require partnership and negotiation between agencies such as waterway managers, the Department of Jobs, Precincts and Regions, the Environment Protection Authority, public land managers and local government. These are negotiated during development of the regional waterway strategies.

Decisions on the type and quantity of water quality management activities consider the scale of the problem and the resources available to remedy the issue.

The Victorian Environmental Water Holder (VEWH) is appointed under the Victorian Water Act to manage Victoria's environmental water entitlements. The VEWH works with the waterway managers and the Commonwealth Environmental Water Holder to make sure environmental water entitlements are used to achieve the most efficient and effective environmental outcomes.

The VEWH also has regard to water quality objectives in SEPP (Waters) when implementing the Seasonal Watering Plan for stream reaches that can be supplied from the Water Holdings. In particular, the VEWH may supply water to improve water quality at priority sites, such as to increase dissolved oxygen levels, and reduce temperature, salinity and nutrient levels.

Victoria's environmental water planning and management framework management framework, as overseen by DELWP and implemented by CMAs, the Victorian Environmental Water Holder and other agencies, and will be used to protects the Basin Plan's values.

2.6 Planning and Environment Act 1987

The purpose of the *Planning and Environment Act 1987* is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians. DELWP manages the legislation for planning, environmental assessment and land subdivision.

The *Planning and Environment Act 1987* sets out procedures for preparing and amending the Victorian Planning Provisions and planning schemes. It also sets out the process for obtaining permits under schemes, enforcing compliance with planning schemes and permits and other administrative procedures.

The main functions of the Act are to:

- set the broad objectives for planning in Victoria
- set the main rules and principles for how the Victorian planning system works
- set up the key planning procedures and legal instruments in the Victorian planning system
- define the roles and responsibilities of the Minister, councils, government departments, the community and other stakeholders in the planning system
- give local councils responsibility for preparing and administering planning schemes

In summary, the planning framework overseen by DELWP and implemented by local councils will be used to protect the Basin Plans values.

2.7 Catchment and Land Protection Act 1994

2.7.1 Regional Catchment Strategies

The *Catchment and Land Protection Act 1994* requires Victoria's catchment management authorities (CMAs) to prepare regional catchment strategies. These strategies provide an overarching framework for land, water and biodiversity management in each of the 10 catchment management regions in Victoria. The regional catchment strategies (VCMC, 2011):

- assess the land and water resources of the catchments in the region and how they are used
- assess the nature, causes, extent and severity of land degradation of the catchments in the region and identify areas for priority attention
- identify objectives for the quality of the land and water resources of the catchments in the region
- set a program of measures to promote improved use of land and water resources and to treat land degradation
- state the action necessary to implement the strategy and who should take it
- specify procedures for monitoring the implementation of the strategy, achieving the land and water resource quality objectives and assessing the effectiveness of the program of measures to prompt improved use of land and water resources

The regional catchment strategies must have regard to SEPP (Waters) and end-of-valley salinity targets. The CMAs consider water quality and salinity issues and identify these as priority issues for the region where relevant.

CMAs regularly update the strategies after extensive community and stakeholder consultation.

The strategies covering Victoria's North and Murray water resource plan area are the:

- Northeast Regional Catchment Strategy 2013-19
- Goulburn Regional Catchment Strategy 2013-19
- North Central Regional Catchment Strategy 2013-19
- Mallee Regional Catchment Strategy 2013-19

The regional catchment strategies provide the overarching strategic framework and priorities for catchment management. More detailed sub-strategies and plans such as waterway management strategies and land and water management plans sit under the regional strategies.

2.7.2 Land and water management plans

CMAs, with the assistance of key delivery partners, prepare land and water management plans for high priority issues and areas identified in the regional catchment strategies. The plans have been prepared for irrigation areas with significant water quality and salinity risks. They have not been prepared to address the water quality and salinity issues in dryland catchments where those issues are more dispersed, not as significant and where there are no available cost-effective management actions.

Land and water management plans have been prepared for the irrigation areas of the Sunraysia Irrigation District and the Goulburn-Murray Irrigation District.

2.8 Schedule B of the Murray-Darling Basin Agreement – River Murray salinity

Victoria supports and complies with Schedule B to the Murray-Darling Basin Agreement (Schedule 1 to the Commonwealth Water Act). Schedule B sets out the formal accountability framework for managing salinity in the Basin. Management arrangements in the Basin are periodically reviewed and updated. The BSM2030 (MDBA, 2017) reflects the outcomes of the most recent review. Schedule B of the Agreement and its associated operational protocols continue to apply.

The water-use licensing and trading provisions of the Victoria Water Act are used to implement the salinity accountability requirements of Schedule B.

3. How Victoria's water quality management aligns with the Basin Plan

Figure 2 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.

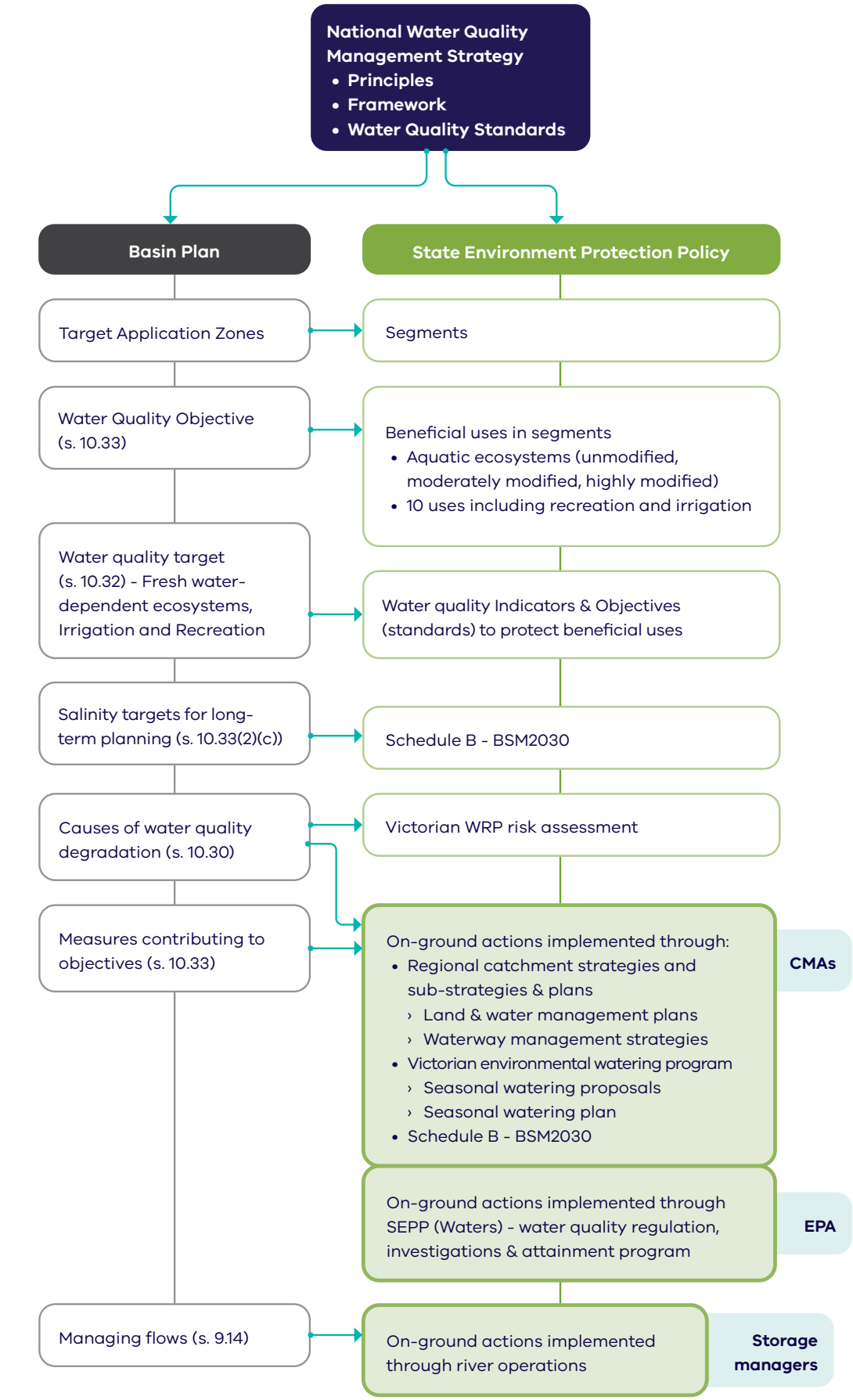

Figure 2: Alignment between Basin Plan water quality requirements and Victoria's water quality management arrangements in the water resource plan areas

Note: (s.) refers to sections of the Basin Plan

4. Surface water - Victoria's North and Murray water resource plan area

This section presents information about the surface water of the Victorian Murray and Northern Victoria water resource plan areas. It includes general information about the resources and their quality, risks to the condition of these resources, a statement on degradation, causes or likely causes of this degradation, measures to contribute to the achievement of water quality objectives of the Basin Plan and water resource plan water quality targets to inform the development of the measures.

The Northern Victorian water resource plan area includes:

- the Ovens, Broken, Goulburn, Campaspe and Loddon tributary catchments of the River Murray
  - this excludes areas which are supplied by River Murray water. For example, the Murray Valley and Torrumbarry Irrigation Districts and private diverters along the River Murray

The Victorian Murray water resource plan area includes:

- the Victorian section of the Upper Murray catchment of the River Murray
- the Mitta Mitta and Kiewa catchments
- irrigation use in the Murray Valley, Torrumbarry irrigation areas and Nyah and Tresco irrigation districts managed by Goulburn-Murray Water (GMW)
- irrigation use in the Merbein, Mildura, Red Cliffs, Robinvale irrigation areas and Woorinen irrigation districts managed by Lower Murray Water (LMW)
- Northern Mallee Pipeline use for supplies to rural customers around Ouyen and urban customers in Chillingollah, Chinkapook, Ouyen, Manangatang, Nandaly, Nullawil, Patchewollock, Speed, Tempy, Underbool, Waitchie and Walpeup managed by Grampians Wimmera Mallee Water (GWMW)
- irrigation use by the private diverters along the length of the River Murray managed by GMW and LMW
- urban use along the length of the River Murray managed by North East Water, Goulburn Valley Water, Coliban Water and Lower Murray Water, and stock and domestic use along the length of the River Murray

The River Murray itself is not included in Victoria's water resource plan areas as its bed and banks lie within the borders of New South Wales and South Australia. However, Victoria's use of the River Murray resources and the areas this water is used in are included in the Victorian Murray water resource plan area.

Victoria's North and Murray water quality management plan addresses the surface water and groundwater resources located within the four catchment management authority regions of the North East CMA, Goulburn Broken CMA, North Central CMA and Mallee CMA.

4.1 Surface water quality

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 3**, 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).

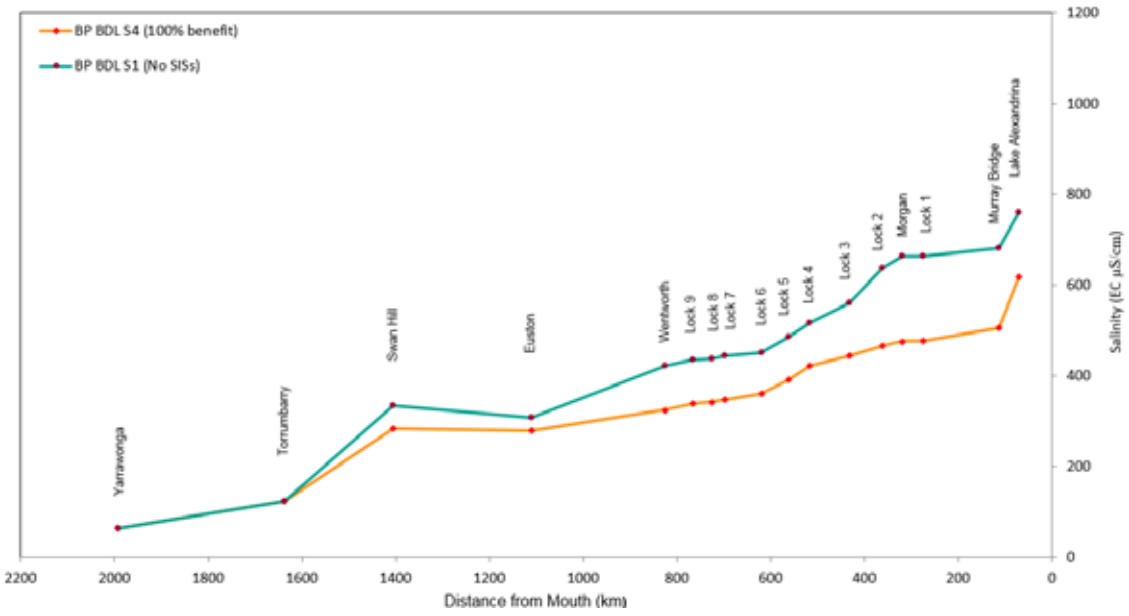

Figure 3: Average daily salinity along the River Murray over the 1975-2000 Benchmark Period with 2013 levels of development and salt interception

Source: MDBA (2014)

Like all water quality characteristics in a dynamic river system salinity varies within year and from year to year. However, there is irrefutable evidence that the wide range of management actions implemented through Schedule B to 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 4**.

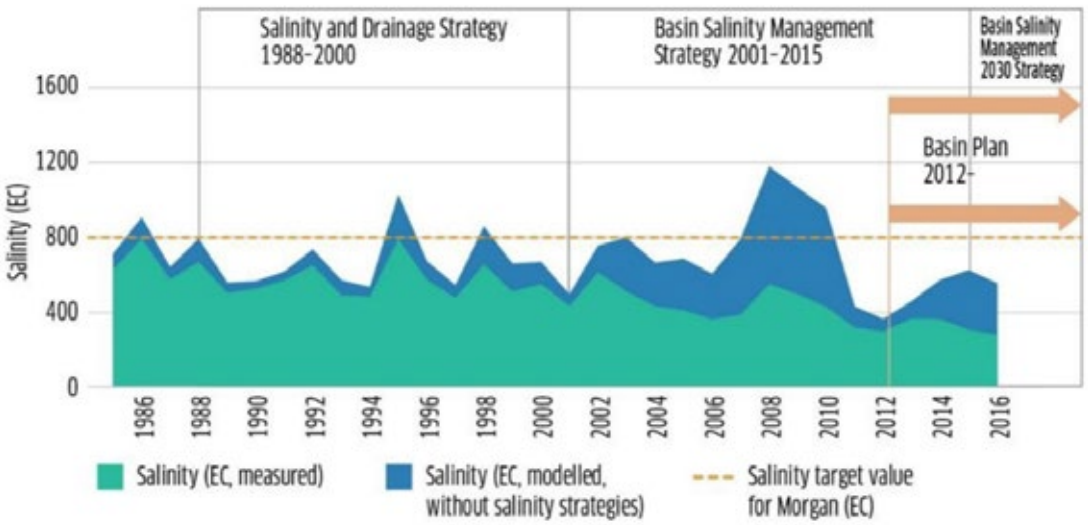

Figure 4: River Murray salinity at Morgan and impact of management strategies

Source: MDBA (2017)

The changes in water quality over the 35-year period from 1978 to 2012 are hard to summarise because of different climate regimes, hydrological drivers and management practices across the period. But there have been general broad decreases in nutrients with exceptions in some areas (Henderson, Liu, & Baldwin, 2013).

Blue-green algae blooms are a continuing issue in the plains areas of Victoria's North and Murray water resource plan area. A major event occurred in the Murray and Goulburn valleys between February and May 2016. As is typical for algal blooms, the event was associated with clear or uncloudy days, high nutrient loads, high temperatures, insignificant rainfall and still water. How Victoria responds to blue-green algae events is outlined in **Chapter 10** of the Victoria's North and Murray Comprehensive Report.

Widespread blackwater events, including hypoxic blackwater, occurred in 2010-11 and 2016-17. These resulted from heavy and unseasonal rainfall across large areas of south eastern Australia that caused wide-spread flooding. Although blackwater events have always occurred naturally, the severity and extent of hypoxic blackwater during these floods was exacerbated by the effects of 100 years of river regulation, the Millennium Drought and the unseasonal nature of flooding occurring in summer.

From a more local perspective, the Index of Stream Condition Assessment assesses rivers' conditions using metrics including hydrologic, physical form, streamside zone, water quality and aquatic life.

The 2013 Index of Stream Condition report (DEPI, 2013) showed that across Victoria's North and Murray water resource plan area there were:

- 19 reaches in the North East CMA boundary monitored for water quality parameters including the Upper Murray (including the Mitta Mitta), Kiewa and Ovens rivers and their tributaries. Water quality in these reaches ranged from moderate (21 percent of reaches) to excellent (36 percent of reaches), with the majority rated in good condition (43 percent of reaches). These results correlate with the extensive forest coverage across the region
- 54 reaches in the Goulburn Broken CMA boundary monitored for water quality parameters including the Goulburn and Broken rivers and their tributaries. Water quality in the majority of reaches was moderate condition (41 percent), followed by 20 percent in poor condition, 17 percent in excellent condition, 17 percent in good, and five percent in very poor condition. Many reaches within the Goulburn Basin showed elevated phosphorus levels, and to a lesser

extent, turbidity. Again, these results are associated with reaches located in areas of cleared agricultural land

- 28 reaches in the North Central CMA boundary monitored for water quality parameters including the Campaspe and Loddon rivers and their tributaries. Water quality results ranged from excellent to very poor. The majority of reaches were assessed to be in moderate (43 percent) and poor condition (32 percent), followed by good condition (17 percent), and excellent and very poor condition (both four percent). One reach in the Campaspe Basin located on a cleared tract of the McIvor Creek scored very poorly, with elevated phosphorus, salinity and turbidity levels. In contrast, one reach located on the Campaspe River downstream of Lake Eppalock in an area of patchy forest cover, was the only reach across the entire region to show close to unmodified water quality. The majority of sites showed elevated levels of phosphorus and salinity, which is attributed to dryland and irrigation farming practices

4.2 River Murray water quality management

The River Murray is a part of New South Wales. Therefore, Victoria is not directly responsible for managing the water quality within the Murray River.

Schedule B of the Basin Plan – Basin Salinity Management is the major initiative in the Murray-Darling Basin Agreement designed to manage water quality. It sets out the formal accountability framework for managing salinity in the Basin. The Basin Salinity Management 2030 strategy (MDBA, 2017) reflects the outcomes of the most recent review. The Murray-Darling Basin Authority is required to formulate water quality objectives for the River Murray which are set out in the Murray-Darling Basin Agreement and describe a range of operational rules designed to maintain or improve water quality.

The River Murray water quality monitoring program is also a requirement of the Murray-Darling Basin Agreement. The MDBA manages this program on behalf of Basin governments, maintaining a uniform system for measuring, analysing and presenting data to create a picture of current and long-term river health within the River Murray system. An interjurisdictional Water Quality Advisory Panel provides governance and expert advice with regard to the MDBA's role in managing the water quality of the River Murray, its tributaries and storages.

Detailed operational arrangements have been in place to manage blue-green algal blooms in the River Murray for many years and the management of algal blooms is now part of 'business as usual' operations.

The Murray Regional Algal Coordinating Committee is in place for monitoring and managing blue-green algae outbreaks along the River Murray. The committee includes all the relevant managing authorities in New South Wales, Victoria and South Australia. The committee develops and implements strategies for managing blue-green algal blooms to minimise their impact. The committee is responsible for coordinating public communications and issuing public alerts to make sure all water users are aware of problems and know to avoid direct contact with the water (MDBA, unknown).

Water quality in the River Murray is critical to Victorians because of the environmental, social and economic values it supports. Victoria works with other states to manage salinity in the Murray through Schedule B to the Murray-Darling Basin Agreement and less formally on other water quality matters through the Water Quality Advisory Panel.

The Basin Plan requirements relating directly to water quality in the River Murray will be addressed in the water quality management plan for the New South Wales Murray and Lower Darling water resource plan area.

The major types and causes of water quality degradation in the River Murray that Victoria will discuss with New South Wales will include blue-green algae blooms, hypoxic blackwater events and salinity.

4.3 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, regard must be had to the key causes identified in Chapter 9 of the Basin Plan. The Basin Plan identifies nine types of water quality degradation and their causes, including elevated salinity, suspended matter, and nutrients (details are in the Basin Plan Schedule 10).

The quality of the surface water of the Victoria's North and Murray water resource plan area have been affected by significant changes to the waterways across the region over time. These include regulation and the construction of dams, as well as significant changes to the land use in the catchment. Further impacts have been experienced from active and accidental discharges over the last few hundred years.

Degradation or decline in water quality, whether from natural causes like drought or fire or human-induced causes such as land clearing and land use change, can have significant impacts on beneficial uses. Sections of the catchments which retain a large amount of native vegetation like mountains and highlands have been less affected by water quality degradation than the highly modified flat lands. Some of this degradation in the northern sections that has occurred through a significant shift in catchment land and water use has led to a 'step change' in water quality. While action is taken 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. Victoria's North and Murray Water Quality Management Plan considers both system-wide and local risks and causes of water quality degradation.

Table 3 presents the types of water quality degradation in Northern Victoria and Victorian Murray water resource plan areas. Column one presents the causes, or likely causes, of water quality degradation. In identifying the list, the Risk Assessment (**Appendix B**) was considered, and regard was had to the list of causes of water quality degradation in the Murray-Darling Basin (provided in Schedule 10 to the Basin Plan). Also, Victoria reviewed its strategies and plans and consulted with regional agencies.

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Table 3: Cause or likely causes of surface water quality degradation in both the Victorian Murray and Northern Victoria water resource plan areas

Cause or likely causes of water quality degradation in the Victorian Murray and Northern Victoria water resource plan areas	Type of water quality degradation
Saline groundwater and surface water discharges into surface water systems	• elevated salinity
Reduction in streamflows	• elevated salinity • elevated nutrients • cyanobacteria • water temperature and dissolved oxygen outside natural ranges

Cause or likely causes of water quality degradation in the Victorian Murray and Northern Victoria water resource plan areas	Type of water quality degradation
Altered flow regime	• elevated salinity • elevated suspended matter • elevated nutrients • cyanobacteria • water temperature and dissolved oxygen outside natural ranges
Land management practices, including: • inappropriate cultivation • overgrazing & riparian grazing • poor soil conservation practices, including wave wash from speed boats • practices that lead to decline in stream morphology	• elevated suspended matter • elevated nutrients • cyanobacteria
Water management practices that lead to: • rapid drawdown of a surface water resource • volume or manner of release of water, causing erosion	• elevated suspended matter • elevated nutrients
Pathogens entering water via human and animal waste from existing land use without mitigation (including sewage discharges)	• elevated pathogen count
Eutrophication – caused by existing land use without mitigation, or pests and weeds	• water temperature and dissolved oxygen outside natural ranges
Pests (carp)	• elevated suspended matter • elevated nutrients • cyanobacteria
Bushfires	• elevated suspended matter • elevated nutrients
Inappropriate disposal and management of industrial and other waste – from earth resource extraction (mine dewatering)	• elevated levels of pesticides and other contaminants
Poor management of pesticides (spray drift, runoff, leaching, erosion of contaminated soils, inappropriate disposal)	• elevated levels of pesticides and other contaminants
The exposure to the air of soils containing iron sulphide minerals	• pH outside natural ranges
Removal/loss of riparian vegetation	• water temperature and dissolved oxygen outside natural ranges
Climate change causing warmer ambient air temperatures	• water temperature and dissolved oxygen outside natural ranges

Cause or likely causes of water quality degradation in the Victorian Murray and Northern Victoria water resource plan areas	Type of water quality degradation
Micro-organisms consuming organic matter	• water temperature and dissolved oxygen outside natural ranges
Extreme drought causing warmer ambient air temperatures	• water temperature and dissolved oxygen outside natural ranges

4.4 Risks to the condition of surface water in the water resource plan area

Section 10.31 of the Basin plan requires Victoria's North and Murray water quality management plan to identify measures to address the risks, as referred to in section 10.41(2)(d) of the Basin Plan, identified as a result of the risk assessment (see **Appendix B**). To support meeting this requirement, the Basin Plan requires a water resource plan to be prepared having regard to the current and future risks to the condition and availability of the water resources of a water resource plan area (section 10.41 of the Basin Plan).

Victoria has assessed current and future risks to the availability and condition of the water resources in the water resource plan area. Water quality (condition) related risks are discussed in **Appendix B** of the Comprehensive Report which outlines:

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

The risks to Northern Victoria and Victorian Murray water resource plan areas are addressed by a range of measures and strategies. Measures contributing to the achievement of water quality objectives are presented in **Part 4.5**. Strategies identified through Victoria's risk assessment process are summarised in **Appendix B** of the water resource plan. In addition, human consumptive use is protected through the *Safe Drinking Water Act 2003*, which specifically regulates water distributed by urban water corporations for consumption and domestic use.

4.4.1 Medium to high risks to condition of water resources in the Northern Victoria water resource plan area

The risk assessment of the Northern Victoria water resource plan area identified risks to the condition of surface waters. These are summarised in **Table 4**.

Table 4: Medium to high risks to condition of water resources in the Northern Victoria water resource plan area

Water quality risks to consumptive uses were identified from:	• climate change (elevated pathogens, sediment or nutrients, salinity, toxicants, and other water quality impacts) • extreme events and/or bushfires (elevated salinity, elevated levels of suspended sediment and/or nutrients, other water quality impacts) • existing land use, land use change and interception (elevated salinity, suspended sediment and/or nutrients, elevated pathogens, other water quality impacts) • non-compliance with the Victorian Water Act (elevated sediment and/or nutrients) • increased utilisation of water access entitlements (elevated levels of suspended sediments and/or nutrients and elevated salinity) • timing and location of demands (other water quality impacts) • earth resource development (elevated salinity, suspended sediments and/or nutrients and toxicants) • major assets failure (elevated salinity, other water quality impacts) • pests and weeds (suspended sediment and/or nutrients, other water quality impacts)
Risks to environmental uses were identified, from:	• climate change (elevated salinity, elevated suspended sediment and/or nutrients, elevated pathogens, other water quality impacts) • extreme events (elevated salinity, suspended sediment and/or nutrients, pathogens, other water quality impacts) • land use and interception (elevated suspended sediment, elevated levels of salinity, elevated pathogens, other water quality impacts) • non-compliance with the Victorian Water Act (elevated levels of suspended sediment and/or nutrients, elevated salinity, other water quality impacts) • increased utilisation of water access rights (elevated suspended sediment and/or nutrients, elevated salinity) • timing and location of demands (other water quality impacts) • earth resource development (elevated salinity and toxicants) • major asset failure (elevated salinity, other water quality impacts) • pests and weeds (elevated suspended sediments and/or nutrients, other water quality impacts)
Risks to Aboriginal uses were identified:	• from all of the risks identified for consumptive and environmental uses with the addition of flooding, change in land use condition and point source discharges (elevated pathogens, elevated salinity, elevated levels of suspended sediment and/or nutrients, elevated toxicants, other water quality impacts) • with a low level of confidence, explained further in the Risk Assessment at **Appendix B** to the Victoria's North and Murray water resource plan

Risks to recreational/ social use from:	• climate change (elevated toxicants, pathogens, suspended sediments/and or nutrients, other water quality impacts) • extreme drought elevated pathogens, suspended sediments/ and or nutrients and other water quality impacts) • existing land use practices (suspended sediments and/or nutrients, pathogens, and other water quality impacts) • earth resources development (elevated toxicants) • pests and weeds (suspended sediment and/or nutrients, other water quality impacts)

Recognising Aboriginal values

Through this assessment of risk, it was found that whilst environmental and consumptive uses of water are relatively well understood as water resource planning concepts, Aboriginal uses of water are not. Aboriginal Water is an emerging term to describe the full range of Aboriginal interests and aspirations in water. There have been some indicators of connection between water quality and Aboriginal water values. Victoria continues to work to develop Aboriginal Water and will consider how any Aboriginal water values and uses can be integrated into water management instruments to support the protection of these. For more information see **Chapter 8** and **Appendix F**.

4.4.2 Medium to high risks to condition of water resources of the Victorian Murray water resource plan area

The risk assessment of the Victorian Murray water resource plan area identified risks to the condition of surface waters. These are summarised below **Table 5**.

Table 5: Medium to high risks to condition of resources of the Victorian Murray water resource plan area

Water quality risks to consumptive uses were identified from:	• climate change (elevated pathogens, sediment or nutrients, salinity, toxicants, and other water quality impacts) • extreme events and/or bushfires (elevated salinity, elevated levels of suspended sediment and/or nutrients, other water quality impacts) • existing land use and interception (elevated salinity, suspended sediment and/or nutrients, elevated pathogens, other water quality impacts) • non-compliance with the Victorian Water Act (elevated sediment and/or nutrients) • increased utilisation of water access entitlements (elevated levels of suspended sediments and/or nutrients) • timing and location of demands (elevated salinity) • earth resource development (elevated salinity and/or toxicants) • major assets failure (other water quality impacts) • pests and weeds (suspended sediment and/or nutrients, other water quality impacts)

Risks to environmental uses were identified, from:	• climate change (elevated salinity, elevated pathogens, other water quality impacts) • extreme events (elevated salinity, suspended sediment and/or nutrients, pathogens, other water quality impacts) • land use and interception (elevated suspended sediment, elevated levels of salinity, elevated pathogens, other water quality impacts) • non-compliance with the *Water Act* 1989 (elevated levels of suspended sediment and/or nutrients) • timing and location of demands (elevated salinity) • earth resources development (elevated salinity) • major asset failure (other water quality impacts) • pests and weeds (other water quality impacts)
Risks to Aboriginal uses were identified from:	• all of the risks identified for consumptive and environmental uses with the addition of flooding, change in land use condition and/or availability, increased utilisation of water access rights and point source discharges (elevated pathogens, elevated salinity, elevated levels of suspended sediment and/or nutrients, elevated toxicants, other water quality impacts)
Risks to recreational/ social use were identified from:	• climate change (elevated toxicants, pathogens, other water quality impacts) • extreme drought (elevated pathogens, and other water quality impacts) • existing land use practices (suspended sediments and/or nutrients, pathogens, and other water quality impacts) • earth resources development (elevated toxicants) • pests and weeds (suspended sediment and/or nutrients, other water quality impacts)

4.4.3 Measures addressing risks

Section 10.31 of the Basin Plan requires measures to be identified for risks arising from elevated levels of salinity or other types of water quality degradation.

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 on the basis that the above highlighted risks are addressed in Victoria's North and Murray water resource plan area through:

- strategies identified in the Risk Assessment as outlined in **Appendix B**
- the measures contributing to the achievement of water quality objectives as outlined in **Part 4.5** below

4.5 Measures contributing to the achievement of water quality objectives

Victoria has a comprehensive and active water quality management framework that has parallels to many aspects of the Basin Plan's clauses on water quality management. The strategies to address medium to high risks to the condition of water resources identified as part of the risk assessments for Victoria's North and Murray Water Resource Plan show this is an active and continuously improving framework for addressing water quality.

Beyond these strategies, Victoria has done a detailed review to identify and specify measures for each of the Northern Victoria and Victorian Murray water resource plan areas that will contribute to the achievement of the Basin Plan's water quality objectives. Their identification and development have had regard to the causes, or likely causes, of water quality degradation and the water quality targets of these water resource plan areas, and the salinity targets for the purposes of long-term salinity planning and management set out in Chapter 9 of the Basin Plan.

Two significant measures that will contribute to the achievement of water quality objectives under section 10.33 of the Basin Plan for the Northern Victorian and Victorian Murray water resource plan areas are:

1. implementation of the State Environment Protection Policy (Waters)
2. implementation of Victoria's commitments under the Basin Salinity Management Strategy 2030

As outlined in **Part 2** there are other measures that will also contribute to achieving the water quality objectives. SEPP (Waters) and BSM2030 have been identified as the relevant measures for addressing section 10.33 of the Basin Plan as they form the overarching response to water quality management. Other strategies that form part of the framework must be based on the requirements and obligations under these measures.

Table 6: Measures contributing to water quality objectives

Water Quality Objective	Measures contributing to the achievement of each water quality objective in the Northern Victoria and Victorian Murray water resource plan areas			
	Implementation of SEPP (Waters), or future equivalent		Implementation of Victoria's commitments under BSM2030 (the Basin Salinity Management Strategy)	
	Northern Victoria WRP Area	Victorian Murray WRP Area	Northern Victoria WRP Area	Victorian Murray WRP Area
Fresh water-dependent ecosystems	✓	✓	✓	✓
Raw water for treatment for human consumption	✓	✓	✓	✓
Irrigation water	✓	✓	✓	✓
Recreational water	✓	✓	✓	✓

Water Quality Objective	Measures contributing to the achievement of each water quality objective in the Northern Victoria and Victorian Murray water resource plan areas			
Maintaining good levels of water quality	✓	✓	✓	✓
Salt export	NA		✓	

4.5.1 Measure 1: Implementation of the State Environment Protection Policy (Waters), or future equivalent

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 protection of Victoria's water environments and gives the Environment Protection Authority and other duty holders roles, responsibilities and powers for environmental protection.

SEPP (Waters) 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 SEPP (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 *Water Act 1989* and associated regional waterway strategies.

In seeking to improve the health of Victorian waters, SEPP (Waters) is enhancing the quality of shared waters and has regard to the impacts it may have on the ability of another Basin state to meet water quality targets.

SEPP (Waters) is consistent with the National Water Quality Management Strategy and so will not have adverse impacts on other states.

State Environment Protection Policies (SEPPs) are subordinate legislation under the EP Act. SEPP (Waters) supports the protection of Victoria's waters in two key ways:

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

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

SEPP (Waters) rules and obligations clauses 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 obligations in SEPP (Waters), duty holders can understand their legal requirements to manage water quality. SEPP (Waters) has an implementation plan that outlines the Government's priorities which will drive work priorities and budgeting.

The SEPP (Waters) is also used to inform regional and local strategies and plans that aim to improvement environmental quality objectives.

4.5.1.1 Contribution to achieving the objective for water-dependent ecosystems

The Basin Plan (under section 9.04) objective for water-dependent ecosystems for Ramsar wetlands is that the quality of water is sufficient to maintain the ecological character of those wetlands. The water quality objective for water-dependent ecosystems other than declared Ramsar wetlands is that the quality of water is sufficient to protect and restore ecosystems and their function and to ensure that the ecosystems are resilient to climate change and other risks and threats.

SEPP (Waters) includes water-dependent ecosystems and species as a beneficial use to be protected in Victoria's surface waters. This beneficial use is consistent with the Basin Plan fresh water-dependent ecosystem. Therefore, implementation of SEPP (Waters) will protect the Basin Plan water-dependent ecosystems.

Water-dependent ecosystems and species are protected in all rivers and streams. Numerical environmental quality objectives have been set for rivers and streams to guide water managers on the appropriate levels of relevant indicators to protect the ecosystems. If these objectives are not attained, further investigation is required to understand if a threat is real, and what action needs to be taken.

4.5.1.2 Contribution to achieving the objective for raw water for treatment for human consumption

The Basin Plan (section 9.05) objectives are to:

- minimise the risk that the quality of raw water taken for treatment for human consumption results in adverse human health effects
- maintain the palatability rating of water taken for treatment for human consumption at the level set out in the Australian Drinking Water Guidelines
- minimise the risk that the quality of raw water taken for treatment for human consumption results in the odour of drinking water being offensive to consumers

SEPP (Waters) identifies 'water suitable for human consumption after appropriate treatment' as a beneficial use of Victoria's surface waters. It is protected where water is sourced for supply in accordance with the special water supply catchments area set out in Schedule 5 of the *Catchment and Land Protection Act 1994* or the *Safe Drinking Water Act 2003*.

SEPP (Waters) beneficial use is consistent with the intent of the Basin Plan raw water for treatment for human consumption. Therefore, implementation of SEPP (Waters) will protect the Basin Plan raw water for treatment for human consumption.

SEPP (Waters) does not establish specific numerical environmental quality objectives for raw or treated water for human consumption for surface waters. However because the protection of water-dependent ecosystems and species, which has the most stringent environmental quality

objectives, is identified in all segments, the measures/activities to protect water-dependent ecosystems and species will provide protection for raw water for human consumption.

4.5.1.3 Contribution to achieving the objective for irrigation water

The Basin Plan (under section 9.06) outlines 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. As explained in **section 4.6.2**, the quality of source water for irrigation is maintained through Victoria's water quality framework which includes the implementation of SEPP (Waters).

4.5.1.4 Contribution to achieving the objective for recreational water quality

The Basin Plan (under section 9.07) water quality objective for recreational water quality is to achieve a low risk to human health from water quality threats posed by exposure through ingestion, inhalation or contact from recreational use of Basin water resources.

Recreational use of water is recognised as a beneficial use in SEPP (Waters), which is categorised as primary and secondary contact recreation and aesthetic enjoyment of the waters. The three uses are protected across all rivers and streams in Victoria, except where public access is legally restricted or has specifically been exempted by the policy. SEPP (Waters) provides comprehensive environmental quality objectives for primary and secondary contact, with E.coli as the freshwater indicator of pathogenic bacterial contamination.

SEPP (Waters) beneficial use is consistent with the intent of the Basin Plan recreational water consumption. As a result, implementation of SEPP (Waters) will protect the Basin Plan recreational water.

4.5.1.5 Contribution to achieving the objective of maintaining good levels of water quality

The Basin Plan (section 9.08) outlines the objective to maintain good levels of water quality as being the maintenance of water quality characteristics at a level that is better than the target value set out in Part 4 of Chapter 9 of the Basin Plan.

SEPP (Waters) identifies environmental quality objectives of beneficial uses that are appropriate to the segment in which they are applied. The objectives define the level of water quality necessary to protect beneficial uses. Environmental quality objectives describe the concentration, level, state or biological condition of an indicator for different segments that would not cause harm or pose a significant risk to beneficial uses.

4.5.2 Measure 2: Implementation of Victoria's obligations under Basin Salinity Management 2030 (BSM2030)

The salinity levels of the River Murray have historically been the highest priority water quality issue.

BSM2030 protects the waters of the River Murray and its tributaries by requiring 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 EC[3] 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 related 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 to provide a valley-scale context to the identification and management of salinity risk to the shared water resources and within-valley assets. Each Basin state is to review the end-of-valley targets before the BSM2030 mid-term review in 2026 to make

3 EC is an electrical conductivity unit commonly used to indicate salt concentration or the salinity of water (1 EC = 1 µS/cm)

sure that the 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', overseen 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 2000-2015 (BSMS). BSMS continued the good work of the Salinity and Drainage Strategy and focused on managing the impact of irrigation development before 1988 and still had an increasing impact on the river's salinity issues after 2000.

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.

Salinity management activities in Victoria will continue to comply with the requirements of Schedule B, 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. BSM2030 contributes to the achievement of the Basin Plan water quality objectives in these ways.

4.5.2.1 Contribution to achieving the objective for fresh water-dependent ecosystems

Managing salinity concentrations in the River Murray maintains the water quality of this waterway at a level suitable for the ecosystems and species within it. Under BSM2030 Victoria has committed to the objective of maintaining the quality of the shared water resources of the River Murray and Darling River for all beneficial uses such as agricultural, environmental, urban, industrial and recreational.

4.5.2.2 Contribution to achieving the objective for raw water for treatment for human consumption

BSM2030 makes use of the salinity targets in Schedule B and in the Basin Plan. Many communities in Victoria, New South Wales and South Australia depend on the waters of the River Murray. Maintaining the BSM2030 target, which is the Basin Plan target, of 800 EC at Morgan plays a critical role in ensuring that the salinity levels of the river are suitable for treatment for drinking.

4.5.2.3 Contribution to achieving the objective for Recreational Water

The recreational water quality objective is least affected by salinity, as primary and secondary contact recreation can occur in waters up to very high levels of salt (marine water concentrations and beyond). Under BSM2030 Victoria has committed to the objective of maintaining the quality of the shared water resources of the Murray and Darling Rivers for all beneficial uses such as agricultural, environmental, urban, industrial and recreational.

4.5.2.4 Contribution to achieving the objective of maintaining good levels of water quality

BSM2030 has an explicit and dedicated role in maintaining the good levels of salinity of the River Murray in a clear and audited manner over the long term.

4.5.3 Having regard to causes, or likely causes of degradation in the development of measures

Section 10.33(2) of the Basin Plan requires the measures to be prepared having regard to causes or likely causes of degradation. The causes, or likely causes of water quality degradation identified in **Table 3** were determined based on the Risk Assessment (**Appendix B**). **Part 4.3** explains how the risk assessment had regard to potential causes of degradation. The risk assessment also considered Victoria's current water management framework, which includes adherence to the State Environment Protection Policy (Waters) and Basin Salinity Management 2030 strategy. Therefore, these measures have been developed having regard to the causes, or likely causes of water quality degradation identified in accordance with section 10.30 of the Basin Plan.

4.5.4 Having regard to water quality targets in the development of measures

Water quality targets - section 10.32 of the Basin Plan

Section 10.33(2) of the Basin Plan requires the measures to be developed having regard to the targets in Division 4 of Part 4 of Chapter 9 of the Basin Plan. The measures were developed having regard to the Basin Plan water quality targets and alternative targets identified by Victoria. **Part 4.6** of this Appendix outlines how alternative targets have been adopted that are consistent with water quality targets in the Basin Plan. As the alternative targets have been developed in relation to Victoria's adherence to SEPP (Waters) and BSM2030, Basin Plan targets have been considered.

Salinity targets - section 9.19 of the Basin Plan

The obligations under BSM2030, to which Victoria is a signatory, are consistent and complementary to achieving the salinity targets in the Basin Plan. Together, BSM 2030 and the Basin Plan link Victoria's catchment-based arrangements for salinity management with Victoria's water resource plan obligations. See **Part 4.5.2** for more detail.

Victoria's end of valley salinity targets outlined in **Part 4.5.5** are a key component of the Basin Salinity Management 2030 strategy, and its predecessor Basin Salinity Management Strategy 2000-2015, delivered across Basin jurisdictions. Through monitoring of these targets and through associated modelling, it has been determined that catchments deliver less salt into the River Murray than was previously considered in the establishment of the Basin Salinity Management approach.

4.5.5 Having regard to the impact on another state when developing measures

4.5.5.1 Victorian Murray water resource plan area

Section 10.35 of the Basin Plan requires that the measures in the water quality management plan must be developed having regard to the impact on the ability of another Basin state to meet water quality targets and any adverse impacts the measures may have on other Basin states' water resources.

The Victorian Murray water resource plan area is connected to the New South Wales Murray and Lower Darling water resource plan area and the South Australian River Murray water resource plan area. For more information on connectivity see **Chapter 4** of Victoria's North and Murray Water Resource Plan Comprehensive Report.

Victoria is contributing to the water quality objectives of the Commonwealth Water Act and the Basin Plan 2012 as a signatory to the Murray-Darling Basin Agreement and the Basin Salinity Management 2030 strategy.

Additionally, SEPP (Waters) is consistent with the National Water Quality Management Strategy

and will not have any adverse impact on New South Wales or South Australia to meet water quality targets. The environmental quality indicators and objectives in SEPP (Waters) have been developed in line with, and to complement, the nationally-agreed approach outlined in the Australian and New Zealand Environment Conservation Council Guidelines.

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.

Further discussion of water quality indicators and objectives in SEPP (Waters) can be found in **Part 4.6.5**. Adopting alternative water quality targets in line with SEPP (Waters) and their consistency with the Basin Plan water quality targets is explained in **Part 4.6**. These discussions further highlight how this measure will not impact on another Basin State's ability to meet its water quality targets.

Victoria's North and Murray Water Quality Management Plan submitted by Victoria has identified measures that address risks arising from water quality degradation (section 10.31) and measures to be carried out that contribute to the achievement of the objectives set out in the Basin Plan (section 10.33). In developing these measures, Victoria has had regard to the impact that each measure might have on the ability of New South Wales and South Australia to meet their own water quality targets (Part 4 of Chapter 9 of the Basin Plan).

The water quality targets that were considered in the course of this process include water resource plan salinity targets for water-dependent ecosystems (section 9.16 of the Basin Plan), irrigation water (section 9.17 of the Basin Plan) and long-term salinity targets (Chapter 9, Part 4, Division 4 of the Basin Plan and the Murray-Darling Basin Agreement, Schedule B, Appendix 1).

In developing these measures, Victoria has consulted with New South Wales and South Australia under the Murray-Darling Basin Agreement through the Basin Salinity Management Advisory Panel. This satisfies the consultation requirement under subsection 63(2) of the Commonwealth Water Act.

The following Commonwealth instruments are particularly relevant for the Basin States in the context of section 10.35 of the Basin Plan.

- *Water Act 2007 (Cth)*, Schedule 1—The Murray-Darling Basin Agreement:

  Clause 1 provides for the purpose of the Agreement being:

  "to promote and co-ordinate effective planning and management for the equitable, efficient and sustainable use of the water and other natural resources of the Murray Darling Basin, including by implementing arrangements agreed between the Contracting Governments to give effect to the Basin Plan, the Water Act and State water entitlements".

  Clause 45 of the Commonwealth Water Act requires the Authority must establish, maintain and operate an effective and uniform system for measuring and monitoring the quality of the River Murray, water tributaries of the River Murray and stored water.

  Clause 98 identifies that when the Authority is giving directions it may have regard to the improvement or maintenance of water quality in the River Murray (including the upper River Murray).

- *Water Act 2007 (Cth),* Schedule 1, Schedule B—Basin Salinity Management

Clause 1 of Schedule B provides for the purpose of the Agreement to be: *"to implement certain aspects of the Basin Salinity Management Strategy 2001-2015, or any subsequent strategy approved by the Ministerial Council to manage salinity:*

- *by promoting joint works, measures and other action to reduce or limit the rate at which salinity increases within the Murray-Darling Basin;*
- *by providing for the adoption of salinity targets;*
- *by establishing Registers to record salinity impacts and to allocate salinity credits and salinity debits to Contracting Governments; and*
- *by providing for monitoring, assessing, auditing and reporting on matters set out in this Schedule and on progress in implementing the Strategy".*

4.5.5.2 Northern Victoria water resource plan area

The Northern Victoria water resource plan area is not considered to be connected to the water resource plan areas of other Basin states. The rivers from the Northern Victoria water resource plan area flow into the River Murray, which is considered to be connected to the Victorian Murray water resource plan area. For more information on connectivity see **Chapter 4** of Victoria's North and Murray Water Resource Plan Comprehensive Report.

4.6 Water quality targets for the Victorian Murray and Northern Victoria water resource plan areas

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. Setting 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 which are to be considered in the development of measures for each water resource plan area.

They are identified as:

- water quality targets for fresh water-dependent ecosystems (section 9.16 of the Basin Plan)
- water quality targets for irrigation water (section 9.17 of the Basin Plan)
- water quality targets for recreational water (section 9.18 of the Basin Plan)

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, for the Northern Victoria and Victorian Murray water resource plan areas, Victoria identifies here:

- alternative targets for fresh water-dependent ecosystems
- alternative targets for irrigation water
- alternative targets for recreational water

The next sections provide more detail on the water quality targets for fresh water-dependent ecosystems, irrigation water and water used for recreation and how the alternative target meet the requirements of section 10.32(4) of the Basin Plan.

Basin Plan section 10.32(4):

The WQM Plan may specify an alternative water quality target value if:

a. *it is consistent with the water quality objectives in Part 3 of Chapter 9; and*
b. *it is determined in accordance with the procedures set out in the ANZECC Guidelines; and*
c. *either:*
    i. *the alternative target value provides a better level of protection than the value that would apply under subsection (2) or (3), as applicable; or*
    ii. *the WQM plan sets out reasons why the alternative target value will be as effective in achieving the objectives in Part 3 of Chapter 9; or*
    iii. *the WQM plan sets out reasons why the target value in subsection (2) or (3), as applicable, is inappropriate for the water resource plan area; and*
d. *for a water resource that is also covered by a water resource plan area of another Basin State—it is developed in consultation with that State.*

4.6.1 Water quality targets for fresh water-dependent ecosystems

Fresh water-dependent ecosystems (lakes and wetlands non-Ramsar):

The Basin Plan targets for non-Ramsar lakes and wetlands are the same as the SEPP (Waters) environmental quality objectives and indicators for rivers and streams. **Table 7** and **Table 8** identify Victoria's environmental quality objectives for water-dependent ecosystems and species (lakes and wetlands non-Ramsar) for the Northern Victoria and Victorian Murray water resource plan areas. The SEPP (Waters) objectives outlined in **Table 7** and **Table 8** are the water quality targets for fresh water-dependent ecosystems (lakes and wetlands non-Ramsar) for the purposes of section 10.32(1) of the Basin Plan.

Although the targets in SEPP (Waters) are the same as the targets under section 9.04 of the Basin Plan, the use of SEPP (Waters) is an *alternative target* for the purposes of section 10.32(4) of the Basin Plan. Justification for the use of the alternative targets in accordance with the requirements of section 10.32(4) of the Basin Plan is outlined in **Part 4.6.1.1**.

Fresh water-dependent ecosystems (Ramsar):

There are currently four Ramsar sites in the Victoria's North and Murray water resource plan area: the Barmah Forest Ramsar site, the Gunbower Forest Ramsar site, the Kerang Wetlands Ramsar Site and the Hattah-Kulkyne Ramsar Site (Hattah Lakes).

The SEPP (Waters) environment quality objectives and indicators for wetlands and lakes are considered as alternative targets for Ramsar sites. Ramsar sites are considered to be water dependent ecosystems and species that are largely unmodified. A comparison between the applicable SEPP (Waters) and Basin Plan targets for Ramsar sites are listed in **Table S.3** and **Table S.4** of Schedule 1. Justification for the use of the alternative targets in accordance with the requirements of section 10.32(4) of the Basin Plan is outlined in **Part 4.6.1.1**.

Table 7: Fresh Water-Dependent Ecosystem Targets for Victorian Murray and Northern Victoria WRP Areas

WATER RESOURCE PLAN (WRP) AREA VM - Victorian Murray WRP Area NV - Northern Victoria WRP Area	SEGMENT	ENVIRONMENTAL QUALITY INDICATOR									
		Total phosphorus (µg/L)	Total nitrogen (µg/L)	Dissolved oxygen (percent saturation)		Turbidity (NTU)	Electrical conductivity (µS/cm@ 25°C)	pH (pH units)		Toxicants Water	Temperature [b]
		75th percentile	75th percentile	25th percentile	Maximum	75th percentile	75th percentile	25th percentile	75th percentile	% protection [a]	
	Highlands (*Largely unmodified*)										
VM: Mitta Mitta River and its tributaries; Kiewa River, Upper Murray tributaries NV: Rubicon River (Goulburn River Tributary)	Streams above 1,000 m altitude	≤20	≤150	≥85	130	≤3	≤30	≥5.9	≤6.9	95	<= 20%ile and <= 80%ile of the reference distribution
	Uplands A (*Largely unmodified*)										
VM: Lower Kiewa River and its tributaries, River Murray storage tributaries including lower Mitta Mitta, tributaries to upper River Murray NV: NA	Upper Murray and Kiewa basins	≤30	≤470	≥90	130	≤10	≤100	≥6.5	≤7.5	95	<= 20%ile and <= 80%ile of the reference distribution
VM: small area NV: Upper Goulburn River and its tributaries, Big River	Upper Goulburn (part) and Broken basins	≤25	≤550	≥90	130	≤10	≤100	≥6.4	≤7.4	95	<= 20%ile and <= 80%ile of the reference distribution

WATER RESOURCE PLAN (WRP) AREA VM - Victorian Murray WRP Area NV - Northern Victoria WRP Area	SEGMENT	ENVIRONMENTAL QUALITY INDICATOR									
		Total phosphorus (µg/L)	Total nitrogen (µg/L)	Dissolved oxygen (percent saturation)		Turbidity (NTU)	Electrical conductivity (µS/cm@ 25°C)	pH (pH units)		Toxicants Water	Temperature [b]
		75th percentile	75th percentile	25th percentile	Maximum	75th percentile	75th percentile	25th percentile	75th percentile	% protection [a]	
	Uplands B (*Largely unmodified*)										
VM: Upper Kiewa River, Back Creek, Yackandandah Creek (upper) NV: Upper Goulburn River, upper Ovens River and tributaries, King River	Uplands of northern draining basins – Ovens, Broken and Goulburn (part)	≤25	≤400	≥85	130	≤10	≤50	≥6.4	≤7.4	95	<= 20%ile and <= 80%ile of the reference distribution
	Central Foothills and Coastal Plains *(Slightly to moderately modified)*										
VM: NA NV: upper Loddon River and tributaries, upper Campaspe River and tributaries	Uplands of Moorabool, Werribee, Maribyrnong, Campaspe, Loddon Avoca, Wimmera and Hopkins basins.	≤55	≤1,050	≥70	130	≤15	≤2,000	≥6.8	≤8.0	95	<= 20%ile and <= 80%ile of the reference distribution
VM: NA NV: mid Goulburn River and tributaries, mid Ovens river and tributaries, mid Broken River and tributaries	Foothills of Ovens, Broken and Goulburn basins	≤50	≤800	≥70	130	≤20	≤250	≥6.4	≤7.4	95	<= 20%ile and <= 80%ile of the reference distribution

WATER RESOURCE PLAN (WRP) AREA VM - Victorian Murray WRP Area NV - Northern Victoria WRP Area	SEGMENT	ENVIRONMENTAL QUALITY INDICATOR									
		Total phosphorus (µg/L)	Total nitrogen (µg/L)	Dissolved oxygen (percent saturation)		Turbidity (NTU)	Electrical conductivity (µS/cm@ 25°C)	pH (pH units)		Toxicants Water	Temperature [b]
		75th percentile	75th percentile	25th percentile	Maximum	75th percentile	75th percentile	25th percentile	75th percentile	% protection [a]	
	Murray and Western Plains (*Slightly to moderately modified*)										
VM: Small section lower Broken Creek NV: Lower Ovens and tributaries	Lowlands of Kiewa, Ovens and Goulburn basins	≤55	≤800	≥75	130	≤25	≤500	≥6.4	≤7.5	95	<= 20%ile and <= 80%ile of the reference distribution
VM: NA NV: Lower Campaspe, Loddon Rivers Note: Wimmera, Avoca and Mallee are in the Wimmera-Mallee water quality management plan	Lowlands of Campaspe, Loddon, Avoca, Wimmera and Mallee basins	≤50	≤900	≥65	130	≤40	≤2,000	≥6.8	≤7.8	95	<= 20%ile and <= 80%ile of the reference distribution

a) 95% level of protection relates to the ANZECC trigger values for fresh-water as set out in Appendix A of this water quality management plan, and as derived from Table 3.4.1 of ANZECC Guidelines.

b) this is a default figure from ANZECC & ARMCANZ (2000). SEPP (Waters) does not present a Temperature Objective for Rivers and Streams and in the absence Clause 17 of SEPP (Waters) refers to default values such as this.

Table 8: Environmental quality objectives for physical and chemical indicators for wetlands

Wetland Type	Sub-type	ENVIRONMENTAL QUALITY INDICATOR						
		pH range	Dissolved oxygen range (% saturation)	Electrical conductivity (µScm-1)	Turbidity (NTU)	Total Nitrogen (µg/L)	Total Phosphorus (µg/L)	Toxicants Water
		Min-Max	Min-Max	75th percentile	75th Percentile	75th Percentile	75th Percentile	% protection
Riverine	Flow-through	6.5-8.5	80-120	1,500	5	500	30	95
	Terminal	6.5-8.5	80-120	N/A	15	1,500	100	
	Floodplain	6.5-8.5	80-120	N/A	15	1,500	100	
Deep inland	Fresh	6.5-8.5	80-120	1,500	5	500	30	95
	Saline	6.5-8.5	80-120	N/A	5	500	30	
Shallow inland	With an outflow	6.5-8.5	80-120	N/A	15	1,500	100	95
	Closed	N/A	N/A	N/A	N/A	N/A	N/A	

4.6.1.1 Discussion of alternative targets

Victoria's alternative targets for fresh water-dependent ecosystems are in line with the requirements for alternative targets set out in 10.32, and:

a. are consistent with the water quality objectives in Part 3 of Chapter 9
b. were developed using best practice and in accordance with the procedures set out in the ANZECC Guidelines
c. will be as effective in achieving the objectives in Part 3 of Chapter 9

(a) Consistency with the Basin Plan objectives for water-dependent ecosystems (Basin Plan section 9.04)

The Basin Plan requirements in Chapter 9 for water quality and salinity management plans have been prepared having regard to the nationally-agreed framework for water quality planning and management. Victoria's water quality framework and the National Water Quality Management Strategy are consistent. As a result, Victoria can meet the requirements of the Basin Plan through its existing water quality management arrangements.

Victoria's North and Murray Water Quality Management Plan applies the SEPP (Waters) segments and sub-segments.

The reference site approach recommended in ANZECC & ARMCANZ (2000) was used in the development of targets in the Basin Plan and the SEPP (Waters) environmental quality objectives.

The advantages of using SEPP (Waters) environmental quality objectives are:

- they are based on larger and more up-to-date water quality and biological data sets
- with more data available, SEPP (Waters) environmental quality objectives used more reference site data sets and relied less heavily on expert opinion for objective setting
- SEPP (Waters) used greater acknowledgement of the importance of levels of ecosystem modification within the environmental quality objective setting process, resulting in less stringent (i.e. more realistic) environmental quality objectives for more modified ecosystems
- the Basin Plan assessment method uses the median of the assessment data rather than the 75th percentile used by SEPP (Waters), resulting in a less stringent outcome than for SEPP (Waters). That is, under the Basin Plan targets, sites only needed to meet the target half the time, instead of three-quarters of the time as required by SEPP (Waters)

The recent assessment of SEPP (Waters) environmental quality objectives with the Basin Plan targets found that across the Murray-Darling Basin catchments in Victoria, the proportion of the time the Basin Plan targets have been met is slightly greater than the SEPP (Waters) environmental quality objectives (less than 10 percent difference) except for pH where the differences were greater than 30 percent. The SEPP (Waters) objectives, therefore, are generally slightly more stringent than the Basin Plan targets. It is important to note that greater stringency does not necessarily equate to `better protection'. Through provision of more realistic targets, the lower stringency identified for the third dot point, above, is likely to enhance uptake of the alternative targets, supporting a system of regulation and management that improves water quality in a substantially modified region.

Water-dependent ecosystems (lakes and wetlands non-Ramsar):

Using the indicator and objective values of water-dependent ecosystems and species and segments from SEPP (Waters), as distinct from the Basin Plan targets for fresh water-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 column 1 of **Table 7**.

These targets will not only provide a more targeted level of protection than the Basin Plan water quality targets, they also provide effective management because they integrate seamlessly into Victoria's current water quality management framework.

These targets are therefore consistent with the Basin Plan objectives for water-dependent ecosystems which seek that water quality is sufficient to maintain, protect and restore ecosystems.

Table S.1 and **Table S.2** of **Schedule 1** of this Appendix provides a comparison of values between the Basin Plan targets and Victoria's alternative targets for water-dependent ecosystems (lakes and wetlands non-Ramsar) presented in this plan. The small levels of variance in values are likely to be because of Victoria's use of extensive local data sets and the updated data available since the Basin Plan targets were developed before 2012.

The SEPP (Waters) objectives for lakes and wetlands are based on detailed studies of Victorian lakes and wetlands (EPA 2010), following the ANZECC & ARMCANZ (2000) approach. The SEPP (Waters) environmental quality objectives are based on lake types, not geographic location (EPA 2010). Therefore, the Basin Plan targets and the SEPP (Waters) objectives cannot be directly compared, as the SEPP (Waters) environmental quality objectives cannot be assigned to any individual target application zone (TAZ) (i.e. all lake types potentially apply to each TAZ). A comparison of the SEPP (Waters) geographic boundaries and the Basin Plan target application zones is provided in **Section S.2** of **Schedule 1** to this Appendix.

Water-dependent ecosystems (Ramsar):

Table S.3 and **Table S.4** of **Schedule 1** to this Appendix provides a comparison of values between the Basin Plan targets and Victoria's alternative targets for water-dependent ecosystems (Ramsar) presented in this plan. Under SEPP (Waters) Ramsar wetlands are categorised as `largely unmodified' which is the most stringent set of targets. The `largely unmodified' targets allow for the water quality to be protected to a level that will maintain the ecological character of the Ramsar sites.

The Ecological Character Description is a fundamental management tool for site managers, forming the basis of management planning and action as well as including guidance on site monitoring requirements to detect changes in the ecological character of the site.

Ecological Character Descriptions for the Barmah Forest Ramsar site and the Gunbower Forest Ramsar site do not provide water quality targets (Hale and Butcher 2011a, b).

The Kerang Wetlands Ramsar site has Limits of Acceptable Change provided for salinity concentration (as measured by electrical conductivity) in many wetlands at the site. Salinity concentration is assessed as a critical component, a high priority risk and the greatest threat to fish species in the Kerang region (Kellogg, Brown & Root Pty Ltd 2011). However, the Limits of Acceptable Change are all based on electrical conductivities at or above 4000 µS/cm. Ramsar sites' listing criteria and Limits of Acceptable Change are generally based on presence of biological populations and communities, in particular threatened water-dependent species and communities; water quality is not always an issue compared to water quantity and habitat availability and quality.

Therefore, although Limits of Acceptable Change specifying water quality requirements for individual wetlands could be considered as alternative targets within a Ramsar site, they are rarely provided in the Ramsar process, limited in number and are typically applicable to a single water body. This greatly restricts their applicability for regional application.

The Basin Plan has separate targets for Ramsar wetlands as set out in Schedule 11 of the Basin Plan (see **Table S.3** and **Table S.4** in **Schedule 1** of this Appendix). Although SEPP (Waters) has no environmental quality objectives for Ramsar sites, the SEPP (Waters) environmental quality objectives for `lakes and wetlands' are specifically derived for the protection of lakes and wetland types identified in Victoria and therefore are likely to be more representative of these ecosystems in Victoria, despite not being aimed at any specific Ramsar plan requirement. This includes the species protection levels for toxicants which incorporates a recent decision by EPA Victoria's external Scientific Advisory Panel that 95 percent species protection was more appropriate than 99 percent for Victoria (EPA unpublished, released May 2017). The SEPP (Waters) Scientific Advisory Panel agreed that 99 percent protection was too stringent in Victoria and the 95 percent was more appropriate.

Therefore, the use of the SEPP (Waters) lakes and wetlands environmental quality objectives for the protection of ecosystems would represent an improvement over the use of the default Basin Plan Ramsar wetland targets. It is recommended that the SEPP (Waters) environmental quality objectives are applied to these Ramsar sites.

(b) Developed using best practice and in accordance with the procedures set out in the ANZECC Guidelines

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

Victoria's alternative values are developed using best practice and in line with the ANZECC Guidelines. SEPP (Waters) is consistent with the National Water Quality Management Strategy

charter, policies and procedures, in particular the approach of the Australian and New Zealand Guidelines for Fresh and Marine Quality (ANZECC Guidelines).

Victoria's alternative values (environmental quality objectives) for fresh water-dependent ecosystems are based on best practice for setting environmental values. They present values that indicate where a direct toxic effect or adverse effect on environmental values may occur, as a trigger for further investigation, while recognising community values and feasibility for waterway protection. They are drawn from SEPP (Waters) and are therefore consistent with the water quality management framework in the state, reinforcing their role for water quality protection.

SEPP (Waters) targets provide a value that indicates where a direct toxic effect, or adverse effect on environmental values may occur or has occurred, and therefore they act as a `trigger' to prompt a management response, such as further investigation.

At the same time as these values are in line with the ANZECC Guidelines' recognition of three levels of protection for aquatic ecosystems, based on the condition of the ecosystem, the SEPP (Waters) values are based on three levels of protection of largely unmodified, slightly to moderately unmodified and highly modified water environments for surface waters. By recognising the condition of the ecosystems in this way, the values presented are feasible and in line with community values for protection.

SEPP (Waters) draws on local water quality data from 1990-2013 and were used to derive these environmental quality objectives.

The process outlined in the ANZECC Guidelines involves identifying the most appropriate indicator relevant to the environmental threat. Reference sites were used to derive local values for indicators. Reference sites are those that were considered to be near natural or minimally-disturbed versions of that environment, such as where there are no intensive agriculture, mining or wastewater discharges. Water quality data from as many reference sites as practicable was then used to derive the local values for these indicators.

Further information on the process for developing Victoria's SEPP (Waters) values which are drawn on here is available in the Environment Protection Authority (2018) Publication 1688: *Development of environmental quality indicators and objectives for the SEPP (Waters)*. **https://www.epa.vic.gov.au/~/media/Publications/1688.pdf**

(c) Values will be as effective, as Basin Plan targets, in achieving the Basin Plan objectives for water-dependent ecosystems (Basin Plan section 9.04)

Victoria's alternative targets will be as effective as the Basin Plan targets in achieving the Basin Plan objectives for water-dependent ecosystems because they:

- have been developed using extensive local data in their development
- take into consideration the level of protection relevant to their condition and use
- are in line with Victoria's water quality management framework and policies

The alternative values more accurately represent condition, and through alignment with state policy will enable policies and management responses that will achieve water quality outcomes.

As the targets are consistent with the water quality objectives (see discussion in part (a) above) they are therefore as effective in achieving the objectives for water-dependent ecosystems.

4.6.2 Water quality target for 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.

The sites for which this target applies are the sites at which water is extracted by an irrigation infrastructure operator for the purpose of irrigation. In the Northern Victoria water resource plan area and the Victorian Murray water resource plan area these are described in **Table 9**.

4.6.2.1 Discussion of alternative target

(a) Consistency with the Basin Plan objectives for irrigation water

For full details on Victoria's water quality management framework and how it is consistent with the Basin Plan objectives see **Figure 2**. This target is an alternative to the Basin Plan target and recognises Victoria's commitment to water quality protection for irrigation through protection of source water quality in both the shared waters of the River Murray and in Victorian waterways through the state's water quality management framework. Specifically, the water quality protection is achieved through Victoria's requirements under SEPP (Waters) as explained in **Part 4.6.1.1** above and adherence to salinity targets through the Basin Salinity Management 2030 Strategy (see **Part 4.6.4**). The Basin Plan's objective for irrigation waters is that the quality of surface water, when used in accordance with the best irrigation and crop management practices and principles of ecologically sustainable development, does not result in crop yield loss or soil degradation. This objective acknowledges the integration between water quality and irrigation and crop management practices in determining whether there will be an impact on crop yield and soil sustainability. That is, the quality of the water cannot be separated from how the water is used, and how crops are managed, when determining its suitability for irrigation. The Basin Plan provides a descriptive target for sodium adsorption ratio for irrigation waters which is the value which, if exceeded, would cause soil degradation when that water is applied to land.

Victoria's alternative salinity water quality target for irrigation water is similarly descriptive. Recognising that appropriateness of different salinity levels of water used in irrigation is highly dependent on a range of individual factors – rather than having an absolute value.

(b) Developed using best practice and in accordance with the procedures set out in the ANZECC Guidelines

Victoria recognises that a single numerical figure to protect all irrigation in multiple districts is not an approach recognised by the ANZECC guidelines, nor are indicators and environmental quality objectives for irrigation included in Victoria's SEPP (Waters). For example, the National Water Quality Management Strategy Implementation Guide (ANZECC 1998) notes that the effects of salinity are site specific, and salinity targets for irrigation cannot be generalised for different locations across the Basin. There are many factors relevant to whether water of a particular quality is suitable for irrigation, including business factors such as crop selection, irrigation method,soil type and soil properties, including sodium adsorption rates. At the same time Victoria's statewide water quality management framework, and participation in interjurisdictional agreements ensures efforts are made to protect the water quality in source rivers as possible. As SEPP (Waters) was developed using best practice and in accordance with the procedures set out in the ANZECC guidelines, this target is also considered to be developed in the same way and the discussion provided in section 4.6.1.1 applies here.

(c) Values will be as effective, as Basin Plan targets, in achieving the Basin Plan objectives for irrigation water

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 the available water, and likely quality of that water in changing conditions. Therefore,

this approach is more appropriate than applying a single salinity target for irrigation water across Victoria. The target is as effective as Basin Plan targets as Victoria's water management framework, including adherence to SEPP (Waters) and obligations under BSM2030 ensure that water quality is managed and protected in the systems that are the source of irrigation water.

In addition, DELWP supports improved irrigation and land management practices to minimise the impacts of salinity on our natural resources through the Sustainable Irrigation Program. Catchment Management Authorities prepare strategies, such as Regional Catchment Strategies and Land and Water Management Plans (see **Part 2.7**), under DELWP guidance to set visions and actions to improve land health and promote sustainable irrigation. The Land and Water Management Plans specify actions taken within the catchments to manage the risk of salinity.

The risk of salinisation from irrigation is managed on a property scale by farmers, as directed by the conditions on their Water Use Licence (WUL). The conditions relating to salinity and drainage risks are identified through the New Irrigation Development (NID) process, run by Agriculture Victoria. The NID process requires farmers to identify the risks posed through irrigating their property, and appropriate management solutions. Requirements out of the NID process may include on farm drainage, drainage re-use systems and additional monitoring of groundwater levels and quality.

Victoria is a signatory to the Murray-Darling Basin Agreement, Schedule B – Basin Salinity Management. In accordance with the Agreement, Victoria maintains a salinity register of significant actions which change the salinity within the Murray River by 0.1uS/cm at Morgan, South Australia before the year 2100. Actions which increase the salinity of the River (salinity debits) are related to the impact of irrigation development and irrigation drainage. These impacts are managed through actions taken to reduce the salinity of the River (salinity credits) such as; irrigation efficiency programs, drainage management activities and installation and operation of salt interception schemes. Victoria holds a net credit position on the Basin Salinity Management Salinity Registers, which are maintained by the Murray-Darling Basin Authority. This position maintained through biennial audits, and ongoing monitoring and assessments of the salinity impact of every significant action.

Basin Plan s10.34

Table 9: Location of targets for irrigation water

WRP Area	River	Water Corporation	Extraction Site
New South Wales	Murray	LMW	Robinvale Pumping Station
			Red Cliffs Pumping Station
			Merbein Pumping Station
			Millewa River Pump
			Central Main Pump Station at King's Billabong
			Psyche Bend Pumps
New South Wales	Murray	GMW	Yarrawonga Main Channel offtake
			Torrumbarry Diversions: • National Channel headworks • Ashwin's Pumps
			Nyah Pumps

WRP Area	River	Water Corporation	Extraction Site
Victorian Murray	Little Murray	GMW	Swan Hill No 9 channel off-take, from Little Murray
Northern Victoria	Loddon	GMW	Supplementary supply to Little Lake Boort – mix of water from Goulburn via the Waranga Western Channel during May- Sept – from Waranga Basin (off river storage from Goulburn River at Goulburn Weir) and Loddon Water
Northern Victoria	Campaspe	Coliban Water	Lake Eppalock
	Goulburn	GMW	Stuart Murray Canal at Goulburn Weir
			Cattanach Canal at Goulburn Weir
			East Goulburn Main Channel at Goulburn Weir
	Broken Creek	GMW	Supplementary supplies from the East Goulburn Main (from Goulburn Weir) Channel up to 40,000 ML each year (during the irrigation season from August to May inclusive).

4.6.3 Water quality targets for recreational water

Alternative water quality targets for recreational water are adopted as the SEPP (Waters) water quality objectives for recreational water. Schedule 3 section 6 of SEPP (Waters) contains the water-based recreation indicators and environmental water quality objectives (see **Table S.7** and **Table S.8** of **Schedule 1** to this Appendix)..

4.6.3.1 Discussion of alternative targets

(a) Consistency with the Basin Plan objectives for recreational water

The Basin Plan specifies the cyanobacteria values as per the National Health and Medical Research Council (NHMRC) Guidelines for Managing Risk in Recreational Water.

The Indicators and objectives for primary and secondary contact recreation are mostly based on NHMRC guidelines and New Zealand Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (2003).

The indicators and objectives are:

- Marine and estuarine waters - indicator is enterococci and objectives are based on those in NHMRC. E. coli can be used for estuarine waters if there is a saltwater wedge, causing a freshwater top layer.
- Freshwaters - The two proposed Freshwater indicators of E. coli and enterococci are based on NZ and more recent overseas guidelines', which require the use of E. coli or both indicators. Water managers can select either indicator (i.e. they don't have to use both). Both have been linked to health outcomes in overseas studies. Freshwater objectives for E. coli are based on NZ guidelines and enterococci are based on NHMRC guidelines.

As recommended by NHMRC, SEPP (Waters) objectives will have a risk-based framework for applying the objectives and managing risk if they are not met. In addition, the objectives will have multiple time-scales. Short-term objectives have been added as an extra barrier of protection (in addition to long-term objectives recommended by NHMRC). Therefore, SEPP

(Waters) objectives are consistent with the water quality objectives in Part 3 of Chapter 9 of the Basin Plan, because when implemented they achieve a low risk to human health.

(b) Developed in accordance with the procedures set out in the ANZECC Guidelines

The ANZECC guidelines allow States to adopt their own values by taking into account factors such as the variability of the particular ecosystem or environment, rainfall and local water quality data. Victoria did this in accordance with the procedures in the ANZECC guidance. For recreational water, the NHMRC guidelines are directly linked to preventing human health impacts and as such were also used to develop the primary and secondary contact recreation objectives for Victorian waters.

SEPP (Waters) includes indicators and objectives for primary and secondary contact recreation that are mostly based on the NHMRC 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 NHMRC 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 14 were used for SEPP (Waters).

(c) Values will be as effective, as Basin Plan targets, in achieving the Basin Plan objectives for water-dependent ecosystems (Basin Plan section 9.04)

SEPP (Waters) also includes objectives for secondary contact recreation, which are not provided for in the NHMRC guidelines. SEPP (Waters), were largely based on the NHMRC guidelines, departed from these guidelines in some aspects. To provide confidence about this, three 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 Environmental 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 the Guidelines for Managing Risks in Recreational Water (Chapter 6 in NH&MRC 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.

4.6.4 End-of-valley salinity targets

There are six end-of-valley Basin salinity target sites in the Northern Victoria and Victorian Murray water resource plan areas used for long-term planning purposes, consistent with clause 10.33(2)(c) of the Basin Plan. These targets are not included in SEPP (Waters). The six end-of-valley targets are shown in **Table 10**.

Victoria reports annually on these targets. The most recent report, Victoria's Annual Status Report 2015/16 Basin Salinity Management 2030, is available at **https://www.water.vic.gov.au/murray-darling-basin/basin-salinity-management**.

Table 10: Victoria's end of valley salinity targets

End of Valley Basin	Target (EC us/cm)		Mean annual salt load (tonnes per year)
	Median	80th percentile	
Ovens River at Peechelba-East (gauging site 403241)	72	100	54,540
Kiewa River at Bandiana (gauging site 402205)	47	55	19,000
Goulburn River at Goulburn Weir (gauging site 405259)	99	No target	No target
Broken Creek at Casey's Weir (gauging site 404217)	141	No target	No target
Loddon River at Laanecoorie (gauging site 407203)	711	No target	No target
River Murray at Lock 6 (gauging site 426200)	+15EEC^*	No target	No target

^Equivalent Electrical Conductivity – refer to Basin Salinity Management Strategy Operational Protocols Version 2.0, Murray-Darling Basin Commission, Figure 4, pg. 100.

**The target relates to Victoria's contribution to river salinity throughout the entire Mallee zone. This contribution is assessed using the EM2 model, rather than modelled surface water salinity.*

4.6.5 Alternative targets developed in consultation with other states

The River Murray above Hume Dam is split geographically between New South Wales and Victoria. Below Hume Dam the bed and banks of the River Murray are situated inside New South Wales until the South Australian border, when the bed and banks are located within South Australia.

As this plan sets out alternative targets for fresh water-dependent ecosystems, irrigation water and recreational water for Victoria's partial share of the River Murray above Hume Dam, section 10.32 (4)(d) of the Basin Plan requires that the targets are developed in consultation with the relevant states. The connected water resources are only applicable to the Victorian Murray water resource plan area. Surface water in the Northern Victoria water resource plan area is not connected to another state.

Victoria helped establish the annual water quality management plan interstate forums since 2016. They bring together water quality planners from each Basin state and the Murray-Darling Basin Authority annually to update on the approach and the progress of our water quality management plans. Victoria identified that the development of the SEPP (Waters) policy was occurring through these forums and from our intention to provide alternative targets in line with our state policy. Following the gazettal of SEPP (Waters) in October 2018, Victoria updated water quality planning officers in New South Wales and South Australia on the proposed alternative targets. 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 SEPP (Waters) 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.

As well as direct engagement with water quality planning officers, Victoria participates in the Water Resource Planners Forum hosted by the MDBA.

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.

5. Groundwater – Goulburn-Murray water resource plan area

This section presents information about the groundwaters of the Goulburn-Murray water resource plan areas. It includes general information about the resources and their quality, risks to the condition of these resources, a statement on degradation, causes or likely causes of this degradation.

The groundwater resources in Victoria's North and Murray water resource plan area are almost all contained within the Goulburn–Murray groundwater basin. The exception is in the thin strip that runs along the south bank of the River Murray from Swan Hill to the South Australian border. In Victoria groundwater basins are divided into groundwater catchments which contain groundwater management units (either water supply protection areas or groundwater management areas).

The hydrogeology of the region can be broadly subdivided into two distinct geological regions:

- southern highlands of bedrock with sedimentary valleys
- northern plains with layers of sedimentary aquifers with underlying bedrock

In the south the highlands feature exposed bedrock and eroded material that form the Quaternary Aquifer. This thin shallow aquifer is comprised of sand, colluvium, fluvial sands, gravels, clay and silts. It is found in upland valleys of the river systems. There are fractured basalts of the New Volcanics formation overlying both bedrock and upland sedimentary valleys in the Loddon, Coliban and Campaspe Rivers. Water is also held in the Mesozoic and Palaeozoic basement rock, which is comprised of sedimentary fractured rock. Basement rock is close to the surface or exposed along the Great Dividing Range forming the headwaters of all the rivers in the Victoria's North and Murray Water Quality Management Plan and is increasingly buried deeper to the north and east. These water resources are generally low yielding.

In the north, the Goulburn–Murray sedimentary plain gradually thickens into several geological layers:

- the Upper Tertiary Quaternary Aquifer (UTQA) of the Shepparton formation is made of layered clay, sands and silt and covers much of the plain. Usable groundwater yield is generally found in shoe string sand of buried paleo-channels
- the Upper Tertiary Quaternary Aquifer overlies the Upper Tertiary Aquifer comprising Calivil formation, containing fluvial sand, gravel and clay and is a significant source for groundwater users
- the Lower Tertiary Aquifers of the Renmark formation underlies the Calivil in the deeper parts of the basin. They comprise sand, gravel, clay and silt and minor coal
- Cretaceous Permian sediments made of fractured rock, sand and minor coal
- Mesozoic and Palaeozoic basement rock, which comprises sedimentary fractured rock

Victorian groundwater management units are geographically based, while Basin Plan groundwater management units (SDL resource unit) are laterally based. Therefore, within each Victorian groundwater management unit there will be more than one Basin Plan SDL resource unit.

The Basin Plan splits resources in the Goulburn-Murray water resource plan area into four SDL resource units, these are:

- Goulburn-Murray: Shepparton Irrigation Region (GS8a) - All groundwater in the Shepparton Irrigation Region Water Supply Protection Area to a depth of 25 metres below the land surface
- Goulburn-Murray: Highlands (GS8b) - All groundwater in the outcropping Palaeozoic rocks (or the in situ weathered horizon where it is within 5 metres of the surface) from the land surface to 200 metres below the surface
- Goulburn-Murray: Sedimentary Plain (GS8c) - All groundwater from the land surface to 200 metres below the surface or 50 metres below the base of the Tertiary sediments, whichever is the deeper, excluding groundwater in GS8a
- Goulburn-Murray: deep (GS8d) - All groundwater, excluding groundwater in items GS8a, GS8b and GS8c

Therefore, the Goulburn-Murray: Highlands (GS8b) SDL resource unit runs across all groundwater catchments, surface water SDL resource units and multiple groundwater management units. The Goulburn-Murray: Shepparton Irrigation Region SDL resource unit is the section of the sedimentary plain which is located under the GMID where due to the irrigation district groundwater is managed to promote usage to reduce the impact of rising water tables and salinity on land. The Goulburn-Murray: Highlands SDL resource unit is situated in the south of Goulburn-Murray water resource plan area and is recharged from rainfall into the fractured rock aquifers. The Goulburn-Murray: Sedimentary Plain SDL resource unit, includes (from oldest to most recent) the Renmark formation, the Calivil formation, the Shepparton Formation and Coonambidgal Formation aquifer. The most recent units overlie and confine the older deeper units, however, the depth and thickness of each formation also reflects the shape of the basin. For more information on the Goulburn-Murray water resource plan area see **Section 2.3** of **Chapter 2** and **Section 4.4** of **Chapter 4** of Victoria's North and Murray Comprehensive Report.

5.1 Groundwater quality

Like surface water, good quality low salinity groundwater is generally found in the upland areas of the north east and ranges to the south. Water quality declines to the west and north (see **Figure 5**) 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 much 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. For example, in the Goulburn-Murray: Shepparton Irrigation Region SDL resource unit, elevated salinity has occurred due to rising water tables that has mobilised salt naturally stored in the soil profile. In other areas saline groundwater may occur where evaporation exceeds rainfall recharge; from seawater incorporated into sediments when the sea extended upstream along the Murray Basin as far as the Loddon River; or from dissolution of aquifer minerals.

Where saline groundwater is recognised, groundwater management areas and water supply protection areas consider the effects of naturally occurring high salt levels to land and usable groundwater and implement monitoring and actions if impacts to water quality are identified.

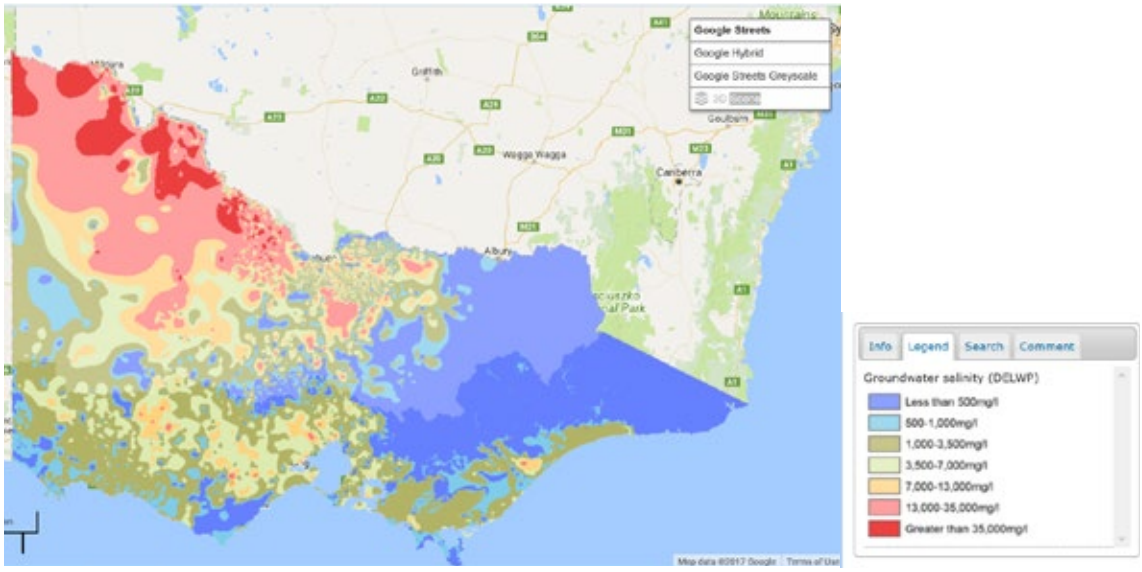

Figure 5: Victorian groundwater salinity

Source: **http://www.vvg.org.au**

5.1.1 Groundwater quality and management plans

Information in groundwater management plans for management units and groundwater resource reports[4] provide a more local perspective on groundwater quality. Groundwater in areas outside of groundwater management units is generally used less because of lower yields or high groundwater salinity. The follow sections explain variations in groundwater salinity across catchments in northern Victoria:

- Upper Murray groundwater catchment – groundwater salinity in the Upper Murray groundwater catchment is in the range of 500 to 1000 mg/L
- Ovens groundwater catchment – groundwater salinity in the Ovens groundwater catchment (Lower Ovens groundwater management area and Upper Ovens River water supply protection area) is low, in the range of 500 to 1000 mg/L
- Goulburn Broken groundwater catchment
  - Mid Goulburn groundwater management area – groundwater in the Deep Lead in Mid Goulburn groundwater management area ranges in salinity from 1,000 mg/L to 4,000 mg/L (total dissolved solids) generally becoming saltier to the north. There is also a lens of relatively fresh Deep Lead groundwater near Shepparton. When compared with the Deep Lead, the Shepparton Formation is saltier and ranges from 2,000 to 6,000 mg/L (total dissolved solids) (GMW, 2014)
  - Shepparton Irrigation Region groundwater management area (less than 25 m) - groundwater quality in the sand and gravel aquifers within the Shepparton Formation is variable, with salinity ranging from an electrical conductivity (EC) of less than 1000 EC to over 20,000 EC. The majority of privately pumped groundwater utilises groundwater at the lower end of this range (typically 1000 EC – 4000 EC). The variable quality is a reflection of the fragmented nature of the resource, with salt being concentrated in isolated aquifers (GMW, 2015)
  - Katunga water supply protection area - groundwater yield and quality is generally good in the Deep Lead and salinity generally increases from east to west and northwest of the Katunga water supply protection area. Groundwater yields in the Shepparton Formation (top 25 m) can be highly variable as can salinity which can be over 28,000 mg/L (GMW, 2017)

4 Resource reports can be obtained from **http://gwv.cloudapp.net/aquiferservice/aquiferMap.htm**

- Campaspe groundwater catchment
  - Groundwater in the Central Victorian Mineral Springs groundwater management area is generally of good quality, with salinity levels typically being less than 1000 mg/L total dissolved solids or 1600 EC. Highest recorded groundwater salinities are in the north in the bedrock and granite aquifers. Groundwater salinity is lowest around areas of high rainfall and recharge, particularly along the Great Dividing Range and around volcanic cones of the basalt aquifer. Groundwater chemistry of mineral springs in the Daylesford-Hepburn Springs region are naturally elevated in iron, sulphur, copper and other minerals
  - Groundwater in the Lower Campaspe Valley water supply protection area is generally of good quality. While there are some anomalies, groundwater salinity in the Deep Lead generally increases to the north. Water quality in the main trunk of the aquifer is generally between 550 to 1,550 EC south of the Waranga Western Channel, to between 1,550 to 2,500 EC to the north. Water quality in the overlying Shepparton Formation aquifer is fresh in the south but also deteriorates to be generally more brackish further north in the water supply protection area
- Loddon groundwater catchment
  - Groundwater in the Loddon Highlands water supply protection area is generally of good quality. The freshest groundwater is located in the basalt aquifers in the south where high rainfall and permeable soils associated with the volcanic cones results in greater recharge. Groundwater salinity generally increases northwards along the groundwater flow path (GMW, 2012). Groundwater chemistry of mineral springs in the Daylesford-Hepburn Springs region are naturally elevated in iron, sulphur, copper and other minerals
  - Groundwater salinity in the Mid Loddon groundwater management area is generally in the range of 1,000 to 3,500 mg/L
  - Groundwater salinity in the north of the catchment around Kerang is above 35,000 mg/L

5.2 Causes, or likely causes, of groundwater 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. The groundwaters in the Goulburn-Murray water resource plan area have not experienced significant degradation.

Because there has been no degradation of water quality of groundwater in the Goulburn-Murray water resource plan area there are no causes, or likely causes, of water quality degradation of groundwater. In assessing degradation regard was had to causes identified in Part 2 of Chapter 9 of the Basin Plan (see **Part 5.3.2**). Potential causes of water quality degradation of groundwater were considered in the Risk Assessment (see **Part 3.3** of **Appendix B**).

As previously described (see **Part 5.1.1**) the chemical composition of Victoria's groundwater varies in relation to salinity levels. Areas of high groundwater salinity in 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.

Although there has been no measured degradation in the Goulburn-Murray water resource plan area to date, there are current processes which could potentially lead to some level of decline in the quality of groundwater during the life of Victoria's North and Murray Water Resource Plan (see **Part 5.3.1.1**). Based on the future risk of degradation occurring (outlined in **Part 5.3.1**), two possible causes of degradation in the Goulburn-Murray: Sedimentary Plain SDL resource unit are identified:

- the use of groundwater for irrigation purposes at locations where highly saline upper aquifer water drains to the lower aquifer

- changes in hydraulic gradients inducing saline groundwater into areas of fresher groundwater

These possible causes of future groundwater degradation are due to drawdown of groundwater levels or pressures inducing saline groundwater from connected areas that are naturally saline moving either laterally or vertically into areas of fresher groundwater. The measures outlined in **Part 5.5.1** in response to section 10.35D of the Basin Plan will address these likely causes.

5.3 Risks to the quality of groundwater resources

5.3.1 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

5.3.1.1 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, 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. As described in **Part 5.2** there has been no water quality degradation of groundwater. Salinity is naturally occurring and is not considered to be water quality degradation. Groundwater management has generally been addressed in issues of extraction, yield and recharge.

5.3.1.2 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.

5.3.2 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. (see **Table 2.2.1** in **Appendix B**)

Risk of impacts on consumptive uses were identified 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.

5.4 Water quality target values 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

Under SEPP (Waters) 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 water quality target values for groundwater are the alternative water quality target values for freshwater dependent ecosystems explained in **Part 4.6.1** and specified in **Table 7** and **Table 8** of **Appendix A**, that are consistent with Victoria's SEPP (Waters) targets for surface water
b. groundwater quality must not adversely affect the maintenance of environmental values that depend on groundwater

Under SEPP (Waters) the target ensures that the quality of groundwater is managed to ensure 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.

The effect of this is that for the purposes of Basin Plan the target values specified in **Table 7** and **Table 8** above for fresh water-dependent ecosystems are surface water target values and groundwater target values for the purposes of section 10.35B of the Basin Plan. Victoria will monitor its groundwater quality in accordance with SEPP (Waters) and the monitoring outlined below in **Part 6** below and will report in accordance with Schedule 12 of Basin Plan.

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 to not apply as no groundwater is used for recreational purposes.

5.5 Rules or measures for groundwater that support the maintenance of water quality

Much of the Goulburn-Murray water resource plan area contains saline shallow groundwater, generally as a result of salt concentration through long groundwater residence times as it travels through the clays, silts and sand aquifers. Extensive areas of the Goulburn-Murray: Sedimentary Plain SDL resource unit and Goulburn-Murray: Shepparton Irrigation Region SDL resource unit are underlain by saline watertables, especially towards the north and west. Saline shallow groundwater is also found within the Goulburn-Murray: Highlands SDL resource unit, and this is a function of the rainfall recharge, evapotranspiration rates at each site.

The statutory plans and local management plans across the area have been developed to protect existing users and the environment from water quantity and water quality degradation, with trigger levels and other restrictions established to afford protection and early warning of emerging issues.

The Lower Campaspe Valley water supply protection area plan has established a salinity monitoring program that includes:

- sampling of private licensed bores operated by groundwater user/bore owner and encouraging all groundwater users to take part
- targeted sampling of private licensed bores to provide a consistent, regular dataset
- sampling of State observation bores to provide consistent, regular groundwater quality data, away from direct pumping impacts, across the Deep Lead and Shepparton Formation aquifers in the area

This information feeds into the analysis and adaptive management approach to assess water quality changes and to evaluate whether any restrictions or other management interventions are required to protect water quality.

Case study – Lower Campaspe Valley water supply protection area

The Lower Campaspe Valley water supply protection area was declared in 2010 and incorporated the former Campaspe deep lead water supply protection area and the southern Campaspe groundwater management area and additional areas north to the River Murray and west of Lockington. The Lower Campaspe Valley Water Supply Protection Area Groundwater Management Plan was developed to balance economic, environmental and social values through protecting existing users and the environment including base flow and groundwater dependent ecosystems by managing groundwater levels and the potential for change to groundwater salinity (DSE, 2012).

Intensive development and pumping of the deep lead aquifer in this region from the mid-1980s resulted in an observed decline of around 10m in the potentiometric surface of this aquifer. As well as declining water availability and the potential for bores to run dry, excessive groundwater pumping can lead to increased salinity through induced inter-aquifer flow and aquifer matrix compaction, affecting its structural integrity.

The Lower Campaspe Valley water supply protection area groundwater management plan was developed to manage and control the risks that excessive groundwater development could have on the available water and its quality and the overall condition of the aquifer itself. A permissible consumptive volume (PCV) of 56.3GL/year is set for the water supply protection area which is a cap on the total licensed volume that can be issued for the area.

The plan includes rules or 'prescriptions' that control the amount of take, or which describe the monitoring or management activities to sustain the resource.

These prescriptions include:

- Prescription 1: Restrictions on taking groundwater, based on review of groundwater levels within State Government groundwater observation bores. Trigger levels are set and varying groundwater allocation percentages are announced based on these levels in two zones, ranging from 40 percent to 100 percent allocation
- Prescription 2: Rules that limit the maximum volume that can be issued in sub-zones in the area up to a total volume of the permissible consumptive volume
- Prescription 3: Rules governing the transfer of licences to reduce the intensity of groundwater development in specific management zones
- Prescription 4: Regular groundwater level monitoring to understand the impacts of high intensity groundwater pumping on water levels
- Prescription 5: Regular groundwater salinity monitoring, to understand and manage any impacts that may reduce the water quality, from over-pumping or leakage of saline groundwater from adjacent aquifers
- Prescription 6: Metering of licensed take, to provide accurate information on the extent to which entitlements are accessed
- Prescription 7: Annual reporting to make sure that the ongoing resource management for this area is completely transparent and made publicly available and a comprehensive review after five years

These prescriptions have been developed to protect the resource from declining water availability and quality.

In terms of prioritising risks, the risk to aquifer integrity is ranked much lower than the risk of groundwater shortage or of increasing groundwater salinity. This is purely due to the effect that more prominent risks have themselves become indicators that aquifer integrity could be compromised.

The Lower Campaspe Valley water supply protection area groundwater management plan includes prescriptions to protect water quantity and water quality. The monitoring systems put in place and the associated triggers and rules apply to protect the groundwater resource form these quantity and quality impacts. It would take an intensive and prolonged decline in water levels to lead to impacts in the structural integrity of the aquifer, which the currently-prescribed rules and procedures will detect at a very early stage.

Owing to the high levels of development in the area, and the prominence of this plan among the community, actions such as reduced allocations to respond to deteriorations in water levels and quality will also provide protection from any risk to the structural integrity of the aquifer.

From a protection of groundwater-dependent priority environmental assets standpoint, long-term management of these assets may involve the maintenance of groundwater of a sufficient quantity and quality at the right times to sustain the groundwater-dependent ecosystems present. On the other hand, it may also involve protecting these ecosystems from receiving too much saline groundwater.

The Shepparton Irrigation Region groundwater management area plan, which has many priority environmental assets, has been established to provide land and environmental protection from high watertables, saline groundwater discharge and waterlogging. Users are encouraged to pump and use groundwater from the shallow Shepparton and Coonambidgal Formations to lower saline groundwater levels across the region. The priority environmental assets are subject to regular and frequent condition monitoring, coinciding with regular and extensive monitoring

of watertable levels and quality across the Goulburn-Murray: Shepparton Irrigation Region SDL resource unit.

5.5.1 Meeting Basin Plan requirements

Section 10.35C of the Basin Plan requires regard to be had as to whether rules are required that support the maintenance of water quality in the Goulburn-Murray water resource plan area. Victoria's North and Murray Water Quality Management Plan provides a rule that requires the Minister, when developing guidelines under section 31 of the Victorian Water Act, to identify certain matters that must be considered when developing a statutory management plan. The purpose of this rule is to clarify how Victoria proposes to meet the requirements of Basin Plan given the considerations are fundamental to the Victorian water resource management framework.

The following is proposed accredited text for section 10.35C of the Basin Plan:

Basin Plan s10.35C

1. The Minister may prepare guidelines under section 30 of the *Water Act 1989* (Vic) for the preparation of a draft management plan for an area declared under section 27 of the *Water Act 1989* (Vic) to require the consultative committee to consider the matters in paragraph (2) below when developing a draft statutory management under section 31 of the *Water Act 1989* (Vic).

2. The guidelines may require the consultative committee to consider whether the draft statutory management plan should include prescriptions for groundwater monitoring having regard to measured or potential elevated (increased above a base line) levels of salinity or other types of water quality degradation within the area.

3. Prescriptions identified in accordance with paragraph (2) above may include:

   a. a requirement to undertake monitoring;

   b. the period and frequency over which the monitoring should occur;

   c. the locations at which monitoring should occur;

   d. restrictions that may be applied to the extraction of groundwater under a take and use licence and how the restrictions will be applied;

   e. a limit on the level of take within the declared water supply protection area.

4. In considering a draft statutory management plan under section 32A of the *Water Act 1989* (Vic), the Minister must consider whether the prescriptions included in the draft plan address the types of risks referred in paragraph (2) above if identified for the water supply protection area relevant to the draft plan.

5. In addition to the above rule, the following measure applies to Victoria's North and Murray water resource plan area:
   - the implementation of State Environmental Protection Policy - SEPP (Waters) - particularly relating to the protection of groundwater beneficial uses under Part 3 of Division 3 of that policy.

6. References to sections of the *Water Act 1989* (Vic) do not have the effect of importing the sections referenced into the accredited material but are included for reference only.

<<end of accredited text for s10.35C of the Basin Plan>>

Section 10.35D of the Basin Plan requires that there is a rule or measure to ensure that water quality is maintained against the effects of elevated levels of salinity and other types of water quality degradation in the Goulburn-Murray: Sedimentary Plain SDL resource unit.

Basin Plan s10.35D

1. Victoria's North and Murray Water Resource Plan ensure the objectives set out in section 10.35C of the Basin Plan are met through:
   a. the rule contained in Victoria's North and Murray Water Resource Plan in response to section 10.35C of the Basin Plan that applies to all water resources in the Goulburn-Murray water resource plan area; and
   b. the measures as identified in paragraph (2) in response to section 10.35D of the Basin Plan.
2. The measures to ensure the objectives in section 10.35C of the Basin Plan are met for the Goulburn-Murray: Sedimentary Plain SDL resource unit are:
   a. the implementation of State Environmental Protection Policy - *SEPP (Waters)* - particularly relating to the protection of groundwater beneficial uses under Part 3 of Division 3 of that policy;
   b. the Minister will impose conditions relating to the time, place and rate of take for groundwater extraction in conditions on a take and use licence under section 56 of the *Water Act 1989* (Vic) or under a works licence under section 67 of the *Water Act 1989* (Vic) as relevant;
   c. in response to changes in risks to the maintenance of groundwater quality and the impacts of groundwater extraction on groundwater dependent environmental assets, the application of the rules under Victoria's North and Murray Water Resource Plan in response to Part 4 of Chapter 10 of the Basin Plan;
   d. maintenance of a register of State observation bores;
   e. scheduled groundwater level readings from identified bores;
   f. establishment of targeted groundwater salinity monitoring program, including requirements for the collection of samples and recording of salinity levels, under statutory management plans approved under section 32A of the *Water Act 1989* (Vic) were risks to groundwater quality are identified;
   g. where there is a decline in water quality, the Minister must investigate the cause of the decline in water quality and determine whether:
      i. a targeted groundwater salinity monitoring program is required, or additional monitoring is required;
      ii. restrictions on the take of groundwater from that area should be applied to prevent the continued deterioration of groundwater quality; or
      iii. a water supply protection area should be declared in accordance with section 27 of the *Water Act 1989* (Vic), to cause a statutory management plan to be prepared.
   h. restrictions on taking groundwater and the issuing or transfer of licences for the taking of groundwater in the Goulburn-Murray: Sedimentary Plain SDL resource unit must be informed by any resource condition limit specified under a permissible consumptive volume declaration under section 22A of the *Water Act*

1989 (Vic) or in a statutory management plan approved under section 32A of the *Water Act 1989* (Vic) for a water supply protection area declared under section 27 of the *Water Act 1989* (Vic).

3. The operation of the response to section 10.08(2), 10.11(1), and, where groundwater is traded, Part 8 of Chapter 10 of the Basin Plan in Victoria's North and Murray Water Resource Plan has the effect of ensuring that resource conditions limits are not exceeded.
4. References to sections of the *Water Act 1989* (Vic) do not have the effect of importing the sections referenced into the accredited material but are included for reference only.

Note: the measure under (2)(h) above reflects the rule included in Victoria's North and Murray Water Resource Plan in response to section 10.21 of the Basin Plan.

<<end of accredited text for s10.35D of the Basin Plan>>

The measures identified in response to section 10.35D of the Basin Plan meet the requirements as they identify how Victoria will ensure that the objectives in section 10.35C of the Basin Plan are met. The measures align with the objectives of section 10.35C as follows:

- setting conditions relating to the time, place and rate of extraction from an aquifer on water access rights or associated authorisations support the management of potential impacts of extraction on the structural integrity of an aquifer and the condition of groundwater resources. Conditions are imposed either on the take and use licence that authorises the take of groundwater or on the works licence which authorises the construction and operation of the bore through which the extraction occurs. Management of the place and rate of extraction also mitigates risks to neighbouring impacts on environmental assets and other water users which can mitigate possible causes of groundwater quality degradation (see **Section 7.4** of Victoria's North and Murray Comprehensive Report for more information on neighbouring impacts)
- maintenance of a register of State observation bores (for more information of State observation bores see below)
- scheduled monitoring requirements to ensure water resource managers have up to date information about groundwater levels in order to respond to impacts on structural integrity or groundwater levels that may have effects on elevated levels of salinity or other types of water quality degradation. Under statutory management plans, groundwater monitoring can occur either quarterly, monthly or more frequently as required to respond to risks
- establishment of targeted groundwater salinity monitoring programs under statutory management plans, including the collection of samples

Victoria already provides for a register of sites monitored by State observation bores. The primary purpose of the State Observation Bores Network (SOBN) is to collect groundwater data for observational purposes. This data can be used for research and other informative measures, to improve the access and management of groundwater. A list of sites within the SOBN can be found at **http://data.water.vic.gov.au/static.htm**. For more information see **Part 6.1**.

The measures outlined in response to section 10.35D of the Basin Plan are reflected in:

- Lower Campaspe Valley water supply protection area groundwater management plan (Prescription 4)
- Loddon Highlands water supply protection area groundwater management plan (Prescription 5)

- Katunga water supply protection area groundwater management plan (prescriptions 5 and 6)
- Upper Ovens River Water Supply Protection Area water management plan (prescription 49 with prescriptions 2-11 reflecting the Water Supply Protection Area under the rules relating to statutory management plans in response to Part 4 of Chapter 10 of Basin Plan

6. Monitoring, data management and reporting

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), with the help of catchment management authorities (CMAs) and water corporations, carry out monitoring programs across the state using a range of 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. It monitors Victoria's environmental water quality through its Victorian Water Quality Monitoring Network, largely through regional water monitoring partnerships and biological monitoring in partnership with the Environment Protection Authority.

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.

There is a range of strategies which all assist in the management of water quality across the state. These include, but are not limited to:

- State Environment Protection Policy (Waters of Victoria)
- regional sustainable water strategies
- the Victorian Environmental Water Holder's seasonal watering plan
- strategies and plans delivered by other stakeholders including regional catchment strategies and regional waterway strategies
- water corporation annual reports

Victoria's Waterway Management Strategy provides the key policy direction for managing waterways. It is intended to provide a single framework to address community expectations and obligations for waterways. This strategy is supported by regional waterway management strategies, consistent with the Victorian Water Act.

The State Environment Protection Policy (Waters) sets out indicators and quantitative objectives to protect the uses of the state's water resources of public importance. The policy identifies beneficial uses and sets environmental quality objectives and indicators to measure whether these uses are being protected.

For more information on monitoring and reporting under Basin Plan see **Chapter 15** of Victoria's North and Murray Comprehensive Report.

6.1 Data management and reporting

Schedule 12 of the Basin Plan requires the Basin states to report on water quality targets on a five-yearly basis. The relevant matters in Schedule 12 of the Basin Plan are:

- Matter 12 Progress towards the water quality targets in Chapter 9 of the Basin Plan
- Matter 13 The implementation, where necessary of the emergency response process for critical human water needs
- Matter 14 The implementation of the water quality and salinity management plan, including

the extent to which regard is had to the targets in Chapter 9 of the Basin Plan when making flow management decisions

The Basin Plan water quality objectives in Chapter 9 of the Basin Plan are consistent with the state's beneficial uses for protecting drinking, industrial and aquatic ecosystems that a waterway and waterbody can support.

Implementing the State Environment Protection Policy (Waters) protects beneficial uses. It makes sure that actions in the catchments do not have a detrimental impact on the quality of freshwater and that different uses and values of water, including drinking, agricultural, recreational and aquatic ecosystem, are fit-for-purpose consistent with section 5.04 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. They work to satisfy needs including legislative and regulatory compliance, performance monitoring, policy development and operational decision-making as set out in the Victorian Water Act.

Victoria has a range of reporting initiatives being implemented to improve water quality monitoring. 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.

These include:

- **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** documents key water management data for Victoria and provides a summary of water availability, water allocation and use of bulk water for surface water and groundwater
- **Victorian Environmental Water Holder** publishes its annual report and various other reports about outcomes of the use of environmental water allocations
- **Basin Salinity Management 2030 (BSM2030)** 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 annually on streamflow and salinity for end-of-valley target sites. Every second year, a comprehensive report is provided to the Ministerial Council on the 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.

Continuous improvements to water quality management

Victoria continues to improve planning, management and implementation arrangements for water quality. The Victorian Government, through its water plan Water for Victoria (DELWP, 2016) committed to the following initiatives that will improve water quality across Victoria:

- Protect water quality through the State Environment Protection Policy
- Invest in integrated catchment management
- Provide $222 million state-wide over four years to improve waterway health
- Improve environmental water management in a changing climate
- Support community partnerships and citizen science
- Improve knowledge and information about waterways and catchments
- Improve water delivery efficiency in irrigation districts
- Manage salinity, waterlogging and water quality
- Improve salinity management in the Mallee

7. References

Australian Government. (2018). *Chapter: National Water Quality Management Strategy.* Canberra: Department of Agriculture and Water Resources.

DEPI. (2013). *Index of Stream Condition - The Third Benchmark of Victorian River Condition ISC3.* Melbourne: The State of Victoria Department of Environment and Primary Industries .

DELWP. (2015). *Long-term Watering Plan Northern Victoria.* Melbourne: Department of Environment, Land, Water and Planning.

DELWP. (2016). *Victorian Water Accounts 2014-15: A statement of Victorian Water Resources.* Melbourne: Department of Environment, Land, Water and Planning.

DELWP. (2016). *Water for Victoria.* Melbourne: Department of Environment, Land, Water and Planning.

DSE. (2009) *Lower Campaspe Water Supply Protection Area Groundwater Management Plan.*

EPA. (1997). *State Environment Protection Policy (Groundwaters of Victoria).* Melbourne: Victorian Government Gazette No. S 160 Wednesday 17 December 1997.

EPA. (2003). *State Environment Protection Policy (Waters of Victoria).* Melbourne: Victorian Government Gazette No. S 107 Wesdnesday 4 June 2003.

GMW. (2012). *Loddon Highlands Water Supply Protection Area Groundwater Management Plan.* Tatura: Goulburn-Murray Water.

GMW. (2014). *Mid Goulburn Groundwater Management Area Local Management Plan.* Tatura: Goulburn-Murray Water.

GMW. (2015). *Shepparton Irrigation Region Groundwater Management Area Local Management Plan.* Tatura: Goulburn-Murray Water.

GMW. (2017). *Groundwater Management Plan for the Katunga Water Supply Protection Area (Amendments).* Tatura: Goulburn-Murray Water.

Henderson, B., Liu, Y., & Baldwin, D. (2013). *Trends in phyiscal and chemical aspects of water quality in the Murray-Darling Basin 1978-2012.* Canberra: CSIRO Water for a Healthy Country Flagship.

MDBA. (2014). *General review of salinity management in the Murray-Darling Basin* . Canberra : Murray-Darling Basin Authority.

MDBA. (2017). *Objectives and outcomes for river operations in the River Murray System.* Canberra: Murray-Darling Basin Authority.

MDBA. (unknown). *How blue green-algae blooms are handled.* Retrieved December 3, 2017, from Murray-Darling Basin Authority: https://www.mdba.gov.au/managing-water/water-quality/how-blue-green-algae-blooms-are-handled

MDBMC (1989). *Salinity and Drainage Strategy*, Murray-Darling Basin Commission, Canberra.

NHMRC, NRMMC (2011) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy.* National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

VCMC. (2011). *Regional Catchment Management Strategy Guidelines* . Melbourne: Victorian Catchment Management Council.

Schedule 1 Water quality target tables

S.1 Comparison of Chapter 9 Basin Plan targets for fresh water-dependent ecosystems with alternative targets adopted by Victoria

Table S.1: Basin Plan water quality targets and corresponding SEPP (Waters) objectives for water-dependent ecosystems (rivers and streams) in the Target Application Zones of Victorian Murray WRPA and groundwaters in this area

	Equivalent areas		Equivalent areas		Equivalent areas	
Geographic Zone: **Basin Plan Target Application Zone/** **SEPP (Waters) Segment**	IM lower Murray	Lowlands of Mallee in Murray Plains	A4 – Lowland Zone including Loddon and Campaspe	Lowland Loddon Valley in Murray Plains	A5 – Lowland Zone including Broken, Goulburn	Lowland Broken Ck (Goulburn) in Murray Plains
Indicators	Basin Plan Target	SEPP (Waters) Objective	Basin Plan Target	SEPP (Waters) Objective	Basin Plan Target	SEPP (Waters) Objective
pH	6.5 - 9.0 (median range)	6.8 / 7.8 (25^{th}/75^{th})	6.5 / 8.3 (median range)	6.8 / 7.8 (25^{th}/75^{th})	6.4 / 7.7 (median range)	6.4 / 7.5 (25^{th}/75^{th})
Turbidity (NTU)	50 (annual median)	<40 (75^{th} %ile)	30 (annual median)	40 (75^{th} %ile)	30 (annual median)	<25 (75^{th})
Total phosphorus (µg/L)	100 (annual median)	<50 (75^{th} %ile)	45 (annual median)	50 (75^{th} %ile)	<45 (annual median)	<55 (75^{th})
Total nitrogen (µg/L)	1000 (annual median)	900 (75^{th} %ile)	900 (annual median)	900 (75^{th} %ile)	<600 (annual median)	<800 (75^{th})
Dissolved oxygen % sat.	85 / 110 (median range)	65 / 130 (25^{th}/max)	80 / 110 (median range)	65 / 130 (25^{th}/max)	85 / 110 (median range)	75 /130 (25^{th}/max)
EC (uS/cm)	End of Valley Targets	<2000 (75th)	Loddon 711 (median)	<2000 (75th)	Goulburn 99 (median) Broken 141 (median)	<500 (75th)
Indicators	Basin Plan Target	SEPP (Waters) Objective	Basin Plan Target	SEPP (Waters) Objective	Basin Plan Target	SEPP (Waters) Objective

	Equivalent areas	Equivalent areas	Equivalent areas
Temperature	Basin Plan: Between the 20%ile and 80%ile of natural monthly water temperature SEPP (Waters): deferring to *ANZECC & ARMCANZ (2000)* Australian and New Zealand Guidelines for Fresh and Marine Water Quality: <= 20%ile and <= 80%ile of the reference distribution. Note: SEPP (Waters) does not specify temperature as an environmental quality indicator for rivers and streams. Clause 17 of the policy states that If the level of any environmental quality indicator or objective is not provided for in Schedule 3 for the policy, contamination must not cause an adverse impact on the beneficial uses, and the level of any indicator must not be greater than— the levels specified in the ANZECC Guidelines. In this case Section 3.3.2.5 *ANZECC & ARMCANZ (2000)*, specifically Table 3.3.1 applies. These are the same values as included in the Basin Plan.		
Toxicants	Basin Plan (non-Ramsar) and SEPP (Waters) both use Table 3.4.1, *ANZECC & ARMCANZ (2000)* at 95% species protection		

	Equivalent areas		Equivalent areas		Equivalent areas	
Geographic Zone: Basin Plan Target Application Zone/ SEPP (Waters) Segment	C6	Montane zones of Kiewa, Mitta Mitta and Murray in Highlands of SEPP (Waters)	B6	Upland zones of Kiewa, Mitta Mitta and Murray in Uplands A of SEPP (Waters)	A6	Lowland zones of Kiewa Valley in Murray Plains of SEPP (Waters)
Indicators	Basin Plan Target	SEPP (Waters) Objective	Basin Plan Target	SEPP (Waters) Objective	Basin Plan Target	SEPP (Waters) Objective
pH	6.4 / 7.7 (median range)	5.9 / 6.9 (25^{th}/75^{th})	6.4 / 7.7 (median range)	6.5 / 7.5 (25^{th}/75^{th})	6.4 / 7.7 (median range)	6.4 / 7.5 (25^{th}/75^{th})
Turbidity (NTU)	<5 (annual median)	<3 (75^{th} %ile)	<5 (annual median)	<10 (75^{th} %ile)	<10 (median)	<25 (75^{th} %ile)
Total phosphorus (µg/L)	<25 (annual median)	<20 (75^{th} %ile)	<30 (annual median)	<30 (75^{th} %ile)	<45 (median)	<55 (75^{th} %ile)
Total nitrogen (µg/L)	<150(annual median)	<150 (75^{th} %ile)	<350 (annual median)	<470 (75^{th})	<600 (median)	<800 (75^{th} %ile)
Dissolved oxygen % sat.	95 / 110 (median range)	85 / 130 (25^{th}/max)	85 / 110 (median range)	90 / 130 (25^{th}/max)	85 / 100 (median range)	75 / 130 (25^{th}/max)
EC (uS/cm)	NA	<30 (75^{th} %ile)	NA	<100 (75^{th} %ile)	NA	<500(75^{th} %ile)
Temperature	Basin Plan: Between the 20%ile and 80%ile of natural monthly water temperature SEPP (Waters): be deferring to *ANZECC & ARMCANZ (2000)* Australian and New Zealand Guidelines for Fresh and Marine Water Quality: <= 20%ile and <= 80%ile of the reference distribution. Note: SEPP (Waters) does not specify temperature as an environmental quality indicator for rivers and streams. Clause 17 of the policy states that If the level of any environmental quality indicator or objective is not provided for in Schedule 3 for the policy, contamination must not cause an adverse impact on the beneficial uses, and the level of any indicator must not be greater than— the levels specified in the ANZECC Guidelines. In this case Section 3.3.2.5 *ANZECC & ARMCANZ (2000)*, specifically Table 3.3.1 applies. These are the same values as included in the Basin Plan.					
Toxicants	Basin Plan (non-Ramsar) and SEPP (Waters) both use Table 3.4.1, *ANZECC & ARMCANZ (2000)* at 95% species protection					

Table S.2: Basin Plan water quality targets and corresponding SEPP (Waters) objectives for water-dependent ecosystems (rivers and streams) in the Target Application Zones of Northern Victoria WRPA and groundwaters in this area

Geographic Zone: Basin Plan Target Application Zone/ SEPP (Waters) Segment	A4	Lowland Loddon and Campaspe Valleys	B4	Upland Loddon & Campaspe Valleys	C5	Montane Ovens Valley & B5 uppermost Goulburn
Indicators	Basin Plan Target	SEPP (Waters) Objective	Basin Plan Target	SEPP (Waters) Objective	Basin Plan Target	SEPP (Waters) Objective
pH	6.5 – 8.3 (median range)	6.8 / 7.8 (25th/75th)	6.5 – 8.3 (median range)	6.8 / 8.0 (25th/75th)	6.4 – 7.7 (median range)	5.9 / 6.9 (25th/75th)
Turbidity (NTU)	<30 (median)	<40 (75th)	<10 (median)	<15 (75th)	<5 (median)	<3
Total phosphorus (µg/L)	<45 (median)	<50 (75th)	<25 (median)	<55 (75th)	<25 (median)	<20
Total nitrogen (µg/L)	<900 (median)	<900 (75th)	<600 (median)	<1050 (75th)	<150 (median)	<150
Dissolved oxygen % sat.	80 – 110 (median range)	65 / 130 (25th/max)	80 – 110 (median range)	70 / 130 (25th/max)	95 – 110 (median range)	85 / 130 (25th/max)
EC (uS/cm)	EoVT Loddon 711 (median)	<2000 (75th)	NA	<2000 (75th)	NA	<30 (75th)
Temperature	Basin Plan: Between the 20%ile and 80%ile of natural monthly water temperature SEPP (Waters): be deferring to *ANZECC & ARMCANZ (2000)* Australian and New Zealand Guidelines for Fresh and Marine Water Quality: <= 20%ile and <= 80%ile of the reference distribution. Note: SEPP (Waters) does not specify temperature as an environmental quality indicator for rivers and streams. Clause 17 of the policy states that If the level of any environmental quality indicator or objective is not provided for in Schedule 3 for the policy, contamination must not cause an adverse impact on the beneficial uses, and the level of any indicator must not be greater than— the levels specified in the ANZECC Guidelines. In this case Section 3.3.2.5 *ANZECC & ARMCANZ (2000)*, specifically Table 3.3.1 applies. These are the same values as included in the Basin Plan.					
Toxicants	Basin Plan (non-Ramsar) and SEPP (Waters) both use Table 3.4.1, *ANZECC & ARMCANZ (2000) at* 95% species protection					

Geographic Zone: Basin Plan Target Application Zone/ SEPP (Waters) Segment	B5	Upland Goulburn, Broken, Ovens in Central Foothills of SEPP (Waters)	B5	Upland Goulburn, Broken, Ovens in Uplands B of SEPP (Waters)	B5	Upland Goulburn, Broken, in Uplands A of SEPP (Waters)	A5	Lowland Goulburn, Broken and Ovens in Murray Plains of SEPP (Waters)
Indicators	Basin Plan target	SEPP (Waters) objective	Basin Plan target	SEPP (Waters) objective	Basin Plan target	SEPP (Waters) objective	Basin Plan target	SEPP (Waters) objective
pH (25^{th}/75^{th})	6.4 – 7.7 (median range)	6.4 / 7.4 (25^{th}/75^{th})	6.4 – 7.7 (median range)	6.4 / 7.4 (25^{th}/75^{th})	6.4 – 7.7 (median range)	6.4 / 7.4 (25^{th}/75^{th})	6.4 – 7.7 (median range)	6.4 / 7.5 (25^{th}/75^{th})
Turbidity (NTU)	<10 (median)	<20 (75^{th})	<10 (median)	<10 (75^{th})	<10 (median)	<10 (75^{th})	<30 (median)	<25 (75^{th})
Total phosphorus µg/L	<30 (median)	<50 (75^{th})	<30 (median)	<25 (75^{th})	<30 (median)	<25 (75^{th})	<45 (median)	<55 (75^{th})
Total nitrogen µg/L (75^{th})	<600 (median)	<800 (75^{th})	<600 (median)	<400 (75^{th})	<600 (median)	<550 (75^{th})	<600 (median)	<800 (75^{th})
Dissolved oxygen % sat. (25^{th}/max)	90 – 110 (median range)	70 / 130 (25^{th}/ max)	90 – 110 (median range)	85 / 130 (25^{th}/ max)	90 – 110 (median range)	90 / 130 (25^{th}/ max)	85 – 110 (median range)	75 / 130 (25^{th}/ max)
EC (uS/cm) (75th)	NA	<250 (75^{th})	NA	<50 (75^{th})	NA	<100 (75^{th})	EoVTs Goulburn 99 (median) Broken 141 (median) Ovens 72 Median, 100 80^{th}%ile	<500 (75^{th})

Geographic Zone: Basin Plan Target Application Zone/ SEPP (Waters) Segment	B5	Upland Goulburn, Broken, Ovens in Central Foothills of SEPP (Waters)	B5	Upland Goulburn, Broken, Ovens in Uplands B of SEPP (Waters)	B5	Upland Goulburn, Broken, in Uplands A of SEPP (Waters)	A5	Lowland Goulburn, Broken and Ovens in Murray Plains of SEPP (Waters)
Temperature	Basin Plan: Between the 20%ile and 80%ile of natural monthly water temperature SEPP (Waters): be deferring to *ANZECC & ARMCANZ (2000)* Australian and New Zealand Guidelines for Fresh and Marine Water Quality: <= 20%ile and <= 80%ile of the reference distribution. Note: SEPP (Waters) does not specify temperature as an environmental quality indicator for rivers and streams. Clause 17 of the policy states that If the level of any environmental quality indicator or objective is not provided for in Schedule 3 for the policy, contamination must not cause an adverse impact on the beneficial uses, and the level of any indicator must not be greater than— the levels specified in the ANZECC Guidelines. In this case Section 3.3.2.5 *ANZECC & ARMCANZ (2000)*, specifically Table 3.3.1 applies. These are the same values as included in the Basin Plan.							
Toxicants	Basin Plan (non-Ramsar) and SEPP (Waters) both use Table 3.4.1, *ANZECC & ARMCANZ (2000)* at 95% species protection							

Table S.3: Basin Plan water quality targets and corresponding SEPP (Waters) objectives applicable to the Barmah Forest Ramsar

Aquatic ecosystem type	Rivers and streams		Lakes and Wetlands			
			All Lakes and Wetlands	Riverine Flow-through	Riverine Terminal	Riverine Floodplain
Source	Basin Plan*	**SEPP (Waters)** †	Basin Plan*	**SEPP (Waters)** β	**SEPP (Waters)** β	**SEPP (Waters)** β
Total phosphorus (µg/L)	**25** (median)	**<55** (75th)	**10** (median)	**30** (max)	**100** (max)	**100** (max)
Total nitrogen (µg/L)	**350** (median)	**<800** (75th)	**350** (median)	**500** (max)	**1500** (max)	**1500** (max)
Turbidity (NTU)	**10** (median)	**<25** (75th)	**20** (median)	**5** (max)	**15** (max)	**15** (max)
Electrical conductivity (µS/cm)		**<500** (75th)		**100** (max)	NA	NA
Dissolved oxygen (% sat)	85–110 (median range)	75/110 (25th/max)	90-110 (median range)	80-120 (min-max)		
pH	6.4–7.7 (median range)	**6.4/7.5** (25th/75th)	6.5-8.0 (median range)	6.5-8.5 (min-max)		
Toxicants [Table 3.4.1, ANZECC & ARMCANZ (2000)]	99% protection (max)	95% protection (max)	99% protection (max)	95% protection (max)		

**Targets specifically allocated for Ramsar ecosystems in the TAZ A5: Goulburn Lowland Zone*

†Objectives derived for protection of rivers and streams in SEPP (Waters) segment 5.2: Murray and Western Plains (Lowlands of the Campaspe)

β *Objectives derived for protection of each lake/wetland type, for Victoria.*

Table S.4: Basin Plan water quality targets and corresponding SEPP (Waters) objectives applicable to the Gunbower Forest Ramsar Site and the Kerang Wetlands Ramsar Site

Aquatic ecosystem type	Rivers and streams		Lakes and Wetlands			
			All Lakes and Wetlands	Riverine Flow-through	Riverine Terminal	Riverine Floodplain
Source	Basin Plan*	**SEPP (Waters)** †	Basin Plan*	**SEPP (Waters)** β	**SEPP (Waters)** β	**SEPP (Waters)** β
Total phosphorus (µg/L)	**15** (median)	**<50** (75th)	**10** (median)	**30** (max)	**100** (max)	**100** (max)
Total nitrogen (µg/L)	**320** (median)	**<900** (75th)	**350** (median)	**500** (max)	**1500** (max)	**1500** (max)
Turbidity (NTU)	**5** (median)	**<40** (75th)	**20** (median)	**5** (max)	**15** (max)	**15** (max)
Electrical conductivity (µS/cm)		**<2000** (75th)		**100** (max)	NA	NA
Dissolved oxygen (% sat)	80–110 (median range)	65/110 (25th/max)	90-110 (median range)	80-120 (min-max)		
pH	6.5–8.3 (median range)	6.8/7.8 (25th/75th)	6.5-8.0 (median range)	6.5-8.5 (min-max)		
Toxicants [Table 3.4.1, ANZECC & ARMCANZ (2000)]	99% protection (max)	95% protection (max)	99% protection (max)	95% protection (max)		

**Targets specifically allocated for Ramsar ecosystems in the TAZ A5: Goulburn Lowland Zone*

†Objectives derived for protection of rivers and streams in SEPP (Waters) segment 5.2: Murray and Western Plains (Lowlands of the Loddon)

β *Objectives derived for protection of each lake/wetland type, for Victoria*

S.2 Comparison of geographic boundaries for fresh water-dependent ecosystems

A comparison of geographical boundaries between the Basin Plan and State Environment Protection Policy (Waters) is complicated not only by boundary differences between the two documents, but also by differences between target application zone (TAZ) boundaries and water resource plan area boundaries, within the Basin Plan (see **Figure S.1**).

Table S.5 lists the five target application zone boundaries for the Northern Victoria water resource plan area and the valley zones within the water resource plan area that these boundaries cover. Also displays the corresponding SEPP (Waters) segments and sub-segments for the valley zones within each TAZ.

Almost all of the lowland reaches in the Northern Victoria water resource plan are (SW3) catchments are in the Murray and Western Plains Segment of SEPP (Waters). The middle upland reaches of the Goulburn, Broken and Ovens Rivers are divided between the Uplands B Segment in the south-east and the Central Foothills and Coastal Plains Segment towards the north-west.

The headwater streams of the Loddon and Campaspe Rivers are also within the Central Foothills and Coastal Plains Segment. Headwater streams above 1000 m in the Goulburn, Broken and Ovens catchments are in the Highlands segment of SEPP (Waters).

Table S.6 lists the six target application zone boundaries applicable to the Victorian Murray water resource plan area (SW2), covering the:

- Kiewa, Murray and Mitta Mitta Rivers upstream of Albury (TAZs A6, B6 and C6)
- area between lower Broken Creek (north of Shepparton), east to approximately Yarrawonga (TAZ A5)
- area below Kerang, from approximately Swan Hill in the west and Torrumbarry in the east (TAZ A4)
- isolated areas, up to 10 km south of the River Murray covering the Robinvale, Nangiloc, Red Cliffs, Mildura and Merbein Irrigation Districts (IM TAZ)

The A6 TAZ is a small area of land covering the lowermost areas of the Kiewa River and the lowland areas of the Victorian Murray around Albury. This area is covered by the Murray and Western Plains Segment of State Environment Protection Policy (Waters). The majority of the B6 TAZ is within the Uplands A Segment of State Environment Protection Policy (Waters) and the TAZ C6 largely overlaps with the Highlands Segment.

The areas of the Victorian Murray water resource plan area located in the IM, A4 and A5 TAZs are within the Murray and Western Plains segment of SEPP (Waters).

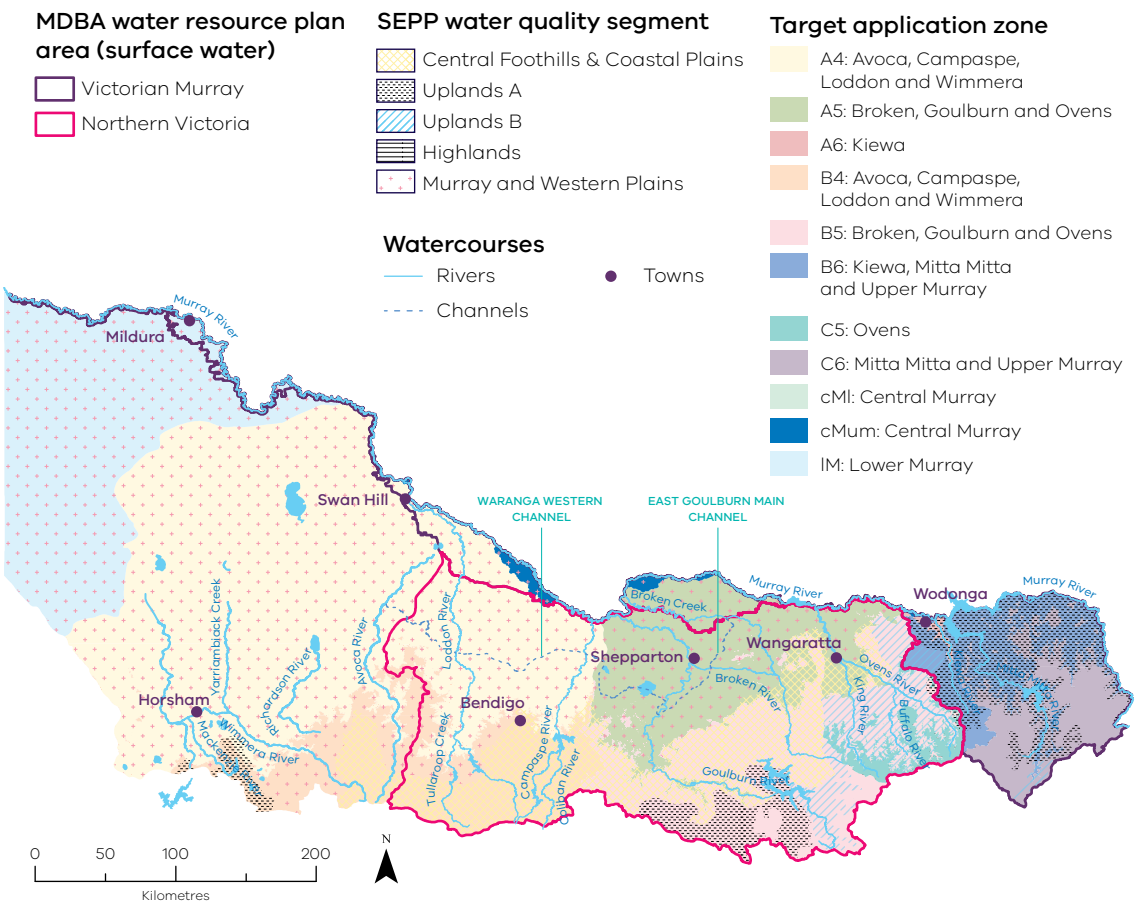

Figure S.1: Comparison of water resource plan areas - surface water, Basin Plan target application zones and SEPP water quality segments across Victoria

Table S.5: Basin Plan target application zones and corresponding SEPP (Waters) segments in the Northern Victoria water resource plan area

Target Application Zone	Valley zones	Corresponding SEPP (Waters) segments and sub-segments	
		SEPP segment description	SEPP sub-segment description
B4	Upland zones of: Loddon and Campaspe Valleys*	Central Foothills and Coastal Plains	Uplands of Campaspe and Loddon
A4	Lowland zones of Loddon and Campaspe Valleys*	Murray and Western Plains	Lowlands of Campaspe and Loddon
C5	Montane zone of Ovens Valley	Highlands	Streams above 1000 m altitude
B5	Upland zones of Broken, Goulburn and Ovens Valleys	Central Foothills and Coastal Plains	Foothills of Ovens, Broken and Goulburn
		Uplands B	Uplands of northern draining catchments - Ovens and Goulburn (part)
		Uplands A	Upper Goulburn (part) and Broken
		Highlands [β]	Streams above 1000 m altitude
A5	Lowland zones of Broken, Goulburn and Ovens Valleys	Murray and Western Plains[¥]	Lowlands of Ovens and Goulburn (and Kiewa)

**Avoca and Wimmera Rivers are in B4 but are in the Wimmera-Mallee water resource plan area*

[β] *Uppermost tributaries of the Goulburn River are at altitudes between 1000 and 1700 m altitude but were placed in B5 (Upland), not C5 (Montane)*

¥ A small proportion of A5 is also in the Central Foothills and Coastal Plains segment

Table S.6: Basin Plan Target Application Zones and corresponding SEPP (Waters) segments in the Victorian Murray water resource plan area

Target Application Zone	Valley zones	Corresponding SEPP (Waters) segments and sub-segments	
		SEPP description	SEPP Sub-segment description
IM	Lower Murray (near Mildura to Robinvale)‡	Murray and Western Plains	Lowlands of Mallee
A4	Lowland Zone of Loddon Valleyβ	Murray and Western Plains	Lowlands of Loddon
A5	Lowland Zone of Broken Ck Valley*	Murray and Western Plains	Lowlands of Goulburn
C6	Montane zone of Kiewa†, Mitta Mitta and Murray Valleys	Highlands	Streams above 1000 m altitude
B6	Upland zones of Kiewa, Mitta Mitta and Murray Valleys	Uplands A¥	Upper Murray and Kiewa basins
A6	Lowland zones of Kiewa Valley	Murray and Western Plains	Lowlands of Kiewa (and Ovens and Goulburn)

‡ A small portion of the IM TAZ encompasses isolated areas in Victoria, up to 10 km from the River Murray. These appear to cover all or parts of the Robinvale, Nangiloc, Red Cliffs, Mildura and Merbein irrigation districts. These form one of three isolated areas of the Victorian Murray water resource plan area.

β A small portion of the A4 TAZ, encompasses the area below Kerang, from approximately Swan Hill in the west and east to Torrumbarry. It includes the lower-most reaches of the Loddon River as well as Gunbower Creek and other Victorian anabranches of the River Murray. This is one of three isolated areas of the Victorian Murray water resource plan area. This area includes the Gunbower Forest Ramsar Site and most of the Kerang Lakes Ramsar Site.

**A small portion of the A5 TAZ, encompasses the area between Lower Broken Creek (north of Shepparton), east to approximately Yarrawonga. This is one of three isolated areas of the Victorian Murray WRPA. This area includes the Barmah Forest Ramsar Site*

†Kiewa has a montane zone, but is not listed in the Basin Plan

¥ A small proportion of B6 is also in the Uplands B segment

Table S.7: Long-term microbial environmental quality indicators and objectives for primary and secondary contact recreation (from SEPP (Waters))

	Microbial Assessment Category (95th percentile (Hazen method) of rolling data set with min. of 60 samples)				
	A	B	C	D	E
	Suitable for primary contact and secondary recreation		Not suitable for primary contact; suitable for secondary contact recreation		Not suitable for any contact recreation
Freshwater	< 130 *E. coli*/100 mL	130 – 260 *E. coli*/100 mL	261 – 550 *E. coli*/100 mL	551 – 5,500 *E. coli*/100 mL	> 5,500 *E. coli*/100 mL

Table S.8: Short-term microbial environmental quality indicators and objectives for primary and secondary contact recreation (from SEPP (Waters))

Short term indicators and objectives for water-based recreation	
E. coli orgs/100 mL freshwater	enterococci orgs/100 mL marine, estuarine and freshwater
Consecutive sample: ≤ 260	Consecutive sample: ≤ 200
Single sample: ≤ 550	Single sample: ≤ 500

Note tables S-7 and S-8 are extracts from Part 6 of Schedule 3 of the State Environment Protection Policy (Waters). To understand how these targets are applied see Part 6 of Schedule 3 of the State Environment Protection Policy (Waters).

Appendix B Approaches to addressing risk

Appendix B Approaches to addressing risk

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1. The risk assessment

1.1 Requirements for addressing risks

1.1.1 Commonwealth Water Act

The *Commonwealth Water Act* 2007 requires the Basin Plan to identify the risks to the condition or continued availability of water resources (section 22(1), item 3).

The risks must deal with the availability of Murray-Darling Basin water resources that arise from the take and use of water, including interception activities, the effects of climate change, land use changes and limitations on the state's knowledge of water resources on which estimates are made about matters relating to basin water resources.

1.1.2 Basin Plan requirements

Consistent with the Commonwealth Water Act, section 4.02 of the Basin Plan identifies potential risks to Murray-Darling Basin water resources, particularly to the condition or continued availability of water and strategies to manage or address these risks.

The risks identified are:

- insufficient water available for the environment (availability)
- water being of unsuitable quality for use (condition)
- poor health of water-dependent ecosystems

The Basin Plan identifies the consequences of these risks for consumptive and other economic uses to maintain social, cultural, Indigenous and other public benefit values.

Section 4.03 of the Basin Plan details a number of strategies to manage, or address, the risks identified in section 4.02 of the Basin Plan.

These strategies are:

- implementing the Basin Plan including these key elements:
  - environmental watering plan
  - water quality and salinity management plan
  - water trading rules
  - water resource planning
- developing water resource plans and amendments to the Basin Plan based on the best available knowledge and in consultation with relevant stakeholders
- promoting a risk-based approach to water resource planning and management
- managing flows to optimise outcomes across the range of water uses in the Murray-Darling Basin
- ensuring effective monitoring and evaluation of the implementation of the Basin Plan
- promoting and enforcing compliance with the Basin Plan and water resource plans
- improving knowledge of water requirements within the Murray-Darling Basin including:
  - environmental watering requirements
  - requirements relating to the social, spiritual and cultural use of Basin resources by Indigenous peoples
  - the impact of climate change on water requirements
  - the water required to deliver social and economic benefits to Basin communities

- improving knowledge of the impact on Basin water resources of:
  - interception activities and land use change
  - floodplain harvesting and peri-urban and industrial take
  - climate change
- improving knowledge of:
  - groundwater and surface water resources, including through improved measurement
  - the causes of water quality degradation and the effects of water quality on environmental assets and ecosystem function

1.1.3 Water resource plan requirements

Section 10.41(1) of the Basin Plan requires Victoria to prepare its water resource plans having regard to the current and future risks to the condition (quality) and continued availability of water resources in the water resource plan area.

The methodology for conducting the risk assessment cover a mix of primary causes, threatening processes and implications for beneficial uses of water resources. These requirements are set out in multiple cross-referenced provisions within the Basin Plan.

The identification and interpretation of the detailed requirements of the risk assessment can be challenging. However, the key requirement is clear: that the risk assessment should consider 'current and future risks to the condition and continued availability' of water resources (section 10.41(1) of the Basin Plan).

A water resource plan must:

- identify, list, assess and define the level of risk (high, medium or low) in line with the AS/NZS 120 31000:2009 (section 10.40 of the Basin Plan)
- describe the data and methods used to assess the risk (section 10.41(7) of the Basin Plan)
- describe quantified uncertainties (section 10.41(8) of the Basin Plan)

For risks assessed as medium or high, a water resource plan must describe the risks (section 10.42(a) of the Basin Plan) and the factors contributing to the risks (section 10.42(b) of the Basin Plan) as well as describing strategies to address them (section 10.43 of the Basin Plan).

The Commonwealth Water Act, Basin Plan and Murray-Darling Basin Authority provide interpretations of the terms that help to set the context for the water resource plan risk assessments:

- water resource – includes 'all aspects of the water resource, including water, organisms, other components and ecosystems'
- condition – includes condition of all these aspects of the water resource
- current and future risks – includes risks that could occur during and beyond the life of the water resource plan, regardless of whether a management strategy is currently in place

1.2 Risk identification and assessment methodology (10.41)

Chapter 10 of the Basin Plan requires a water resource plan to have regard to the risks, strategies and guidelines from Chapter 4 of the Basin Plan– on identification and management of risks.

The risk assessment required an approach that provides structure to the mix of causes, threats and beneficial uses set out in the Basin Plan. This structure enables a methodical, systematic, repeatable and transparent approach to the identification and evaluation of risks necessary for the development of the water resource plans.

Victoria carried out a risk assessment in accordance with the requirements of the Basin Plan. This approach is summarised below in **Figure 1.2.1**.

The approach adopted for the risk assessment aligns with international and national standards, with risk being assessed as the product of the likelihood and consequence of a threat impacting on an 'asset'.

In accordance with the provisions of the Basin Plan, levels of risk assigned to events and their consequences have been defined in a manner consistent with AS/NZS ISO 31000:2009 Risk management – Principles and guidelines. The approach adopted for risk identification and assessment has been undertaken in accordance with the risk management process set out in ISO 31000 (shown in **Figure 1.2.1**).

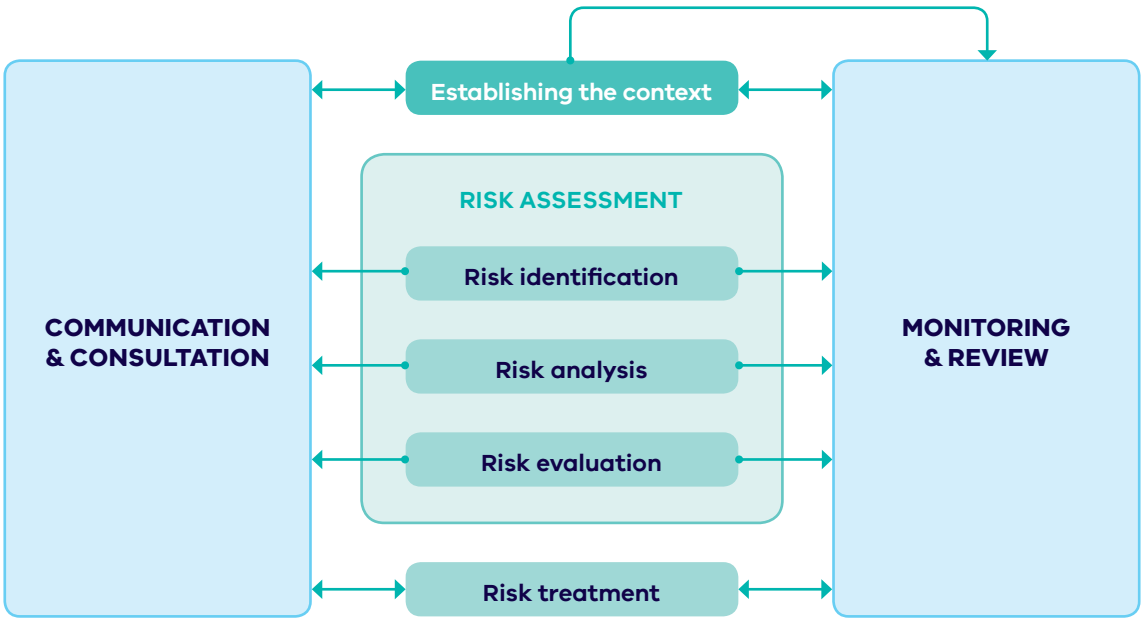

Figure 1.2.1: The risk management process set out in ISO 31000

A single, common and consistent risk assessment framework has been adopted for Victoria's five water resource plan areas. The framework provides a transparent, comprehensive assessment of risk, allowing all risks to be documented and explicitly considered. As such, the framework allows for a detailed exploration and analysis of risk and allows any individual risk to be reviewed and updated, if and when required. The structured nature of the framework also enables risks to be combined and analysed in themes, allowing summaries of risks across the water resource plan areas to be generated and evaluated.

The assessment was done over a 12-month period and overseen by:

- the Department of Environment, Land, Water and Planning (DELWP) water resource plan risk assessment working group: made up of subject matter leads from within DELWP, with skills and responsibilities in surface water policy, interception (farm dams and forestry), climate change, groundwater, environmental water, water quality and drought. This group provided preliminary review and contributions to data, methods and project outputs before a review by the water resource plan risk assessment advisory panel
- the water resource plan risk assessment advisory panel: established to provide a milestone review of the risk assessment. It consisted of representatives from the DELWP, rural water corporations, catchment management authorities, the Victorian Water Industry Association, Murray Lower Darling Rivers Indigenous Nations and the Victorian Environmental Water Holder. A representative from the Victorian Farmers Federation was also invited to attend as an observer. The advisory panel members and their respective organisations provided critical review of the data used in the risk assessment, the identification of risks, the method adopted for the risk assessment, the scenarios to be assessed and the outcomes of the assessment

The following core concepts framed the scope of the risk assessment and the assessment of risks.

Scope of the risk identification and assessment

The risk assessment must identify the current and future risks to the condition and availability of water resources in the water resource plan area (section 10.41(1) of the Basin Plan).

For the purposes of the risk assessment, current and future risks were interpreted to mean the following:

- current risks represent those threats and causes being experienced now
- future risks represent threats and causes proposed by scenarios of a possible future

Basin Plan definitions have been adopted for this risk assessment and therefore the condition of the water resource includes not only water quality, but the health of the water-dependent ecosystems including priority environmental assets. The risk assessment must therefore identify and assess the risks to the condition of organisms, water-dependent ecosystems and other components of the water resource.

The identified risks need to include, but not be limited to, those specified in the Basin Plan (see **Section 1.2.1**). The risk assessment has included these risks and others identified through the risk identification process.

Temporal and spatial scale

The Basin Plan requires water resource plans to address risks to the availability and condition of water resources in Victoria's water resource plan areas.

For this assessment, risks were assessed in terms of their scale of impact on the water resources and the uses within Victoria's the water resource plan areas.

This scale of impact included assessment of the magnitude, spatial extent and duration of impact within each water resource plan area over the life of the water resource plans (2019 to 2029) and beyond. This approach has enabled site-specific and broad-scale risks to be assessed, reflecting the issues within each water resource plan area. The risk assessment considered potential future risks for a period of up to 50 years beyond the life of the water resource plan.

Current, future and residual risk

Risks have been identified in terms of causes, threats and beneficial uses, whereby the beneficial use of water may be impacted by threats arising from various causes. The risk assessment is based on the current level of risk assuming existing policy and practice are in place. In this respect the risk assessment identifies the level of residual risk under current arrangements in Victoria.

A scenario has then been applied to assess future risks occurring. The scenarios exacerbate the risks and lead to the identification of additional medium and long-term risks. In this way all current risks are captured in the assessment of future risks.

Data used to identify and assess risks (10.41(7))

Data has formed the basis of this risk assessment. The literature reviewed is listed in Schedule A of this Appendix consistent with its thematic category. The adequacy of the literature to describe its relevant relationship is rated High (H), Medium (M) and Low (L).

The Basin Plan requires the data and methods used to identify and assess risk to be described in the water resource plan. The descriptions provided in this report and the accompanying materials are considered to be adequate for the MDBA to understand and assess the water resource plan and the risk assessment against Basin Plan requirements. There is also a requirement for the water resource plan to describe any quantified uncertainties and sensitivity analysis. The data and methods adopted for the risk assessment and the level of uncertainty in the assessment have been explicitly included in the risk assessment and reporting. This was developed using a risk register which contains all plausible and not plausible risk statements and the results are collated in **Table 2.1.1 - Table 2.3.2**.

1.2.1 Risks to be assessed

The Basin Plan describes the methodology for identifying and assessing risk. Under the provisions of the Basin Plan, the risk assessment must consider:

1.2.1.1 Availability and condition of water resources

- risks relating to water condition and availability (sections 10.41(1)(a),(b) and (c) of the Basin Plan) for economic (section 4.02(2)(a) of the Basin Plan), social, cultural, Indigenous/Aboriginal and other public benefit values (section 4.02(2)(b) of the Basin Plan)
- risks that water will not be of a suitable quality for use (section 4.02(b) of the Basin Plan) including salinity (section 10.41(2)(d) of the Basin Plan)
- risks to the health of water-dependent ecosystems (sections 4.02(c)) and (10.41(2)(a) of the Basin Plan)
- risks to meeting environmental watering requirements (identified in Victoria's long-term watering plans and Victoria's Environmental Water Management Plans) (section 10.41(2)(a) of the Basin Plan) and risks relating to insufficient water available for the environment (section 4.02(1)(a) of the Basin Plan)
- risks to groundwater systems (including structural damage and groundwater/surface water connections) (sections 10.20(1)(a) and (b) and 10.41(2)(b) of the Basin Plan)
- risks arising from elevated salinity and other types of water quality degradation (section 10.31 and 10.41(2)(d) of the Basin Plan)

1.2.1.2 Interception

Risks from interception activities (section 10.41(2)(c) of the Basin Plan) that may have a significant impact on water resources including those identified in section 10.23 of the Basin Plan, are:

- runoff dams
- commercial plantations
- mining activities, including coal seam gas mining
- floodplain harvesting

The modelling used to underpin the risk assessment relating to interception of water by runoff dams has been updated since completing the risk assessment. The revised modelling is still undergoing review to improve certainty regarding the estimated levels of water intercepted. For this reason, the revised modelling has been applied in assessment of interception for the purposes of Part 5 of Chapter 10 of the Basin Plan as outlined in **Chapter 11** of Victoria's North and Murray Comprehensive Report. The risk assessment as outlined in this Appendix has not been updated to reflect the new modelling at the time of submission of Victoria's North and Murray Water Resource Plan.

1.2.1.3 Extreme events

Event based risks such as, extreme drought, major asset failure, bushfire, point-source discharge, flooding and overbank inundation and the impact on the ability to meet critical human water.

In Victoria critical human needs are defined as

- required to supply Stage 4 restricted demand in urban areas
- supply essential domestic and stock and emergency water supply points to meet water carting requirements for rural customers
- to operate the distribution system to deliver that water

1.2.1.4 Aboriginal objectives

Risks to Aboriginal values and uses of water resources in the water resource plan area.

1.2.1.5 Environmental outcomes

The requirements related to the sustainable use and management of water resources of the water resource plan area within the long-term annual diversion limit for the SDL resource unit:

- surface water - environmental water requirements for priority environmental assets and ecosystem functions (section 10.17 of the Basin Plan)
- groundwater-related risks including groundwater requirements for priority environmental assets and ecosystem functions (section 10.18 of the Basin Plan)
  - groundwater and surface water connections (section 10.19 of the Basin Plan)
  - productive base of groundwater and its management (section 10.20 of the Basin Plan)
  - environmental outcomes related to groundwater (section 10.21(c) of the Basin Plan)

Priority environmental assets and priority ecosystem functions

The risk assessment includes risks to:

- priority environmental assets and ecosystem functions relating to surface water (section 10.17 of the Basin Plan)
- priority environmental assets and ecosystem functions relating to groundwater (section 10.18 of the Basin Plan)
- meeting environmental watering requirements, identified in Victoria's long-term watering plans and Victoria's Environmental Water Management Plans

Victoria has developed three long-term watering plans, for the three surface water water resource plan areas. These plans are based on the watering requirements of specific environmental sites identified in the relevant Environmental Water Management Plans.

Victoria's priority environmental assets set out in **Appendix E** of the Comprehensive Report are the environmental watering assets assessed in this risk assessment. The Risk Assessment identifies that the beneficial uses of water for the environment are environment/aquatic ecosystems. This term includes priority environmental assets and priority ecosystem functions.

Although the Basin Plan specifically requires Basin States to address the risks outlines above it doesn't preclude states addressing other risks as well. For example, Victoria includes the impact of bush fire and the interception by regrowth after fire on water availability and condition as a threat which should be assessed.

1.2.2 Risk assessment methodology

The approach adopted for the risk assessment was based on the requirements of the Basin Plan for water resource plans (section 10.41 of the Basin Plan).

For this risk assessment, risks have been identified in terms of causes, threats and beneficial uses of the water resource, whereby a cause may result in a threat that impacts on a beneficial use of water.

A framework for the risk assessment based on ISO 31000:2009 and based on the concept of likelihood and consequence was developed and adopted for the assessment as described below.

As set out in ISO 31000:2009, the likelihood and consequence assessment must be appropriate to the context of the risk assessment, and customisation of likelihood and consequence categories is entirely appropriate.

The framework developed for the water resource plan risk assessment considers the level of risk to be the product of likelihood and consequence.

For this risk assessment:

- likelihood is assessed in terms of how each cause impacts on each threat
- consequence is assessed in terms of how each threat impacts on each beneficial use

For this risk assessment, likelihood has been defined as a function of susceptibility and probability, and consequence defined as a function of sensitivity.

The framework developed and adopted for the preliminary risk assessment is shown in **Figure 1.2.2**.

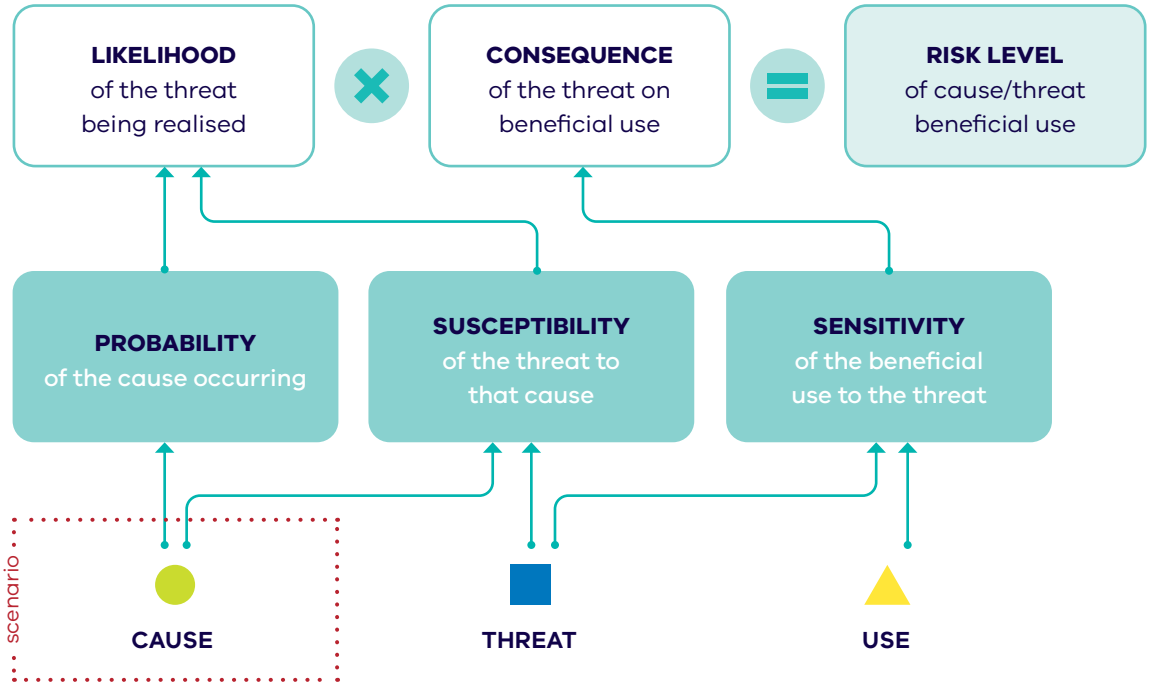

Figure 1.2.2: Process for identifying and assessing risk

Example: Risk identification

A cause, such as extreme drought, may result in a threat like a decline in water availability, that impacts on a use like consumptive use of water.

As an example, there may be a risk associated with an increased number of farm dams (cause), that leads to a reduction in volume of surface water available (threat), adversely impacting on the environment (use).

Table 1.2.1: Components to determine risk

Risk component	Description
CAUSE	An event and accompanying scenario that gives rise to or generates a threat. For this risk assessment, the causes are described as the events that led to the development of a threat. Causes can be changes in levels of development such as increased utilisation of existing rights and entitlements, or events such as climate change or bushfires.
THREAT	Threat is a deviation from an agreed starting point that may affect the use of the water resource. For this risk assessment, a deviation from an agreed starting point could include: • adverse changes in the volume or pattern of water • continuation or changes in water quality or ecosystems that renders them not fit for purpose
USE	The use to which water resources are applied including, environmental, consumptive, recreational/social and Indigenous/Aboriginal uses. For this risk assessment, the water resource plans will be developed to protect the 'condition and continued availability' of Basin water resources for beneficial uses. For this risk assessment, the impact on the availability of water for the environment (surface or groundwater) considers all water used by the environment and not just water which has been specifically released from storage for environmental purposes, or water which is allocated as an environmental entitlement. In this respect, environmental, recreational/social and Indigenous/Aboriginal values may be supported by the provision of water and may not 'use' water in the same manner as consumptive use.

1.2.2.1 Causes and scenarios

A set of potential causes of risk were identified from an extensive literature review and through the engagement process. The causes identified (e.g. climate change) were then assigned a specific scenario that would generate an adverse threat. These causes and accompanying scenarios included one-off natural events, gradual changes over time and incremental changes to land and water use and management. The causes are listed in **Table 1.2.2**. Descriptions of these causes and the scenario adopted are provided in **Table 1.2.3**.

Table 1.2.2: Causes of risk considered in the risk assessment

	Description	Causes considered in the assessment:
CAUSE	An event (and specific scenario) that gives rise to or generates a threat. For this risk assessment, the causes are described as the events that lead to the development of a threat. Causes can be changes in levels of development such as increased utilisation of existing rights and entitlements, or events such as climate change or bushfires.	Climate change • climate change Extreme events • bushfires • extreme drought • extreme wet period • flooding and overbank inundation • major asset failure • point source discharges Land use and interception • earth resource development • failure to continue to invest in best practice land use initiatives • increase in farm dams • land use change (affecting water availability) • land use change (affecting water condition) • pests and weeds Non-compliance • non-compliance with the Victorian Water Act Water access, take, utilisation and location • increase in the number of rights and volume of entitlements • increased utilisation of water access rights • timing and location of demands

Scenarios

Specific scenarios, for each cause, are required to enable risks to be assessed. Each scenario adopted for the risk assessment comprises a detailed description of the specific cause to be assessed.

Many alternative scenarios could be envisaged for each cause. For example, many alternative climate change scenarios are possible. Analysis of each possible scenario for each potential cause would significantly expand the list of potential risks and render the analysis unworkable. For this assessment, one scenario has been assessed for each identified cause. As an example, the International Panel on Climate Change median warming scenario has been adopted for the assessment of the cause 'climate change'.

A full description of the scenario options and rationale for the scenario chosen is contained in the Preliminary Risk Assessment Report (Alluvium, 2016). A brief description of each adopted scenario within each water resource plan area is set out in **Table 1.2.3** also considered selection of scenarios included:

- the probable scenario that produces the highest risk (e.g. extreme drought)
- an extrapolation of past trends (e.g. farm dams, land use)
- that which is adopted in literature (e.g. median climate change)

Importantly, the scenarios cover a range of possible future situations and are not 'forecasts' of a most likely future. The scenarios each represent a possible future. The risk assessment has not combined these scenarios to form one overall future scenario.

Each scenario has been assessed independently to identify the risk associated with that cause and related scenario. Scenarios have also been identified at the water resource plan area scale to ensure their relevance to the causes and threats that will potentially drive risks in each area.

Table 1.2.3: Adopted scenarios for the Northern Victoria water resource plan area

Cause category	Cause	Consequence	Scenario
Climate change	Climate change	Likely to lead to reduced rainfall over south-eastern Australia, increased variability of rainfall and increased mean temperatures.	All water resource plan areas: Median (50th percentile) of global climate model projections based on Moran & Sharples (2011). The median is considered appropriate given much of the analysis available is based on the median rather than the high scenario, and scenario based on the Millennium Drought (see extreme drought scenario) is equivalent to the high scenario in mid to late this century. This scenario and its analysis will be based on the outputs from Scenario B from the Western Region Sustainable Water Strategy (DSE, 2011) and the Northern Region Sustainable Water Strategy (DSE, 2011).
Extreme events	Bushfires	Impacts on availability and condition of water resources arising from bushfires.	Water quality: Major fire during water resource plan period followed by significant flow event (based on worst known examples, including examples from the Mitchell, Macalister and Grampians) Water quantity: Reduction in water yield as a result of regrowth from 2003 bushfire (SKM, 2009).
Extreme events	Extreme drought	An extended period of low rainfall resulting in severe low water availability.	Repeat of the Millennium Drought 13-year climate pattern scaled to represent the rarity of a 1 in 100-year drought. Scenario includes low-flow events (minor freshes) within the drought.
Extreme events	Extreme wet period	An extended period of above average rainfall, which may lead to rising groundwater levels and associated waterlogging and salinity threats.	Wet period equivalent to late 1980s to early 1990s scaled to represent the rarity of a 1 in 100-year wet period. Scenario includes low-flow (events) within the wet period.

continued

Cause category	Cause	Consequence	Scenario
Extreme events	Flooding and overbank inundation	Significant flooding can adversely impact on the condition of water resources.	5 percent annual exceedance probability event (or appropriate historical example).
Extreme events	Major asset failure	A catastrophic failure of major water harvesting and storage infrastructure.	50 percent reduction in the available storage volume in Lake Eildon over the period of the water resource plan.
Extreme events	Point source discharges	Point source discharges are assumed to be a continuation of existing licensed discharges, urban stormwater runoff and accidental spills. Note: Point source discharges associated with mining are described under the earth resource development cause. Point source discharges associated with irrigation drainage are assessed as a component of land use practice.	Stormwater discharges from existing and expanded urban developments in Shepparton and Bendigo.
Land use and interception	Earth resource development	The development, operation, closure and legacy of earth resource activities such as mining, quarrying, oil and gas (hydrocarbons), carbon capture and storage, geothermal and pipelines that intersect aquifers/ aquitards and/or are near waterways pose hazards to surface and groundwater availability and condition, including structural damage to aquifers.	Coal seam gas: No coal seam gas development in Victoria's water resource plan areas (note: there may also be effects on Victoria's groundwater resources due to gas development in New South Wales). Mining: The cessation of mining (and aquifer dewatering) in the Bendigo region, and legacy issues (such as mercury and arsenic contamination) in the Upper Goulburn, Bendigo, and other historic mining areas. Ongoing gold mining with tailing storage facilitates. Open pit: Quarrying – 20 percent expansion of existing floodplain based sand and gravel extractions (particularly in the upper Goulburn River floodplain) with onsite disposal dams.

continued

Cause category	Cause	Consequence	Scenario
Land use and interception	Failure to continue to invest in best practice land use initiatives	Failure to invest in best practice management: grazing, irrigation, cultivation, clearing, road and other infrastructure construction.	Continuation of existing land and waterway management practice in the absence of ongoing support for existing strategies and plans of management.
Land use and interception	Increase in farm dams	Increased construction of farm dams to supply water for domestic and stock consumption.	25 GL increase in the volume of small farm dams in rural-residential developments over a period of 10 years.
Land use and interception	Land use change (affecting availability)	Conversion of dryland agriculture to plantations has been assumed, to produce the largest impacts on water availability. The conversion of irrigated land to plantations is possible, however the impacts are lower than conversion of dryland agriculture to plantation. This is because the water use for plantations and pasture species in areas with annual rainfall below 600 mm is similar, and any applied water is sourced from established water access entitlements which will not impact on long term availability.	5 percent increase of the existing area of plantation. Note: this assumes that existing native timber harvesting at current levels continues.

continued

Cause category	Cause	Consequence	Scenario
Land use and interception	Land use change (affecting condition)	Conversion from grazing to cropping is likely to have a significant impact on runoff water quality in streams particularly in the western areas of the state. In the Northern Victorian water resource plan area two land use changes could have significant impact on the condition of the resource - increased cropping and increased intensification of irrigated dairy production. This scenario includes the potential for development of an algal bloom. Note: The issue of urbanisation is addressed separately under point source discharges.	Combining a 5 percent increase in cropping and a 5 percent increase in irrigated dairy production. However, it is noted that increased cropping in the Ovens River catchment is unlikely.
Land use and interception	Pests and weeds	Considers the impact of weeds such as willow colonisation of streams and pests such as carp invasions. Pest plants such as willow and pest animals such as carp have the potential to pose significant threats to the condition of water resources. Willows can lead to seasonal increases in biological oxygen demand and decreases in dissolved oxygen levels. Willows can also contribute to the abandonment of stream systems. Invasive species such as carp can increase turbidity in stream systems, and predate on native fish species.	Adopt current level of willow extent. Adopt 25 percent increased level of carp.
Non-compliance	Non-compliance with the Victorian Water Act	Includes the unauthorised take and/or use of water or the constructing or altering works without consent.	5 percent illegal take and continuation of current level of unauthorised works on waterways.

continued

Cause category	Cause	Consequence	Scenario
Water access, take, utilisation and location	Increase in the number of rights and volume of entitlements	New entitlements and/or increase domestic and stock user numbers enabling increased take of water from surface or groundwater systems which leads to increased take. The MDBA has capped surface water diversions and there are caps on groundwater entitlement volumes in major groundwater management areas. There are no limits on the number of domestic and stock users. Risk lies in the issue of new groundwater licences (for commercial or irrigation purposes) in unincorporated areas outside existing groundwater management areas or in groundwater management areas where total entitlement volumes are lower than the permissible consumptive volume.	Not applicable
Water access, take, utilisation and location	Increased utilisation of water access rights	Some existing water entitlements are not fully utilised by their holders. Increased utilisation of these entitlements may impact on the availability/condition of water resources.	10 percent increase in use of unregulated surface water entitlements. The scenario is not considered a future risk to regulated catchments.
Water access, take, utilisation and location	Timing and location of demand	Changes to the timing and location of demands for water within the river system may give rise to a range of threats to water availability and/or condition and/or to the structural form of priority environmental assets.	A significant shift in the volume and/or timing of water demands from the Goulburn, Loddon, or Campaspe rivers to the lower River Murray associated with increased intensive agriculture and/or changing environmental water demands.

Table 1.2.4: Adopted scenarios for the Goulburn-Murray water resource plan area

Cause category	Cause	Consequence	Scenario
Climate change	Climate change	Likely to lead to reduced rainfall over south-eastern Australia, increased variability of rainfall and increased mean temperatures.	All water resource plan areas: Median (50th percentile) of global climate model projections based on Moran & Sharples (2011). The median is considered appropriate given much of the analysis available is based on the median rather than the high scenario, and scenario based on the Millennium Drought (see extreme drought scenario) is equivalent to the high scenario in mid to late this century. This scenario and its analysis will be based on the outputs from Scenario B from the Western Region Sustainable Water Strategy (DSE, 2011) and the Northern Region Sustainable Water Strategy (DSE, 2011).
Extreme events	Bushfires	Impacts on availability and condition of water resources arising from bushfires.	Water quality: Water quality impacts of bushfire on groundwater based on scenario for Northern Victoria water resource plan area. Water quantity: Assessed based on scenario for Northern Victoria water resource plan area (SKM, 2009).
Extreme events	Extreme drought	An extended period of low rainfall resulting in severe, low water availability.	Repeat of the Millennium Drought 13-year climate pattern scaled to represent the rarity of a 1 in 100-year drought. Scenario includes low-flow events (minor freshes) within the drought.
Extreme events	Extreme wet period	An extended period of above average rainfall, which may lead to rising groundwater levels and associated waterlogging and salinity threats.	Wet period equivalent to late 1980s to early 1990s scaled to represent the rarity of a 1 in 100-year wet period. Scenario includes low-flow events within the wet period.

continued

Cause category	Cause	Consequence	Scenario
Extreme events	Flooding and overbank inundation	Significant flooding can adversely impact on the condition of water resources.	Not applicable.
Extreme events	Major asset failure	A catastrophic failure of major water harvesting and storage infrastructure.	Failure of bores/bore casings on up to 5 percent of bores based on review of state bore data.
Extreme events	Point source discharges	Point source discharges are assumed to be a continuation of existing licensed discharges, urban stormwater runoff, and accidental spills. Note: Point source discharges associated with mining are described under the earth resource development cause. Point source discharges associated with irrigation drainage are assessed as a component of land use practice.	Leaking landfill sites.
Land use and interception	Earth resource development	The development, operation, closure and legacy of earth resource activities such as mining, quarrying, oil and gas (hydrocarbons), carbon capture and storage, geothermal and pipelines that intersect aquifers/ aquitards and/or are near waterways pose hazards to surface and groundwater availability and condition including structural damage to aquifers.	Coal seam gas: No coal seam gas development in Victoria's water resource plan areas (note: there may also be effects on Victoria's groundwater resources due to gas development in New South Wales). Mining: The cessation of mining and aquifer dewatering in the Bendigo region, and legacy issues (such as mercury and arsenic contamination) in the Upper Goulburn, Bendigo, and other historic mining areas. Ongoing gold mining with tailing storage facilitates. Open pit: Quarrying – 20 percent expansion of existing floodplain based sand and gravel extractions (particularly in the upper Goulburn River floodplain) with onsite disposal dams.

continued

Cause category	Cause	Consequence	Scenario
Land use and interception	Failure to continue to invest in best practice land use initiatives	Failure to invest in best practice management: grazing, irrigation, cultivation, clearing, road and other infrastructure construction.	Continuation of existing land and waterway management practice in the absence of ongoing support for existing strategies and plans of management.
Land use and interception	Increase in farm dams	Increased construction of farm dams to supply water for domestic and stock consumption.	Not applicable.
Land use and interception	Land use change (affecting availability)	Conversion of dryland agriculture to plantations has been assumed, to produce the largest impacts on water availability. The conversion of irrigated land to plantations is possible, however the impacts are lower than conversion of dryland agriculture to plantation. This is because the water use for plantations and pasture species in areas with annual rainfall below 600 mm is similar, and any applied water is sourced from established water access entitlements which will not impact on long term availability.	5 percent increase of the existing area of plantation. Note: this assumes that existing native timber harvesting at current levels continues.
Land use and interception	Land use change (affecting condition)	Conversion from grazing to cropping is likely to have a significant impact on runoff water quality in streams particularly in the western areas of the state. In the Northern Victoria water resource plan area two land use changes could have significant impact on the condition of the resource; increased cropping and increased intensification of irrigated dairy production. This scenario includes the potential for development of an algal bloom. Note: The issue of urbanisation is addressed separately under point source discharges.	The combination of a 5 percent increase in cropping and a 5 percent increase in irrigated dairy production.

continued

Cause category	Cause	Consequence	Scenario
Land use and interception	Pests and weeds	Considers the impact of weeds, such as willow colonisation of streams, and pests such as carp invasions. Pest plants such as willow and pest animals such as carp have the potential to pose significant threats to the condition of water resources. Willows can lead to seasonal increases in biological oxygen demand and decreases in dissolved oxygen levels. Willows can also contribute to the abandonment of stream systems. Invasive species such as carp can increase turbidity in stream systems, while trout can predate on native fish species.	Not applicable.
Non-compliance	Non-compliance with the Victorian Water Act	Includes the unauthorised take and/or use of water or the constructing or altering of works without consent.	5 percent above licensed bore take without authorisation and 10 percent of domestic and stock bore use being applied to (unlicensed) non-domestic and stock use.

continued

Cause category	Cause	Consequence	Scenario
Water access, take, utilisation and location	Increase in the number of rights and volume of entitlements	New entitlements and/or increase domestic and stock user numbers enabling increased take of water from surface or groundwater systems which leads to increased take. The MDBA has capped surface water diversions and there are caps on groundwater entitlement volumes in major groundwater management areas. There are no limits on the number of domestic and stock users. Risk lies in the issue of new groundwater licences (for commercial or irrigation purposes) in unincorporated areas outside existing groundwater management areas or in groundwater management areas where total entitlement volumes are lower than the permissible consumptive volume.	5 percent increase in unincorporated areas and an increase from 20 to 25 GL volume of extraction in the Lower Ovens Groundwater area.
Water access, take, utilisation and location	Increased utilisation of water access rights	Some existing water entitlements are not fully utilised by their holders. Increased utilisation of these entitlements may impact on the availability/condition of water resources.	2006/07 levels of demand occurs for a year on two or more occasions in the next 10 years and a 5 percent increase in domestic & stock bores.
Water access, take, utilisation and location	Timing and location of demand	Changes to the timing and location of demands for water within the river system may give rise to a range of threats to water availability and/or condition.	Not applicable.

Table 1.2.5: Adopted scenarios for the Victorian Murray Surface Water water resource plan area

Cause category	Cause	Consequence	Scenario
Climate change	Climate change	Likely to lead to reduced rainfall over south-eastern Australia, increased variability of rainfall and increased mean temperatures.	All water resource plan areas: Median (50th percentile) of global climate model projections based on Moran & Sharples (2011). The median is considered appropriate given much of the analysis available is based on the median rather than the high scenario, and scenario based on the Millennium Drought (see extreme drought scenario) is equivalent to the high scenario in mid to late this century. This scenario and its analysis will be based on the outputs from Scenario B from the Western Region Sustainable Water Strategy (DSE, 2011) and the Northern Region Sustainable Water Strategy (DSE, 2011).
Extreme events	Bushfires	Impacts on availability and condition of water resources arising from bushfires.	Water quality: Major fire during water resource plan period followed by significant flow event (based on worst known examples, including examples from the Mitchell, Macalister and Grampians). Water quantity: Reduction in water yield as a result of regrowth from 2003 bushfire (SKM, 2009).
Extreme events	Extreme drought	An extended period of low rainfall resulting in severe, low water availability.	Repeat of the Millennium Drought 13-year climate pattern scaled to represent the rarity of a 1 in 100-year drought. Scenario includes low-flow events (minor freshes) within the drought.
Extreme events	Extreme wet period	An extended period of above average rainfall, which may lead to rising groundwater levels and associated waterlogging and salinity threats.	Wet period equivalent to late 1980s to early 1990s scaled to represent the rarity of a 1 in 100-year wet period. Scenario includes low-flow events within the wet period.

continued

Cause category	Cause	Consequence	Scenario
Extreme events	Flooding and overbank inundation	Significant flooding can adversely impact on the condition of water resources.	5 percent annual exceedance probability event (or appropriate historical example).
Extreme events	Major asset failure	A catastrophic failure of major water harvesting and storage infrastructure.	50 percent reduction in the available storage volume in Hume Weir over the period of the water resource plan Or loss of function in salt interception scheme.
Extreme events	Point source discharges	Point source discharges are assumed to be a continuation of existing licensed discharges, urban stormwater runoff, and accidental spills. Note: Point source discharges associated with mining are described under the earth resource development cause. Point source discharges associated with irrigation drainage are assessed as a component of land use practice.	Stormwater discharges from existing and expanded urban developments (in major regional towns such as Wodonga, Echuca, Mildura).

continued

Cause category	Cause	Consequence	Scenario
Land use and interception	Earth resource development	The development, operation, closure and legacy of earth resource activities such as mining, quarrying, oil and gas (hydrocarbons), carbon capture and storage, geothermal and pipelines that intersect aquifers/ aquitards and/or are near waterways pose hazards to surface and groundwater availability and condition (including structural damage to aquifers).	Coal seam gas: No coal seam gas development in Victoria's water resource plan areas (note: there may also be effects on Victoria's groundwater resources due to gas development in New South Wales). Mining: The cessation of mining (and aquifer dewatering) in the Bendigo region, and legacy issues (such as mercury and arsenic contamination) in the Upper Goulburn, Bendigo, and other historic mining areas. Ongoing gold mining with tailing storage facilitates. Open pit: Quarrying - 20 percent expansion of existing floodplain based sand and gravel extractions (particularly in the upper Goulburn river floodplain) with onsite disposal dams. Note: these risk are still relevant to the Victorian Murray water resource plan area because Northern Victorian water resources flow into the Victorian Murray water resource plan area.
Land use and interception	Failure to continue to invest in best practice land use initiatives	Failure to invest in best practice management: grazing, irrigation, cultivation, clearing, road and other infrastructure construction.	Continuation of existing land and waterway management practice in the absence of ongoing support for existing strategies and plans of management.
Land use and interception	Increase in farm dams	Increased construction of farm dams to supply water for domestic and stock consumption.	1.5 GL increase in the volume of small farm dams in rural-residential developments over a period of 10 years.

continued

Cause category	Cause	Consequence	Scenario
Land use and interception	Land use change (affecting availability)	Conversion of dryland agriculture to plantations has been assumed, to produce the largest impacts on water availability. The conversion of irrigated land to plantations is possible, however the impacts are lower than conversion of dryland agriculture to plantation. This is because the water use for plantations and pasture species in areas with annual rainfall below 600 mm is similar, and any applied water is sourced from established water access entitlements which will not impact on long term.	5 percent increase of the existing area of plantation. Note: this assumes that existing native timer harvesting at current levels continues.
Land use and interception	Land use change (affecting condition)	Conversion from grazing to cropping is likely to have a significant impact on runoff water quality in streams particularly in the western areas of the state. In the Victorian Murray water resource plan area two land use changes have been identified as having a potential significant impact on the condition of the resource; increased dairy production (Mitta Mitta and Kiewa Valleys) and increased intensive horticulture (Mildura). The latter of these (horticulture in Mildura) will be assessed under the cause titled 'change in the timing and location of demand'. Increased dairy production assumes an increase in herd numbers and land area.	A 5 percent increase in dairy production across the water resource plan area including the Kiewa and Mitta Mitta valleys and the Murray Valley Irrigation area.

continued

Cause category	Cause	Consequence	Scenario
Land use and interception	Pests and weeds	Considers the impact of weeds such as willow colonisation of streams and pests such as carp invasions. Pest plants such as willow and pest animals such as carp have the potential to pose significant threats to the condition of water resources. Willows can lead to seasonal increases in Biological Oxygen Demand and decreases in dissolved oxygen levels. Willows can also contribute to the abandonment of stream systems. Invasive species such as carp can increase turbidity in stream systems, while trout can predate on native fish species.	Adopt current level of willow extent. Adopt 25 percent increased level of carp.
Non-compliance	Non-compliance with the Victorian Water Act	Includes the unauthorised take and/or use of water or the constructing or altering of works without consent.	5 percent illegal take and continuation of current level of unauthorised works on waterways.

continued

Cause category	Cause	Consequence	Scenario
Water access, take, utilisation and location	Increase in the number of rights and volume of entitlements	New entitlements and/or increase in domestic and stock user numbers enabling increased take of water from surface or groundwater systems which leads to increased take. The MDBA has capped surface water diversions and there are caps on groundwater entitlement volumes in major groundwater management areas. There are no limits on the number of domestic and stock users. Risk lies in the issue of new groundwater licences (for commercial or irrigation purposes) in unincorporated areas outside existing groundwater management areas or in groundwater management areas where total entitlement volumes are lower than the Permissible Consumptive Volume.	Not applicable.
Water access, take, utilisation and location	Increased utilisation of water access rights	Some existing water entitlements are not fully utilised by their holders. Increased utilisation of these entitlements may impact on the availability/condition of water resources.	10 percent increase in use of unregulated surface water entitlements. The scenario is not considered a future risk to regulated catchments.
Water access, take, utilisation and location	Timing and location of demand	Changes to the timing and location of demands for water within the river system may give rise to a range of threats to water availability and/or condition and/or to the structural form of priority environmental assets.	A significant shift in the volume and/or timing of water demands from the Goulburn, Loddon or Campaspe rivers to the lower Murray associated with increased intensive agriculture and/or changing environmental water demands.

1.3 Threats

THREAT

Section 10.41(1) of the Basin Plan - A water resource plan must be prepared having regard to current and future risks to the condition and continued availability of the water resources of the water resource plan area.

To meet the requirements of section 10.41(1) of the Basin Plan Victoria has had regard to the current and future risks to the continued availability of water resources by embedding these into the risk assessment as described in this section.

Threats refer to the condition and availability of water. The condition and availability of water have been assessed in terms of a defined starting point comprising:

- continuation of existing active legislation, instruments, policies, processes, and practices used for the planning and management of the state's water resources
- the implementation of the Basin Plan, with full recovery of 2,750 GL of water for the environment across the Murray-Darling Basin (as adjusted)

A threat is a deviation from an agreed starting point that may affect water uses. For this risk assessment, a deviation from an agreed starting point includes:

- adverse changes in the volume or pattern of water
- continuation or changes in water quality or ecosystems that render them not fit for purpose.

The threats have been developed to reflect the terminology of the Basin Plan (i.e. the risks to the condition and availability of the water resources within the water resource plan area). For the purpose of the risk assessment the threats have been divided into sub-categories to allow exploration of the specific attribute of availability and condition that contribute to risk. The threats are set out and described in **Table 1.3.1**.

The condition of the water resource as set out in the Basin Plan refers not only to the water quality but the health of a water-dependent ecosystem. For the purpose of this risk assessment, those elements of 'condition' that have inherent value (e.g. the organisms and or ecosystems) have been assessed as a 'beneficial use' supported by suitable availability and condition.

Other elements of 'condition' of the water resource that do not have inherent value such as levels of salinity in surface water and a decline in the quality of the physical habitat, have been treated as threats that generate risks to the beneficial use of water.

Table 1.3.1: Threat categories assessed

Threats	Category	Sub category	Definition
Continued **availability** of the water resource	Surface water	Reduction in volume	A change to the inflow of water to the water resource plan area.
		Changes to seasonal pattern of water	A change to the seasonal pattern of rainfall and runoff (e.g. a shift in weather patterns that results in an increase in summer rainfall within the water resource plan area).
		Changes to the interannual pattern	A change to the annual pattern of water availability such as increased annual variability.
	Groundwater	Decline or adverse rise in inflow to aquifers	A long-term decline or adverse rise in the inflow of water to the aquifers of the area. An adverse rise would include increases that result in waterlogging or rising salinity.
		Adverse change to the seasonal pattern of inflows to aquifers	A change to the seasonal pattern of inflow to the aquifers of the area that have an adverse impact on beneficial users and uses.

continued

Threats	Category	Sub category	Definition
Condition of the water resource Risks arising from elevated salinity and other types of water quality degradation (10.31 and 10.41(2)(d))	Water quality	Levels of salinity	Level of salinity in the water resource plan area.
		Levels of suspended sediment and/or nutrients	Level of suspended sediment and nutrients (phosphorus and nitrogen) in the water resource plan area.
		Levels of toxicants	Level of toxicants (pesticides, herbicides, heavy metals, hydrocarbons) in the water resource plan area.
		Levels of pathogens	Level of pathogens (such as Giardia, and cyanobacteria) present in the water resources of the water resource plan area.
		Other water quality attributes	Level of other water quality attributes such as water temperature, pH and/or dissolved oxygen including temperature.
Priority environmental assets and priority ecosystem functions -surface water (10.17)	Structural form (physical / non-water/ non-biological) of priority rivers and wetlands	Loss or decline in longitudinal connectivity	A compromise of fish passages or other barriers such as vegetation connectivity.
		Loss or decline in lateral connectivity	A loss or decline of floodplain connectivity such as the construction of levees or reduction in overbank flows.
		Loss or decline in physical habitat	The loss or decline in condition of instream physical habitat such as sedimentation, erosion, loss of large wood.
Priority environmental assets and priority ecosystem functions -groundwater (10.18)	Availability of water for the priority environmental assets dependent of groundwater	Decline or adverse rise in inflow to aquifer	A long-term decline or adverse rise in the inflow of water to the aquifers of the area. An adverse rise would include increases that result in waterlogging or rising salinity.
		Adverse changes to the seasonal pattern of inflows to aquifers	A change to the seasonal pattern of inflow to the aquifers of the area that have an adverse impact on beneficial users and uses.

continued

Threats	Category	Sub category	Definition
Groundwater surface water connections (10.19) Risks to the productive base of ground water (10.20)	Risks to groundwater systems (including structural damage and groundwater / surface water connections) (10.19) (10.20 (1) (a) and (b))	Loss of structural form of aquifers as an impact affecting connection to surface water Risk to the productive base of groundwater for consumptive uses	Loss of structural form of aquifer as an impact from the causes. Risk to availability consumptive uses of groundwater.

1.4 Use of water

USE

For a threat to be realised and ultimately generate a risk it must have an impact on a use of water from the perspective of availability (quantity) or condition (quality).

For the purpose of this risk assessment, the water resource plans have been developed to protect the 'condition and continued availability' of Basin water resources for use. In many risk assessments the relative importance of a beneficial use has been used along with sensitivity to define consequence. The State Environment Protection Policy (Waters of Victoria) was originally in place when this risk assessment was completed, it defined the beneficial uses which are used in this risk assessment, it has since been replaced with the State Environment Protection Policy (Waters) which continues to use the same beneficial uses. For this risk assessment only beneficial uses of regional, state, national and/or international importance have been considered, and these beneficial uses have been considered to be of equal importance for the risk assessment.

Beneficial uses of local importance are not the focus of the water resource plans and therefore have not been examined in this risk assessment.

The water resource plans protect the 'condition and continued availability' of Basin water resources for beneficial uses.

Beneficial uses have been assessed in terms of:

- consumptive uses
- environmental uses
- recreational/social uses, and
- Indigenous/Aboriginal uses

These beneficial uses have been assessed based on assessment of risk to:

- surface water availability based on categories that define the legal entitlement or right to water **Table 1.4.1**)
- groundwater availability based on categories that reflect the physical attributes of the aquifer from which water is derived (**Table 1.4.2**)
- water quality condition based on the State Environment Protection Policy (Waters) beneficial use categories (**Table 1.4.4**)
- structural form of surface water resources based on categories that reflect priority environmental assets and priority ecosystem functions -wetlands and rivers (**Table 1.4.5**)
- structural form of aquifers

The following tables set out the sub-classes of beneficial use adopted for the risk assessment. Sub-classes have been adopted as they:

- can reflect the sensitivity to the threatening process (e.g. the availability of water from held entitlements is less sensitive to changes in the seasonal pattern of surface water than the availability of water from unregulated flow)
- can be developed to be consistent, as far as possible, with the 'indicators' used in the 2010 Victorian Risk Assessment for the Murray-Darling Basin Risks to Shared Water Resources Program
- can be general enough that there is a workable number of beneficial use-threat combinations to assess

A note on Aboriginal water

The environmental and consumptive uses of water are relatively well understood as water resource planning concepts. However, Aboriginal uses of water are not as well understood.

Aboriginal water is an emerging term to describe the full range of Aboriginal interests and aspirations in water. It encompasses 'Aboriginal environmental outcomes' and: 'cultural flows' (see below) and identifies improvements in environmental outcomes and economic benefits for Aboriginal communities.

The MDBA has proposed the term 'Aboriginal environmental outcomes' to describe and communicate the benefits to Aboriginal people that can be derived from environmental watering. To help understand the term Aboriginal environmental outcomes, it is important to know what they are not. They are not 'cultural flows' or 'cultural water', which are water entitlements held by Aboriginal Nations and which may also have a commercial benefit where any revenue accrued goes to Aboriginal people.

Ownership of water by Traditional Owners can bring many benefits, including:

- improved self-esteem and empowerment as a result of being able to care for Country
- improvements to health and wellbeing through being able to see Country in a healthy state as a result of their interventions
- potential economic returns.

Aboriginal environmental outcomes can occur as a result of healthier rivers and wetlands; such as:

- improved fish populations
- more reeds that can be harvested
- increased bird breeding events.

Cultural flows or cultural water nourishes a socio-economic relationship with water and Aboriginal environmental outcomes provide tangible physical benefits.

Victoria's water management framework, including existing instruments and processes, may be used to address both aspects of Aboriginal water. An evidence-based approach is necessary to identify the appropriate implementation options. These are expected to be different in different locations.

It is clear that Aboriginal uses of water encompass a wide range of cultural and environmental benefits. However, for the purposes of this risk assessment these have been grouped together as a single beneficial use because there is limited information to allow risks to be assessed differently for each sub-group of Indigenous/Aboriginal use.

1.4.1 Surface water availability

Table 1.4.1 sets out the categories used for the assessment of risks to beneficial users associated with surface water availability. The risk associated with the availability of surface water for consumptive use, or any other use, with one form of right to water (e.g. high-reliability bulk entitlements) was examined separately to the risk associated with the availability of surface water for consumptive uses accessed by other rights (e.g. stock and domestic). This enabled the risks to the different forms of water entitlement to be examined.

Table 1.4.1: Beneficial use categories for assessment of surface water availability risk

Beneficial use	Entitlement and right /form of access to water (temporal)
Environment	• high-reliability bulk entitlement and water shares • low-reliability bulk entitlement and water shares • controlled water (passing flows) • uncontrolled water (above-cap water)
Consumptive	• very-high-reliability water (urban bulk entitlements) • high-reliability bulk entitlements and water shares • low-reliability bulk entitlements and water shares • system operation water • section 51 (take and use) licences • section 8 domestic and stock rights
Recreational/social	• social and recreational values not provided by a recreation bulk entitlement (e.g. water harvested for entitlements in storages or water released into waterways by the environmental water holders)
Indigenous/Aboriginal	• section 8A Traditional Owner rights note: Other Indigenous/Aboriginal uses of surface water include consumptive, environmental and social uses.

1.4.2 Groundwater availability

The categories for the assessment of risks to beneficial uses associated with groundwater are set out in Table 1.4.2.

The groundwater beneficial use sub-categories divide the groundwater areas that are intrinsically different in terms of the inertia of the aquifer. The inertia of the aquifer is associated with:

- the storage (S) of the aquifer relative to recharge (R) rate to the aquifer (S/R)

An aquifer with a small S/R will be more sensitive to a change in recharge condition.

Conversely an aquifer with a high S/R has a significantly large storage volume relative to annual recharge and hence is less sensitive to a change in recharge. This method was used in the development of the groundwater sustainable diversion limits for the Basin Plan (CSIRO and SKM, 2010).

Table 1.4.2: Beneficial use categories for assessment of groundwater availability risk

Beneficial use	Sub Beneficial Use Class	Storage to Recharge Ratio	Form of access to water
Environment	Basin GCS	S/R >40	None (disconnected to surface systems)
	Basin Margin GCS (deep)	S/R 20-40	
	Basin Margin GCS (shallow)	S/R 10-20	Considerations around environmental water needs described in groundwater management plans.
	Upland Layered Valley	S/R 10-20	
	Uplands GCS	S/R <10	
Consumptive	Basin GCS	S/R >40	Licence entitlements and domestic and stock rights.
	Basin Margin GCS (deep)	S/R 20-40	
	Basin Margin GCS (shallow)	S/R 10-20	
	Upland Layered Valley GCS	S/R 10-20	
	Uplands GCS	S/R <10	
Recreational/Social	Not assessed		
Indigenous	Indigenous values provided by groundwater		

Table 1.4.3: Victorian state aquifer classification mapped to the SDL resource units these aquifers relate to

SDL area	Victorian Aquifer framework category
Goulburn-Murray: Shepparton Irrigation Region (GS8a)	Basin Margin GCS (shallow)
Goulburn-Murray: Sedimentary Plain (GS8c)	Basin Margin GCS (shallow) Basin GCS Upland Layered Valley Uplands GCS
Goulburn-Murray: Highlands (GS8b)	Uplands GCS
Goulburn-Murray: Deep (GS8d)	Basin Margin GCS (deep)

1.4.3 Water quality condition

The beneficial use categories adopted for the assessment of water quality (condition) reflect the beneficial uses of water as set out in State Environment Protection Policy (Waters). The State Environment Protection Policy (Waters of Victoria) was originally in place when this risk assessment was completed, it has since been replaced with the State Environment Protection Policy (Waters) which continues to use the same beneficial uses. These categories are set out in Table 1.4.4.

Table 1.4.4: Beneficial use categories for assessment of surface and groundwater condition (water quality) risk

Beneficial uses	Categories
Environment/aquatic ecosystems	Largely unmodified
	Slightly to moderately modified
	Highly modified
Consumptive	Human consumption after appropriate treatment
	Agriculture and irrigation
	Aquaculture
	Industrial and commercial use
	Fish, crustacean and molluscs for human consumption
Recreational/Social	Primary contact recreation (e.g. swimming)
	Secondary contact recreation (e.g. boating)
	Aesthetic enjoyment
Indigenous/Aboriginal	Indigenous cultural and spiritual values

1.4.4 Priority environmental assets and priority ecosystem functions - structural form

For the purpose of this risk assessment the beneficial uses associated with the structural form of the water resource includes the two categories, rivers and wetlands. These categories were used to assess the risk to longitudinal connectivity, lateral connectivity and instream physical habitat (structural form) of priority environmental assets and priority ecosystem functions identified in the long-term environmental watering plans (see **Table 1.4.5**).

Table 1.4.5: Beneficial use categories for assessment of condition (structural form) risk

Beneficial uses	Categories
environmental assets/aquatic ecosystems and priority ecosystem functions	Rivers
	Wetlands

1.5 Susceptibility, probability and consequence

1.5.1 Probability

Probability refers to the chance of a cause occurring, given the adopted scenario and the existing management arrangements (e.g. the International Panel on Climate Change median warming scenario – a 2 degree increase in global temperature – is almost certain to occur despite existing management arrangements)

What is the probability that { *climate change, extreme drought, earth resource extraction, major asset failure, etc...* } *will actually occur?*

Each cause was assessed separately for each water resource plan area, and included consideration of:

- probability of the cause
- confidence in that assessment

1.5.2 Susceptibility

Susceptibility considers how susceptible a threat is to a particular cause (e.g. the volume of surface water is highly susceptible to impacts from climate change).

If { *climate change, extreme drought, earth resource extraction, major asset failure, etc...* } *will actually occur, to what extent would it cause* { *reduction in available volume, decline in aquifer inflow, elevated salinity levels, changes to lateral connectivity, etc...* } *?*

The susceptibility of each threat to each cause has been assessed in terms of three variables. Each combination of cause and threat was assessed separately for each water resource plan, and included consideration of:

- magnitude: the magnitude of the change / impact of a cause on a threat
- spatial extent: the spatial extent of the cause on the threat
- duration: the duration of the change / impact on the threat arising from the cause

In addition, the level of confidence was ranked for each susceptibility assessment.

1.5.3 Sensitivity

For the purpose of this assessment sensitivity refers to the link between a threat and a beneficial use such as where high-reliability water entitlements (for consumptive use) may be moderately sensitive to changes in the long-term volume of surface water.

If { *climate change, extreme drought, earth resource extraction, major asset failure, etc...* } *will actually occur, to what extent would it cause* { *reduction in available volume, decline in aquifer inflow, elevated salinity levels, changes to lateral connectivity, etc...* } *?*

Each combination of threat and beneficial use was assessed for each water resource plan, and included:

- development of rating tables to compare how each beneficial use would be affected for different levels of threat
- confidence in that assessment

The explicit treatment of these factors of probability, susceptibility and sensitivity can introduce some complexity but has helped to produce a comprehensive, transparent and readily justified risk assessment.

1.6 Quantified uncertainties (10.41(8)) through a sensitivity analysis

A rating on the level of confidence was applied to each element of the risk assessment (probability, susceptibility and sensitivity). The level of confidence assessment ratings has enabled the establishment of an individual level of confidence rating for each individual combination of cause, threat and beneficial use. A three-level assessment of confidence was applied to each assessment of probability, susceptibility and sensitivity:

- High confidence: where the assessment is based on the literature or statistical analysis
- Moderate confidence: where the assessment was made based on sound professional opinion
- Low confidence: where the assessment was made based on a best estimate.

A final level of confidence rating, using the sum of the three level of confidence scores for each of the probability (of cause occurring), susceptibility (of the threat to the cause) and sensitivity (of the beneficial use to the threat), was calculated for each risk. The three levels of confidence scores were added rather than multiplied to avoid the potential to understate or overstate the final level of confidence, as a result of high or low levels of confidence applied to each element of the risk assessment.

The approach adopted for the risk assessment quantifies uncertainty for each assessment of probability, susceptibility and sensitivity. As such the approach provides for an explicit assessment of uncertainty for each individual risk, as in each and every individual combination of cause, threat and beneficial use). This treatment of uncertainty is required under the Basin Plan and enables the effective management of risk. The addition of confidence scores resulted in a rating of three to eight as identified in **Table 1.2.1**, **Table 2.3.2** (surface water) and **Table 2.2.2** (groundwater).

The ratings were translated into the following rating provided in the risk tables (**Table 3.2.1** - **Table 3.4.41**) in **Section 2** of this report.

2. List of risks (10.41(4)) assessment of level of each risk (10.41(5)) and quantified uncertainties (10.41(8))

The Basin Plan requires all identified risks to be listed in water resource plans. This is provided in tables in this section. There are many thousands of potential risks included in these charts. Macro causes have been identified to help categorise the risks, these are the overarching categories within which the causes can be asses. The risk assessment identifies climate change, extreme events, land use and interception. non-compliance and water access, take utilisation and locations as the categories. Note these are broader than the causes defined in the Basin Plan. Importantly, these macro categories have not resulted in the arbitrary exclusion of risks. The approach adopted has enabled detailed analysis of specific risks and grouping of risk into themes that allows broad analysis of issues.

The Basin Plan requires that all identified risks must be assessed (section 10.41(5) of the Basin Plan). The level of risk as defined by ISO 31000, must be defined using the categories low, medium and high, although further categories can be used. AS/NZS ISO 31000:2009 Risk management – principles and guidelines, has been used to guide the risk assessment.

Victoria has added risk categories to help classify and consider risks in water resource plan development to reflect the risk and its associated impact on the condition and continued availability of water. This further classification of risk has also helped identify some strategies for addressing risks in a manner commensurate with the level of risk.

For clarity risks noted as 'moderate' in the tables below correspond to medium-level risks in ISO:31000 and risks identified as 'high' or 'very high' correspond to high-level risks under the ISO:310000 principles.

The Basin Plan also requires that quantified uncertainties in the level of risk attributed to each risk, including the results of any sensitivity analysis, are identified (section 10.41(8 of the Basin Plan)). Tables setting out the level of confidence in each risk assessment are provided here. Low levels of confidence were most commonly applied to and associated with risks to Aboriginal water use.

These are presented in table form below.

Risk assessment

Legend	5	4	3	2	1	0
	Very high risk	High risk	Medium risk	Low risk	Very low risk	Not plausible – no risk

Level of confidence/sensitivity analysis

Legend	8	7	6	5	4	0
	High confidence	Moderate – High confidence	Moderate confidence	Low – Moderate confidence	Low confidence	No plausible risk

2.1 Northern Victoria water resource plan area (surface water)

Table 2.1.1: Northern Victoria water resource plan area – List and assessment of risks

Northern Victoria WRPA - Surface Water Level of risk		Availability										Condition & Avail		Condition - Water Quality										Waterway Biota	
		Environment				Consumptive								Environ	Consumptive					Social				Environment	
		HR BE	LR BE	Contr'd water	Uncontr'd water	VHR BE	HR BE	LR BE	System op. water	s51 licences	s8 S&D rights	Rec. & amenity	Aborig. culture	North Vic	Human drink	Ag & irrig	Aqua-culture	Industry / commerc'l	Fish crust'ns consum'n	Primary contact rec.	Secondary contact rec.	Aesthetics	Rivers	Wetlands
Climate change	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Extreme drought	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Extreme wet period	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Flooding and overbank inundation	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Bushfires	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Land use change: Availability	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Land use change: Condition	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Existing land use practices	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Farm dams	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Increased utilisation of water access rights	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Increase in the number of entitlements leading to increased take	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Non-compliance with the Water Act 1989	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Timing and location of demands	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Earth resources development	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Point source discharges	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Major asset failure	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Pest and weeds	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							

Table 2.1.2: Northern Victoria water resource plan area – level of confidence

Northern Victoria WRPA - Surface Water Level of confidence in risk assessment		Availability										Condition & Avail		Condition - Water Quality										Waterway Biota	
		Environment				Consumptive								Environ	Consumptive					Social				Environment	
		HR BE	LR BE	Contr'd water	Uncontr'd water	VHR BE	HR BE	LR BE	System op. water	s51 licences	s8 S&D rights	Rec. & amenity	Aborig. culture	North Vic	Human drink	Ag & irrig	Aqua-culture	Industry / commerc'l	Fish crust'ns consum'n	Primary contact rec.	Secondary contact rec.	Aesthetics	Rivers	Wetlands
Climate change	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Extreme drought	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Extreme wet period	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Flooding and overbank inundation	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Bushfires	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Land use change: Availability	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Land use change: Condition	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Existing land use practices	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Farm dams	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Increased utilisation of water access rights	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Increase in the number of entitlements leading to increased take	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Non-compliance with the Water Act 1989	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Timing and location of demands	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Earth resources development	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Point source discharges	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Major asset failure	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Pest and weeds	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							

2.2 Goulburn-Murray water resource plan area (groundwater)

Table 2.2.1: Goulburn-Murray water resource plan area – List and assessment of risks

Goulburn-Murray WRPA - Groundwater Level of risk		Condition & Avail		Availability								Condition - Water Quality				
				Environment				Consumptive				Consumptive				
		Rec. & amenity	Aborig. culture	Basin Margin Deep	Basin Margin Shallow	Upland Layered Valley	Uplands	Basin Margin Deep	Basin Margin Shallow	Upland Layered Valley	Uplands	Human drink	Ag & irrig	Aqua-culture	Industry / commerc'l	Fish crust'ns consum'n
Climate change	Decline in inflow to, or increase in extraction from, aquifer	3	5	3	4	5	5	4	4	5	5					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	3	5	3	4	5	5	4	4	5	5					
	Salinity		5					3	3	3	3	3	4	3	3	4
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Extreme drought	Decline in inflow to, or increase in extraction from, aquifer	1	3	1	1	2	2	1	1	2	2					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	1	4	1	3	3	3	3	3	3	3					
	Salinity		3					1	1	1	1	1	1	1	1	1
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Extreme wet period	Decline in inflow to, or increase in extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		3					1	1	1	1	1	1	1	1	1
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		1									1	1	1	1	1
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		1									1	1	1	1	1
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Flooding and overbank inundation	Decline in inflow to, or increase in extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		3					1	1	1	1	1	1	1	1	1
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		3									1	1	1	1	1
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		3									1	1	1	1	1
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Bushfires	Decline in inflow to, or increase in extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		3					1	1	1	1	1	1	1	1	1
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		3									1	1	1	1	1
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		3									1	1	1	1	1
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Land use change: Availability	Decline in inflow to, or increase in extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		3					1	1	1	1	1	1	1	1	1
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		3									1	1	1	1	1
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		3									1	1	1	1	1
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Land use change: Condition	Decline in inflow to, or increase in extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		4					1	2	1	1	1	3	2	2	3
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		4									3	3	3	2	3
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		4									1	2	2	1	2
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Existing land use practices	Decline in inflow to, or increase in extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		3					1	1	1	1	1	2	1	1	2
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		3									1	1	1	1	1
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		3									1	1	1	1	1
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Farm dams	Decline in inflow to, or increase in extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Salinity		3					1	1	1	1	1	1	1	1	1
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Increased utilisation of water access rights	Decline in inflow to, or increase in extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Salinity		3					1	1	1	1	1	1	1	1	1
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Increase in the number of entitlements leading to increased take	Decline in inflow to, or increase in extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Salinity		3					1	1	1	1	1	1	1	1	1
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Non-compliance with the Water Act 1989	Decline in inflow to, or increase in extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	1	3	1	1	1	1	1	1	1	1					
	Salinity		3					1	1	1	1	1	1	1	1	1
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Timing and location of demands	Decline in inflow to, or increase in extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		0									0	0	0	0	0
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Earth resources development	Decline in inflow to, or increase in extraction from, aquifer	1	4	1	2	2	2	1	2	2	2					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	1	4	1	2	2	2	1	2	2	2					
	Salinity		4					1	2	1	1	1	3	2	2	3
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		4									3	3	3	2	3
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		4									1	2	2	1	2
	Loss of structual form of aquifer		4	2	2	2	2	2	2	2	2					
Point source discharges	Decline in inflow to, or increase in extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		4					1	2	1	1	1	3	2	2	3
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		4									3	3	3	2	3
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		4									1	2	2	1	2
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Major asset failure	Decline in inflow to, or increase in extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		4					1	1	1	1	1	2	2	1	2
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Loss of structual form of aquifer		0	0	0	0	0	0	0	0	0					
Pest and weeds	Decline in inflow to, or increase in extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		0									0	0	0	0	0
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer		0	0	0	0	0	0	0	0	0					

Table 2.2.2: Goulburn-Murray water resource plan area – level of confidence

Goulburn-Murray WRPA - Groundwater Level of confidence in risk assessment		Condition & Avail		Availability								Condition - Water Quality				
				Environment				Consumptive				Consumptive				
		Rec. & amenity	Aborig. culture	Basin Margin Deep	Basin Margin Shallow	Upland Layered Valley	Uplands	Basin Margin Deep	Basin Margin Shallow	Upland Layered Valley	Uplands	Human drink	Ag & irrig	Aqua-culture	Industry / commerc'l	Fish crust'ns consum'n
Climate change	Decline in inflow to or increase in extraction from aquifer	7	6	7	7	7	7	7	7	7	7					
	Change to the seasonal pattern of inflow to or extraction from aquifer	7	6	7	7	7	7	7	7	7	7					
	Salinity		5					6	6	6	5	5	5	5	5	5
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Extreme drought	Decline in inflow to or increase in extraction from aquifer	7	6	7	7	7	7	7	7	7	7					
	Change to the seasonal pattern of inflow to or extraction from aquifer	7	6	7	7	7	7	7	7	7	7					
	Salinity		5					6	6	6	5	5	5	5	5	5
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Extreme wet period	Decline in inflow to or increase in extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		6					7	7	7	6	6	6	6	6	6
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		5									5	5	5	5	5
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		5									5	5	5	5	5
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Flooding and overbank inundation	Decline in inflow to or increase in extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		6					7	7	7	6	6	6	6	6	6
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		6									6	6	6	6	6
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		6									6	6	6	6	6
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Bushfires	Decline in inflow to or increase in extraction from aquifer	5	5	5	5	5	5	5	5	5	5					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		4					5	5	5	4	4	4	4	4	4
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		4									4	4	4	4	4
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		4									4	4	4	4	4
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Land use change: Availability	Decline in inflow to or increase in extraction from aquifer	7	6	7	7	7	7	7	7	7	7					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		6					7	7	7	6	6	6	6	6	6
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		6									6	6	6	6	6
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		6									6	6	6	6	6
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Land use change: Condition	Decline in inflow to or increase in extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		4					5	5	5	4	4	4	4	4	4
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		4									4	4	4	4	4
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		4									4	4	4	4	4
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Existing land use practices	Decline in inflow to or increase in extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		4					5	5	5	4	4	4	4	4	4
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		4									4	4	4	4	4
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		4									4	4	4	4	4
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Farm dams	Decline in inflow to or increase in extraction from aquifer	6	5	6	6	6	6	6	6	6	6					
	Change to the seasonal pattern of inflow to or extraction from aquifer	6	5	6	6	6	6	6	6	6	6					
	Salinity		5					6	6	6	5	5	5	5	5	5
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Increased utilisation of water access rights	Decline in inflow to or increase in extraction from aquifer	6	5	6	6	6	6	6	6	6	6					
	Change to the seasonal pattern of inflow to or extraction from aquifer	6	5	6	6	6	6	6	6	6	6					
	Salinity		5					6	6	6	5	5	5	5	5	5
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Increase in the number of entitlements leading to increased take	Decline in inflow to or increase in extraction from aquifer	6	5	6	6	6	6	6	6	6	6					
	Change to the seasonal pattern of inflow to or extraction from aquifer	6	5	6	6	6	6	6	6	6	6					
	Salinity		5					6	6	6	5	5	5	5	5	5
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Non-compliance with the Water Act 1989	Decline in inflow to or increase in extraction from aquifer	6	5	6	6	6	6	6	6	6	6					
	Change to the seasonal pattern of inflow to or extraction from aquifer	6	5	6	6	6	6	6	6	6	6					
	Salinity		5					6	6	6	5	5	5	5	5	5
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Timing and location of demands	Decline in inflow to or increase in extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		0					0	0	0	0	0	0	0	0	0
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Earth resources development	Decline in inflow to or increase in extraction from aquifer	7	6	7	7	7	7	7	7	7	7					
	Change to the seasonal pattern of inflow to or extraction from aquifer	7	6	7	7	7	7	7	7	7	7					
	Salinity		6					7	7	7	6	6	6	6	6	6
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		6									6	6	6	6	6
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		6									6	6	6	6	6
	Structual form of aquifer	0	6	7	7	7	7	7	7	7	7					
Point source discharges	Decline in inflow to or increase in extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		6					7	7	7	6	6	6	6	6	6
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		6									6	6	6	6	6
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		6									6	6	6	6	6
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Major asset failure	Decline in inflow to or increase in extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		5					6	6	6	5	5	5	5	5	5
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					
Pest and weeds	Decline in inflow to or increase in extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Change to the seasonal pattern of inflow to or extraction from aquifer	0	0	0	0	0	0	0	0	0	0					
	Salinity		0					0	0	0	0	0	0	0	0	0
	Suspended sediment & nutrients		0									0	0	0	0	0
	Toxicants		0									0	0	0	0	0
	Pathogens		0									0	0	0	0	0
	Other water quality impacts		0									0	0	0	0	0
	Structual form of aquifer	0	0	0	0	0	0	0	0	0	0					

2.3 Victorian Murray water resource plan area (surface water)

Table 2.3.1: Victorian Murray water resource plan area – List and assessment of risk

Victorian Murray WRPA - Surface Water Level of risk		Availability										Condition & Avail		Condition - Water Quality									Waterway Biota	
		Environment				Consumptive								Environ	Consumptive				Social				Environment	
		HR BE	LR BE	Contr'd water	Uncontr'd water	VHR BE	HR BE	LR BE	System op. water	s51 licences	s8 S&D rights	Rec. & amenity	Aborig. culture	Vic Murray	Human drink	Ag & irrig	Aqua-culture	Industry / commerc'l	Fish crust'ns consum'n	Primary contact rec.	Secondary contact rec.	Aesthetics	Rivers	Wetlands
Climate change	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Extreme drought	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Extreme wet period	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Flooding and overbank inundation	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Bushfires	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Land use change: Availability	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Land use change: Condition	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Existing land use practices	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Farm dams	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Increased utilisation of water access rights	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Increase in the number of entitlements leading to increased take	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Non-compliance with the Water Act 1989	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Timing and location of demands	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Earth resources development	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Point source discharges	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Major asset failure	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Pest and weeds	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							

Table 2.3.2: Victorian Murray water resource plan area – level of confidence

Victorian Murray WRPA - Surface Water Level of confidence in risk assessment		Availability										Condition & Avail		Condition - Water Quality									Waterway Biota	
		Environment				Consumptive								Environ	Consumptive				Social				Environment	
		HR BE	LR BE	Contr'd water	Uncontr'd water	VHR BE	HR BE	LR BE	System op. water	s51 licences	s8 S&D rights	Rec. & amenity	Aborig. culture	Vic Murray	Human drink	Ag & irrig	Aqua-culture	Industry / commerc'l	Fish crust'ns consum'n	Primary contact rec.	Secondary contact rec.	Aesthetics	Rivers	Wetlands
Climate change	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Extreme drought	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Extreme wet period	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Flooding and overbank inundation	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Bushfires	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Land use change: Availability	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Land use change: Condition	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Existing land use practices	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Farm dams	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Increased utilisation of water access rights	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Increase in the number of entitlements leading to increased take	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Non-compliance with the Water Act 1989	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Timing and location of demands	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Earth resources development	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Point source discharges	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Major asset failure	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							
Pest and weeds	Reduction in volume																							
	Change to seasonal pattern																							
	Change to the inter annual pattern																							
	Salinity																							
	Suspended sediment & nutrients																							
	Toxicants																							
	Pathogens																							
	Other water quality impacts																							
	Loss or decline in longitudinal connectivity																							
	Loss or decline in lateral connectivity																							
	Loss or decline in instream physical habitat																							

3. Description of risks (10.42)

Under the provisions of the Basin Plan, water resource plans are required to address medium or higher-level risks.

In addressing the risks, water resource plans must describe the risk and factors that contribute to those risks and quantifying uncertiantis in the level of risk attributed to each risk by way of a sensitivity analysis. Adequate information must be captured in the data-gathering process to enable the development of a description of the risk and the factors contributing to risks for the risk register and the risk assessment.

Water resource plans must describe a strategy to address medium and high risks, or explain why any such risk cannot be addressed in a water resource plan, such as being out of scope.

3.1 Risk categories

Risk statements are structured to include the factors that contribute to the risk namely its cause, the threat it poses, the impact is has on the user/uses of water and the level of confidence (quantified uncertainty) in the assessment of that risk (section 10.41(8) of the Basin Plan). Risks statements for medium to very high-level risks are provided below under the following categories (section 10.42(a)of the Basin Plan):

- availability of the water resource
- condition of the water resource
- priority environmental assets and priority ecosystem functions (structural form)

Risks are also presented to meet Basin Plan requirements for specific risks identified in water resource plan area and for risks that are of particular interest to communities for:

- consumptive uses
- environmental uses
- Aboriginal uses of water and objectives
- recreational/social uses
- extreme events
- environmental water requirements for priority environmental assets and ecosystem functions (sections 10.17 and 10.22(b) of the Basin Plan)
- groundwater related risks (sections 10.18, 10.19, 10.20, 10.21 and 10.22(b) of the Basin Plan)
- interception activities (section 10.23 of the Basin Plan)
- non-compliance with the Victorian Water Act

The risks assessment identified a number of causes of risk to the availability and condition, or to priority environmental assets and priority ecosystem functions (structural form).

These causes have been broadly grouped into macro cause categories:

- climate change
- extreme events
  - bushfires
  - extreme drought
  - extreme wet period
  - flooding and overbank inundation

  - major asset failure
  - point source discharges
- land use and interception
  - earth resource development
  - failure to continue to invest in best practice land use initiatives
  - increase in farm dams
  - land use change affecting water availability
  - land use change affecting water condition
  - pests and weeds
- non-compliance
  - non-compliance with the Victorian Water Act
- water access, take, utilisation and location
  - increase in the number of rights and volume of entitlements
  - increased utilisation of water access rights
  - timing and location of demands

Strategies to address each identified risk are named in the tables in this section and descried in detail in **Table 4.2.1**. They are assigned to each medium or higher-level risk as per section 10.43 of the Basin Plan.

Section 3.2 identifies the medium or higher-level risks and confidence level and identifies the strategies to address the risk for the Northern Victoria water resource plan area

- Consumptive
  - **Table 3.2.1**: Medium or higher-level availability risks to consumptive uses from climate change
  - **Table 3.2.2**: Medium or higher-level availability risks to consumptive uses from extreme events
  - **Table 3.2.3**: Medium or higher-level availability risks to consumptive uses from land use and interception
  - **Table 3.2.4**: Medium or higher-level availability risks to consumptive uses from water access, take, utilisation and location
  - **Table 3.2.5**: Medium or higher-level condition risks to consumptive uses from climate change
  - **Table 3.2.6**: Medium or higher-level condition risks to consumptive uses from extreme events
  - **Table 3.2.7**: Medium or higher-level condition risks to consumptive uses from land use and interception
  - **Table 3.2.8**: Medium or higher-level condition risks to consumptive uses from non-compliance
  - **Table 3.2.9**: Medium or higher-level condition risks to consumptive uses from water access, take, utilisation and location

- Environmental
  - **Table 3.2.10**: Medium or higher-level availability risks to environmental uses from climate change
  - **Table 3.2.11**: Medium or higher-level availability risks to environmental uses from extreme events
  - **Table 3.2.12**: Medium or higher-level availability risks to environmental uses from land use and interception

  - **Table 3.2.13**: Medium or higher-level availability risks to environmental uses from water access, take, utilisation and location
  - **Table 3.2.14**: Medium or higher-level condition risks to environmental uses from climate change
  - **Table 3.2.15**: Medium or higher-level condition risks to environmental uses from extreme events
  - **Table 3.2.16**: Medium or higher-level condition risks to environmental uses from land use and interception
  - **Table 3.2.17**: Medium or higher-level condition risks to environmental uses from non-compliance
  - **Table 3.2.18**: Medium or higher-level condition risks to environmental uses from water access, take, utilisation and location

- Aboriginal
  - **Table 3.2.19**: Medium or higher-level availability risks to Aboriginal uses from climate change
  - **Table 3.2.20**: Medium or higher-level availability risks to Aboriginal uses from extreme events
  - **Table 3.2.21**: Medium or higher-level availability risks to Aboriginal uses from land use and interception
  - **Table 3.2.22**: Medium or higher-level availability risks to Aboriginal uses from non-compliance
  - **Table 3.2.23**: Medium or higher-level availability risks to Aboriginal uses from water access, take, utilisation and location
  - **Table 3.2.24**: Medium or higher-level condition risks to Aboriginal uses from climate change
  - **Table 3.2.25**: Medium or higher-level condition risks to Aboriginal uses from extreme events
  - **Table 3.2.26**: Medium or higher-level condition risks to Aboriginal uses from land use and interception
  - **Table 3.2.27**: Medium or higher-level condition risks to Aboriginal uses from non-compliance
  - **Table 3.2.28**: Medium or higher-level condition risks to Aboriginal uses from water access, take, utilisation and location

- Recreational/social
  - **Table 3.2.29**: Medium or higher-level availability risks to recreational/social uses from climate change
  - **Table 3.2.30**: Medium or higher-level availability risks to recreational/social uses from extreme events
  - **Table 3.2.31**: Medium or higher-level condition risks to recreational/social uses from climate change
  - **Table 3.2.32**: Medium or higher-level condition risks to recreational/social uses from extreme events
  - **Table 3.2.33**: Medium or higher-level condition risks to recreational/social uses from land use and interception

- Critical human water needs (extreme events)
  - **Table 3.2.34**: Medium or higher-level availability risks to critical human water needs
  - **Table 3.2.35**: Medium or higher-level condition risks to critical human water needs

- Priority environmental assets
  - **Table 3.2.36**: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from climate change

  - **Table 3.2.37**: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from extreme events
  - **Table 3.2.38**: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from land use and interception
  - **Table 3.2.39**: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from water access, take, utilisation and location

- Interception
  - **Table 3.2.41**: Medium or higher-level risks from interception activities to water resource availability for consumptive ad environmental water uses
  - **Table 3.2.42**: Medium or higher-level risks from interception activities to water resource condition for consumptive and environmental water uses

- Non-compliance
  - **Table 3.2.43**: Medium or higher-level risks from non-compliance to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses
  - **Table 3.2.44**: Medium or higher-level risks from non-compliance to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses

Section 3.3 identifies the medium or higher-level risks and confidence level and identifies the strategies to address the risk for the Goulburn-Murray water resource plan area

- Consumptive
  - **Table 3.3.1**: Medium or higher-level availability risks to consumptive uses from climate change
  - **Table 3.3.2**: Medium or higher-level condition risks to consumptive uses from climate change
  - **Table 3.3.3**: Medium or higher-level condition risks to consumptive uses from land use and interception

- Environmental
  - **Table 3.3.4**: Medium or higher-level availability risks to environmental uses from climate change

- Aboriginal
  - **Table 3.3.5**: Medium or higher-level availability risks to Aboriginal uses from climate change
  - **Table 3.3.6**: Medium or higher-level availability risks to Aboriginal uses from extreme events
  - **Table 3.3.7**: Medium or higher-level availability risks to Aboriginal uses from land use and interception
  - **Table 3.3.8**: Medium or higher-level availability risks to Aboriginal uses from non-compliance
  - **Table 3.3.9**: Medium or higher-level availability risks to Aboriginal uses from water access, take, utilisation and location
  - **Table 3.3.10**: Medium or higher-level condition risks to Aboriginal uses from climate change
  - **Table 3.3.11**: Medium or higher-level condition risks to Aboriginal uses from extreme events
  - **Table 3.3.12**: Medium or higher-level condition risks to Aboriginal uses from land use and interception
  - **Table 3.3.13**: Medium or higher-level condition risks to Aboriginal uses from non-compliance
  - **Table 3.3.14**: Medium or higher-level condition risks to Aboriginal uses from water access, take, utilisation and location

- Recreational/social
  - **Table 3.3.15**: Medium or higher-level availability risks to recreational/social uses from climate change

- Critical human water needs
  - **Table 3.3.16**: Medium or higher-level availability risks to critical human water needs
  - **Table 3.3.17**: Medium or higher-level condition risks to critical human water needs

- Groundwater special category risks
  - **Table 3.3.18**: Medium or higher-level risks to environmental water requirements for priority environmental assets dependent on groundwater, groundwater and surface water connections, and environmental outcomes relating to groundwater from climate change

- Interception
  - **Table 3.3.21**: Medium or higher-level risks from interception activities to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses
  - **Table 3.3.22**: Medium or higher-level risks from interception activities to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses

- Non-compliance
  - **Table 3.3.23**: Medium or higher-level risks from non-compliance to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses
  - **Table 3.3.24**: Medium or higher-level risks from non-compliance to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses

Section 3.4 identified the medium or higher-level risks and confidence level and identifies the strategies to address the risk for the Victorian Murray water resource plan area.

- Consumptive
  - **Table 3.4.1**: Medium or higher-level availability risks to consumptive uses from climate change
  - **Table 3.4.2**: Medium or higher-level availability risks to consumptive uses from extreme events
  - **Table 3.4.3**: Medium or higher-level availability risks to consumptive uses from land use and interception
  - **Table 3.4.4**: Medium or higher-level condition risks to consumptive uses from climate change
  - **Table 3.4.5**: Medium or higher-level condition risks to consumptive uses from extreme events
  - **Table 3.4.6**: Medium or higher-level condition risks to consumptive uses from land use and interception
  - **Table 3.4.7**: Medium or higher-level condition risks to consumptive uses from non-compliance
  - **Table 3.4.8**: Medium or higher-level condition risks to consumptive uses from water access, take, utilisation and location

- Environmental
  - **Table 3.4.9**: Medium or higher-level availability risks to environmental uses from climate change
  - **Table 3.4.10**: Medium or higher-level availability risks to environmental uses from extreme events
  - **Table 3.4.11**: Medium or higher-level availability risks to environmental uses from land use and interception

- **Table 3.4.12**: Medium or higher-level condition risks to environmental uses from climate change
- **Table 3.4.13**: Medium or higher-level condition risks to environmental uses from extreme events
- **Table 3.4.14**: Medium or higher-level condition risks to environmental uses from land use and interception
- **Table 3.4.15**: Medium or higher-level condition risks to environmental uses from non-compliance
- **Table 3.4.16**: Medium or higher-level condition risks to environmental uses from water access, take, utilisation and location

- Aboriginal
  - **Table 3.4.17**: Medium or higher-level availability risks to Aboriginal uses from climate change
  - **Table 3.4.18**: Medium or higher-level availability risks to Aboriginal uses from extreme events
  - **Table 3.4.19**: Medium or higher-level availability risks to Aboriginal uses from land use and interception
  - **Table 3.4.20**: Medium or higher-level availability risks to Aboriginal uses from non-compliance
  - **Table 3.4.21**: Medium or higher-level availability risks to Aboriginal uses from water access, take, utilisation and location
  - **Table 3.4.22**: Medium or higher-level condition risks to Aboriginal uses from climate change
  - **Table 3.4.23**: Medium or higher-level condition risks to Aboriginal uses from extreme events
  - **Table 3.4.24**: Medium or higher-level condition risks to Aboriginal uses from land use and interception
  - **Table 3.4.25**: Medium or higher-level condition risks to Aboriginal uses from non-compliance
  - **Table 3.4.26**: Medium or higher-level condition risks to Aboriginal uses from water access, take, utilisation and location

- Recreational/social
  - **Table 3.4.27**: Medium or higher-level availability risks to recreational/social uses from climate change
  - **Table 3.4.28**: Medium or higher-level condition risks to recreational/social uses from climate change
  - **Table 3.4.29**: Medium or higher-level condition risks to recreational/social uses from extreme events
  - **Table 3.4.30**: Medium or higher-level condition risks to recreational/social uses from land use and interception

- Critical human water needs
  - **Table 3.4.31**: Medium or higher-level availability risks to critical human water needs
  - **Table 3.4.32**: Medium or higher-level condition risks to critical human water needs

- Priority environmental assets and ecosystem function
  - **Table 3.4.33**: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from climate change
  - **Table 3.4.34**: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from extreme events
  - **Table 3.4.35**: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from land use and interception

  - **Table 3.4.36**: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from water access, take, utilisation and location

- Interception
  - **Table 3.4.38**: Medium or higher-level risks from interception activities to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses
  - **Table 3.4.39**: Medium or higher-level risks from interception activities to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses

- Non-compliance
  - **Table 3.4.40**: Medium or higher-level risks from non-compliance to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses
  - **Table 3.4.41**: Medium or higher-level risks from non-compliance to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses

3.2 Northern Victoria (surface water) water resource plan area

3.2.1 Consumptive users

3.2.1.1 Availability of the water resource

Table 3.2.1: Medium or higher-level availability risks to consumptive uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - high-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	6. Greater flexibility for taking water under winter-fill licences 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: User-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13.Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - high-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to a **reduction in volume of water available**	which results in **adverse impacts on consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in **adverse impacts on consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in **adverse impacts on consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - system operation** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - system operation** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - very high reliability water (urban bulk entitlements)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - very high reliability water (urban bulk entitlements)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	6. Greater flexibility for taking water under winter-fill licences 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: User-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13.Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions

Table 3.2.2: Medium or higher-level availability risks to consumptive uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **major asset failure**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 51 licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure)
There is a **medium risk**	that **bushfire**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	16.Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure)

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - high-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - section 51 licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - section 51 licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 51 licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.2.3: Medium or higher-level availability risks to consumptive uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 23. Maximising the effectiveness of the grid and markets across the state 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.2.4: Medium or higher-level availability risks to consumptive uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **changes to timing and location of demands**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 51 licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	5. Environmental water management in a changing climate 10. Improving rural water supply planning 9. Improving public reporting on water availability and use: user-focused information and reporting 11. Improving state-wide water resource planning and risk assessment 23. Maximising the effectiveness of the grid and markets across the state 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions
There is a **medium risk**	that **changes to timing and location of demands**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.2.1.2 Condition of the water resource

Table 3.2.5: Medium or higher-level condition risks to consumptive uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.2.6: Medium or higher-level condition risks to consumptive uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 14. Maintain compliance with *Safe Drinking Water Act 2003* 16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 14. Maintain compliance with *Safe Drinking Water Act 2003* 16. Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure). 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **high risk**	that **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
here is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 14. Maintain compliance with *Safe Drinking Water Act 2003* 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 14. Maintain compliance with *Safe Drinking Water Act 2003* 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **high risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.2.7: Medium or higher-level condition risks to consumptive uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 20. Managing risks from earth resources development 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **very high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 18. Managing invasive species in waterways 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 18. Managing invasive species in waterways 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **high risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **high risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **high risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	

Table 3.2.8: Medium or higher-level condition risks to consumptive uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 17. Managing groundwater-related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 17. Managing groundwater-related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.2.9: Medium or higher-level condition risks to consumptive uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	10. Improving rural water supply planning 23. Maximising the effectiveness of the grid and markets across the state 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	

3.2.2 Environmental uses

3.2.2.1 Availability of the water resource

Table 3.2.10: Medium or higher-level availability risks to environmental uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - controlled water (passing flows)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - controlled water (passing flows)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - high-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - high-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.2.11: Medium or higher-level availability risks to environmental uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **bushfires**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure)
There is a **medium risk**	that **bushfires**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/ users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **major asset failure**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure)

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - controlled water (passing flows)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 23. Maximising the effectiveness of the grid and markets across the state 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - high-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.2.12: Medium or higher-level availability risks to environmental uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.2.13: Medium or higher-level availability risks to environmental uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **changes to timing and location of demands**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	5. Environmental water management in a changing climate 10. Improving rural water supply planning 9. Improving public reporting on water availability and use: user-focused information and reporting 11. Improving state-wide water resource planning and risk assessment 23. Maximising the effectiveness of the grid and markets across the state 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions

3.2.2.2 Condition of the water resource

Table 3.2.14: Medium or higher-level condition risks to environmental uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	

Table 3.2.15: Medium or higher-level condition risks to environmental uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **bushfires**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 16. Managing exceptional circumstances 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **bushfires**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that an **extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	3. Deliver long-term watering plans 11. Improving state-wide water resource planning and risk assessment 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions
There is a **high risk**	that an **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	3. Deliver long-term watering plans 16. Managing exceptional circumstances 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.2.16: Medium or higher-level condition risks to environmental uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **pests and weeds**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	18. Managing invasive species in waterways 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **high risk**	that **pests and weeds**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **very high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	20. Managing risks from earth resources development 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **high risk**	that **earth resources development**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	

Table 3.2.17: Medium or higher-level condition risks to environmental uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.2.18: Medium or higher-level condition risks to environmental uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	10. Improving rural water supply planning 23. Maximising the effectiveness of the grid and markets across the state 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **changes to timing and location of demands**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Northern Victoria** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.2.3 Aboriginal uses of water and objectives

3.2.3.1 Availability of the water resource

Table 3.2.19: Medium or higher-level availability risks to Aboriginal uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.2.20: Medium or higher-level availability risks to Aboriginal uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **a major asset failure**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **a major asset failure**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that an **extreme wet period**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 11. Improving statewide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that an **extreme wet period**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **bushfire**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **extreme drought**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **extreme drought**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.2.21: Medium or higher-level availability risks to Aboriginal uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 23. Maximising the effectiveness of the grid and markets across the state 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **an increase in farm dams**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **earth resources development**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 20. Managing risks from earth resources development 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **earth resources development**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.2.22: Medium or higher-level availability risks to Aboriginal uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions

Table 3.2.23: Medium or higher-level availability risks to Aboriginal uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact	Risk confidence	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **the increased utilisation of water access rights**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 23. Maximising the effectiveness of the grid and markets across the state 31. Recognising and managing for Aboriginal values 33. Strengthening the water entitlement framework 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **medium risk**	that **the increased utilisation of water access rights**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **the increased utilisation of water access rights**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **changes to timing and location of demands**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

3.2.3.2 Condition of the water resource

Table 3.2.24: Medium or higher-level condition risks to Aboriginal uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water**.	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving statewide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water**.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water**.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water**.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to o**ther water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water**.	This risk has a **low** level of confidence in its assessment.	

Table 3.2.25: Medium or higher-level condition risks to Aboriginal uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **a major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 16. Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure). 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **a major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that an **extreme wet period**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 11. Improving state-wide water resource planning and risk assessment 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that an **extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that an **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that an **extreme wet period**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **bushfires**	lead to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 9. Improving public reporting on water availability and use: user-focused information and reporting 11. Improving state-wide water resource planning and risk assessment 16. Managing exceptional circumstances 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **bushfires**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **bushfires**	lead to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **bushfires**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 4. Emergency water supply 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **point source discharges**	lead to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 19. Managing point source discharge to waters 22. Managing water quality events 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **point source discharges**	lead to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **point source discharges**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **point source discharges**	lead to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **flooding and overbank inundation**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **flooding and overbank inundation**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **flooding and overbank inundation**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **flooding and overbank inundation**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.2.26: Medium or higher-level condition risks to Aboriginal uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **an increase in farm dams**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **earth resources development**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	20. Managing risks from earth resources development 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **earth resources development**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **land use change which affects water condition**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **land use change which affects water condition**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **pests and weeds**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	18. Managing invasive species in waterways 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **pests and weeds**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.2.27: Medium or higher-level condition risks to Aboriginal uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **high risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **non-compliance with the** Water Act 1989	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.2.28: Medium or higher-level condition risks to Aboriginal uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 23. Maximising the effectiveness of the grid and markets across the state 26. Planning the take of Victoria's Share Guidance - consideration of climate change and climate variability in setting groundwater resource limits 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **changes to timing and location of demands**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **changes to timing and location of demands**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

3.2.4 Recreational/social uses

3.2.4.1 Availability of the water resource

Table 3.2.29: Medium or higher-level availability risks to recreational/social uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **social - recreational and amenity uses** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 15. Managing availability risks to recreational water users 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **social - recreational and amenity uses** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.2.30: Medium or higher-level availability risks to recreational/social uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **social - recreational and amenity uses** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 15. Managing availability risks to recreational water users 16. Managing exceptional circumstances 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions

3.2.4.2 Condition of the water resource

- Primary contact recreation such as swimming
- Secondary contact recreation such as boating
- Aesthetic enjoyment

Table 3.2.31: Medium or higher-level condition risks to recreational/social uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.2.32: Medium or higher-level condition risks to recreational/social uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that an **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that an **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that an **extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.2.33: Medium or higher-level condition risks to recreational/social uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	20. Managing risks from earth resources development 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	18. Managing invasive species in waterways 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **medium risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

3.2.5 Extreme events impacting on critical human water needs

Under the Basin Plan a water resource plan must describe how the water resources of the water resource plan area will be managed during extreme events (10.51). These events include:

- extreme dry periods (drought),
- extreme water quality events; and
- other events that compromise the ability to meet critical human needs.

These types of extreme events such as extreme drought, major asset failure, bushfire and flooding, point source discharge and overbank inundation have been included in the risk assessment.

They and are assessed as a combination of their impact in terms of:

Availability

- water for consumptive purposes of very high-reliability bulk entitlement
- system operating water required to deliver the water
- section 8 stock and domestic rights

Condition

- human drinking
- agricultural and irrigation

3.2.5.1 Availability of the water resource for critical human water needs

Table 3.2.34: Medium or higher-level availability risks to critical human water needs

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 25. Planning for supply challenges by urban water corporations 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - high-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.2.5.2 Condition of the water resource for critical human water needs

- Human drinking
- Agricultural and irrigation

Table 3.2.35: Medium or higher-level condition risks to critical human water needs

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 16. Managing exceptional circumstances 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 14. Maintain compliance with *Safe Drinking Water Act 2003* 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **bushfires**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	4. Emergency water supply 16. Managing exceptional circumstances 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **bushfires**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **bushfires**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions
There is a **high risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	

3.2.6 Environmental water requirements for priority environmental assets and priority ecosystem functions (10.17 and 10.22(b))

The assets and functions are identified in the long-term environmental watering plans. They were assessed under the separate risk category of structural form of surface water resources based on categories that reflect priority assets and functions namely wetlands and rivers.

The risks to the assets and the ecosystem function that underpins them was assessed in terms of a:

- loss or decline in longitudinal connectivity, which is defined to comprising barriers to fish passage and other barriers such as vegetation connectivity
- loss or decline in lateral connectivity, which is defined to comprising loss of floodplain connectivity such as levees
- loss or decline in instream physical habitat, which is defined to comprising the loss or decline in condition of instream physical habitat such as sedimentation, erosion or loss of large wood.

They were also assessed in terms of the condition of the water resource for environment (State Environment Protection Policy (Waters) beneficial use category) environment/aquatic ecosystems.

Table 3.2.36: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 26. Planning the take of Victoria's Share Guidance - consideration of climate change and climate variability in setting groundwater resource limits 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **climate change**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.2.37: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **extreme drought**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.2.38: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 18. Managing invasive species in waterways 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **pests and weeds**	lead to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 18. Managing invasive species in waterways 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **pests and weeds**	lead to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **earth resources development**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	20. Managing risks from earth resources development 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **very high risk**	that **earth resources development**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **medium risk**	that **earth resources development**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **medium risk**	that **earth resources development**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	

Table 3.2.39: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **changes to the timing and locations of demands**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 9. Improving public reporting on water availability and use: user-focused information and reporting 23. Maximising the effectiveness of the grid and markets across the state
There is a **very high risk**	that **changes to the timing and locations of demands**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.2.7 Interception activities (10.23)

10.24(c) notes the following types of interception that may have the potential to significantly impact water resources.

Table 3.2.40: Types of interception in the Basin Plan

	Related cause and scenario in risk assessment
(a) runoff dams	Farm dams
(b) commercial plantations	Land use change (affecting availability) Land use change (affecting condition)
(c) interception by mining activities, including coals seam gas mining	Earth resources development
(d) interception by floodplain harvesting	N/A

Victoria's risk assessment also included the impact of bushfire as a potential risk to the availability and condition of the resource due to the water requirements of re-growth after bushfire and the water quality impacts on the resource. This is included in the extreme event category.

Table 3.2.41: Medium or higher-level risks from interception activities to water resource availability for consumptive and environmental water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 15. Managing availability risks to recreational water users 23. Maximising the effectiveness of the grid and markets across the state 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.2.42: Medium or higher-level risks from interception activities to water resource condition for consumptive and environmental water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **high risk**	that **earth resources development**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 20. Managing risks from earth resources development 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

3.2.8 Non-compliance with the Water Act 1989

The Water Compliance Report 2017–18 (DELWP, 2018), reported 1,625 cases of alleged compliance breaches of the Victorian Water Act in non-urban systems across Victoria. This included 786 advisory letters and 740 warning notices.

Fourteen prosecutions for breaches of the Victorian Water Act were initiated in 2017-18, and 10 prosecutions were finalised during this period.

While Victoria has low levels of water theft, risks to compliance can increase during drought when there is more competition for the available water or where there are constraints on delivering water during peak demand. Demand for water is increasing and we can expect increased competition in the water market.

The risk assessment reviewed the risk of non-compliance with the Victorian Water Act, including the unauthorised take and/or use of water or the construction or alteration of works without consent.

For surface water the risk assessment has been based on an additional five percent of consumptive demand being extracted without authorisation.

Unauthorised works in a waterway may lead to increased contaminants being discharge into the water.

Table 3.2.43: Medium or higher-level risks from non-compliance to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions

Table 3.2.44: Medium or higher-level risks to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

3.3 Goulburn-Murray water resource plan

List statements of medium to very high-level risks to very high risks are provided here under these categories (10.42(a)):

- Availability of the water resource for consumptive and environmental uses
- Condition of the water resource

Risks are also presented to meet Basin Plan requirements for specific risks identified in the plan and for risks that are of particular interest to communities.

- Aboriginal uses of water and objectives
- Recreational uses
- Extreme events
- Environmental water requirements for priority environmental assets and ecosystem functions (10.17 and 10.22(b))
- Groundwater related risks (10.18, 10.19, 10.20, 10.21 and 10.22(b))
- Interception activities (10.23)
- Non-compliance with the *Water Act 1989*

Description of risks (10.42)(a)(b)

Risk statements are structured to include the factors that contribute to the risk, such as 'it's cause' the threat' it poses, the impact is has on the user/uses of water and the level of confidence (quantified uncertainty) in the assessment of that risk (10.41(8).

3.3.1 Consumptive users

3.3.1.1 Availability of the water resource

Table 3.3.1: Medium or higher-level availability risks to consumptive uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of basin margin GCS (deep, S/R 20-40)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13.Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 26. Planning the take of Victoria's Share Guidance - Consideration of climate change and climate variability in setting groundwater resource limits 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions
There is a **high risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of basin margin GCS (deep, S/R 20-40)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of basin margin GCS (shallow, S/R 10-20)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of basin margin GCS (shallow, S/R 10-20)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of uplands GCS (S/R <10)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of uplands GCS (S/R <10)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13.Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 26. Planning the take of Victoria's Share Guidance - Consideration of climate change and climate variability in setting groundwater resource limits 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of upland layered valley (S/R 10-20)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of upland layered valley (S/R 10-20)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of uplands GCS (S/R <10)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.3.1.2 Condition of the water resource

Risks arising from elevated salinity and other types of water quality degradation (10.31 and 10.41(2)(d))

Table 3.3.2: Medium or higher-level condition risks to consumptive uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.3.3: Medium or higher-level condition risks to consumptive uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

3.3.2 Environmental users

3.3.2.1 Availability of the water resource

Table 3.3.4: Medium or higher-level availability risks to environmental uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **environment - users of upland layered valley (S/R 10-20)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 26. Planning the take of Victoria's Share Guidance - Consideration of climate change and climate variability in setting groundwater resource limits 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **environment - users of upland layered valley (S/R 10-20)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **environment users of basin margin GCS (shallow, S/R 10-20)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **environment users of basin margin GCS (shallow, S/R 10-20)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **environment - users of basin margin GCS (deep, S/R 20-40)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **environment - users of basin margin GCS (deep, S/R 20-40)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.3.3 Aboriginal uses of water and objectives

3.3.3.1 Availability of the water resource

Table 3.3.5: Medium or higher-level availability risks to Aboriginal uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 24. Monitoring and reporting on the benefits of environmental watering 26. Planning the take of Victoria's Share Guidance - consideration of climate change and climate variability in setting groundwater resource limits 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.3.6: Medium or higher-level availability risks to Aboriginal uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **bushfires**	lead to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **extreme drought**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders
There is a **medium risk**	that **extreme drought**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions

Table 3.3.7: Medium or higher-level availability risks to Aboriginal uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 23. Maximising the effectiveness of the grid and markets across the state 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **earth resources development**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	20. Managing risks from earth resources development 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **earth resources development**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.3.8: Medium or higher-level availability risks to Aboriginal uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.3.9: Medium or higher-level availability risks to Aboriginal uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **increase in the number of entitlements leading to increased take**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water 3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 23. Maximising the effectiveness of the grid and markets across the state 26. Planning the take of Victoria's Share Guidance - consideration of climate change and climate variability in setting groundwater resource limits 24. Monitoring and reporting on the benefits of environmental watering 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions
There is a **medium risk**	that **increase in the number of entitlements leading to increased take**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

3.3.3.2 Condition of the water resource

Table 3.3.10: Medium or higher-level condition risks to Aboriginal uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 25. Planning for supply challenges by urban water corporations 26. Planning the take of Victoria's Share Guidance - consideration of climate change and climate variability in setting groundwater resource limits 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions

Table 3.3.11: Medium or higher-level condition risks to Aboriginal uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **bushfires**	lead to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 9. Improving public reporting on water availability and use: user-focused information and reporting 11. Improving state-wide water resource planning and risk assessment 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **bushfires**	lead to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **bushfires**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 4. Emergency water supply 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that an **extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 11. Improving state-wide water resource planning and risk assessment 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that an **extreme wet period**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that an **extreme wet period**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **flooding and overbank inundation**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 25. Planning for supply challenges by urban water corporations 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **flooding and overbank inundation**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **flooding and overbank inundation**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a high **risk**	that **point source discharges**	lead to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water**.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **point source discharges**	lead to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water**.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **point source discharges**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water**.	This risk has a **low** level of confidence in its assessment.	

Table 3.3.12: Medium or higher-level condition risks to Aboriginal uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **earth resources development**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	20. Managing risks from earth resources development 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **earth resources development**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **earth resources development**	leads to **the loss of structural form of aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **land use change which affects water condition**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.3.13: Medium or higher-level condition risks to Aboriginal uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions

Table 3.3.14: Medium or higher-level condition risks to Aboriginal uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **increase in the number of entitlements leading to increased take**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 23. Maximising the effectiveness of the grid and markets across the state 26. Planning the take of Victoria's Share Guidance - consideration of climate change and climate variability in setting groundwater resource limits 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions
There is a **medium risk**	that **increased utilisation of water access rights**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

3.3.4 Recreational/social uses

3.3.4.1 Availability of the water resource

Table 3.3.15: Medium or higher-level availability risks to recreational/social uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **social - recreational and amenity uses** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 15. Managing availability risks to recreational water users 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **social - recreational and amenity uses** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.3.5 Extreme events impacting on critical human water needs

Under the Basin Plan a water resource plan must describe how the water resources of the water resource plan area will be managed during extreme events (10.51). These events include:

- extreme dry periods (drought),
- extreme water quality events; and
- other events that compromise the ability to meet critical human needs.

These types of extreme events such as extreme drought, major asset failure, bushfire and flooding, point source discharge and overbank inundation) have been included in the risk assessment. They are assessed as a combination of their impact in terms of:

Availability

- water for consumptive purpose.

Condition

- human drinking
- agricultural and irrigation.

3.3.5.1 Availability of the water resource for critical human water needs

Availability of water for consumptive purposes

Table 3.3.16: Medium or higher-level availability risks to critical human water needs

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of basin margin GCS (deep, S/R 20-40)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 25. Planning for supply challenges by urban water corporations 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of basin margin GCS (shallow, S/R 10-20)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of upland layered valley (S/R 10-20)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **consumptive - users of uplands GCS (S/R <10)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.3.5.2 Condition of the water resource for critical human water needs

- Human drinking
- Agricultural and irrigation

Table 3.3.17: Medium or higher-level condition risks to critical human water needs

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **point source discharges**	lead to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)

3.3.6 Groundwater related risks (10.18, 10.19, 10.20, 10.21 and 10.22(b))

3.3.6.1 Environmental water requirements for priority environmental assets dependent on groundwater (10.18) and groundwater and surface water connections affecting environmental watering (10.19)

These assets were assessed under risk categories in terms of:

- availability of groundwater for environmental purposes from these aquifers
  - Basin margin deep
  - Basin margin shallow
  - Upland layered valley
  - Uplands
- structural form of the aquifer.

Table 3.3.18: Medium or higher-level risks to environmental water requirements for priority environmental assets dependent on groundwater (10.18) and groundwater and surface water connections affecting environmental watering (10.19)

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **environment - users of basin margin GCS (deep, S/R 20-40)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 23. Maximising the effectiveness of the grid and markets across the state 24. Monitoring and reporting on the benefits of environmental watering 26. Planning the take of Victoria's Share Guidance - Consideration of climate change and climate variability in setting groundwater resource limits 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **environment - users of basin margin GCS (deep, S/R 20-40)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **environment users of basin margin GCS (shallow, S/R 10-20)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **environment users of basin margin GCS (shallow, S/R 10-20)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **environment - users of upland layered valley (S/R 10-20)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **environment - users of upland layered valley (S/R 10-20)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.3.6.2 Risks to the productive base of groundwater systems (10.20)

Section 10.20 of the Basin Plan requires consideration of risks to the structural integrity of an aquifer and impacts on the hydraulic properties and relationships of an aquifer.

The term 'structural form' in the risk assessment is intended to include both elements of section 10.20. This was assessed in terms of the ability of the aquifer to provide water for environmental and consumptive purposes in the context of damage to the structural form of the aquifer arising from take across environmental or consumptive users.

Table 3.3.19: Risks to the productive base of groundwater systems (10.20)

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **earth resources development**	leads to **loss of structural form of an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **moderate** level of confidence in its assessment.	20. Managing risks from earth resources development 31. Recognising and managing for Aboriginal values

3.3.7 Interception activities (10.23)

10.24(c) notes the following types of interception that may have the potential to significantly impact water resources.

Table 3.3.20: Types of interception in the Basin Plan

	Related cause and scenario in risk assessment
(a) runoff dams	Farm dams
(b) commercial plantations	Land use change (affecting availability) Land use change (affecting condition)
(c) interception by mining activities, including coals seam gas mining	Earth resource development
(d) interception by floodplain harvesting	N/A

Victoria's risk assessment also included the impact of bushfire as a potential risk to the availability and condition of the resource, because of the water requirements of re-growth after a bushfire and the water quality impacts on the resource. This is included in the extreme event category.

Table 3.3.21: Medium or higher-level risks from interception activities to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 23. Maximising the effectiveness of the grid and markets across the state 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **earth resources development**	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	20. Managing risks from earth resources development 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **earth resources development**	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.3.22: Medium or higher-level risks from interception activities to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **earth resources development**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	20. Managing risks from earth resources development 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **earth resources development**	**other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	20. Managing risks from earth resources development 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	

3.3.8 Non-compliance with the Water Act 1989

Non-compliance with the *Water Act 1989*, includes the unauthorised take and/ or use of water or the constructing or altering of works without consent.

The Water Compliance Report 2017–18 (DELWP 2018), reported 1,625 cases of alleged compliance breaches of the Victorian Water Act in non-urban systems across Victoria. This included 786 advisory letters and 740 warning notices.

Fourteen prosecutions for breaches of the Victorian Water Act were initiated in 2017-18, and 10 prosecutions were finalised during this period.

While Victoria has low levels of water theft, risks to compliance can increase during drought when there is more competition for the available water or where there are constraints on delivering water during peak demand. Demand for water is increasing and we can expect increased competition in the water market. The risk assessment reviewed the risk of non-compliance with the Victorian Water Act, including the unauthorised take and/or use of water or the construction or alteration of works without consent.

This risk assessment has been based on an additional 5 percent of consumptive demand being extracted without authorisation.

In terms of groundwater, the scenario is focussed on the impacts on shallow aquifers and associated surface water resources. In these areas, non-compliant use of water from some domestic and stock bores by up to 50 percent is plausible. However, a more limited figure has been adopted for the risk assessment of an additional 10 percent of domestic and stock bore use being extracted for non-compliant purposes.

Table 3.3.23: Medium or higher-level risks from non-compliance to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **adverse change to the seasonal pattern of inflow to, or extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **decline in inflow to, or increase in extraction from, an aquifer**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.3.24: Medium or higher-level risks from non-compliance to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions

3.4 Victorian Murray (surface water) water resource plan area

3.4.1 Consumptive users

3.4.1.1 Availability of the water resource

Table 3.4.1: Medium or higher-level availability risks to consumptive uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - high-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	6. Greater flexibility for taking water under winter-fill licences 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: User-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13.Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - high-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	6. Greater flexibility for taking water under winter-fill licences 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: User-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13.Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions
There is a **high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - system operation water** uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - system operation water** uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - very high reliability water (urban bulk entitlements)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - very high reliability water (urban bulk entitlements)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.4.2: Medium or higher-level availability risks to consumptive uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **a major asset failure**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure)
There is a **medium risk**	that **a major asset failure**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **bushfire**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	16.Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure)

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - high-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions
There is a **high risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - section 51 take and use licences** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 35. Water resource information supports planning and decisions

Table 3.4.3: Medium or higher-level availability risks to consumptive uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water 11. Improving state-wide water resource planning and risk assessment 23. Maximising the effectiveness of the grid and markets across the state 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.4.1.2 Condition of the water resource

Table 3.4.4: Medium or higher-level condition risks to consumptive uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* frameworks 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* frameworks 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* frameworks 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* frameworks 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **high risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.4.5: Medium or higher-level condition risks to consumptive uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **a major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 14. Maintain compliance with *Safe Drinking Water Act 2003* 16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **a major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **an extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **an extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **an extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **high risk**	that **an extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **bushfire**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 16. Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure).
There is a **medium risk**	that **bushfire**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **bushfire**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 14. Maintain compliance with *Safe Drinking Water Act 2003* 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 14. Maintain compliance with *Safe Drinking Water Act 2003* 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **high risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 14. Maintain compliance with *Safe Drinking Water Act 2003* 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.4.6: Medium or higher-level condition risks to consumptive uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 20. Managing risks from earth resources development 25. Planning for supply challenges by urban water corporations 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **very high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)
There is a **high risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 18. Managing invasive species in waterways 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 18. Managing invasive species in waterways 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **high risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.4.7: Medium or higher-level condition risks to consumptive uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.4.8: Medium or higher-level condition risks to consumptive uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increased utilisation of water access rights**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	10. Improving rural water supply planning 23. Maximising the effectiveness of the grid and markets across the state 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions

3.4.2 Environmental users

3.4.2.1 Availability of the water resource

Table 3.4.9: Medium or higher-level availability risks to environmental uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - controlled water (passing flows)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - controlled water (passing flows)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - high-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - high-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/ users.	This risk has a **low** level of confidence in its assessment.	

Table 3.4.10: Medium or higher-level availability risks to environmental uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **a major asset failure**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure)
There is a **medium risk**	that **a major asset failure**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/ users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/ users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **bushfire**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure)
There is a **medium risk**	that **bushfire**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/ users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - controlled water (passing flows)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 16. Managing exceptional circumstances 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - high-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.4.11: Medium or higher-level availability risks to environmental uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

3.4.2.2 Condition of the water resource

Table 3.4.12: Medium or higher-level condition risks to environmental uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.4.13: Medium or higher-level condition risks to environmental uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	3. Deliver long-term watering plans 11. Improving state-wide water resource planning and risk assessment 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.4.14: Medium or higher-level condition risks to environmental uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **pests and weeds**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	18. Managing invasive species in waterways 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **high risk**	that **pests and weeds**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **very high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions

Table 3.4.15: Medium or higher-level condition risks to environmental uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions

Table 3.4.16: Medium or higher-level condition risks to environmental uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increased utilisation of water access rights**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	10. Improving rural water supply planning 23. Maximising the effectiveness of the grid and markets across the state 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions

3.4.3 Aboriginal uses of water and objectives

3.4.3.1 Availability of the water resource

Table 3.4.17: Medium or higher-level availability risks to Aboriginal uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.4.18: Medium or higher-level availability risks to Aboriginal uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **a major asset failure**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **a major asset failure**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an extreme wet period**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an extreme wet period**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **bushfire**	lead to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	16. Managing exceptional circumstances 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.4.19: Medium or higher-level availability risks to Aboriginal uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 23. Maximising the effectiveness of the grid and markets across the state 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **an increase in farm dams**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.4.20: Medium or higher-level availability risks to Aboriginal uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions

Table 3.4.21: Medium or higher-level availability risks to Aboriginal uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **the increased utilisation of water access rights**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 23. Maximising the effectiveness of the grid and markets across the state 31. Recognising and managing for Aboriginal values 33. Strengthening the water entitlement framework 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **medium risk**	that **the increased utilisation of water access rights**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **the increased utilisation of water access rights**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

3.4.3.2 Condition of the water resource

Table 3.4.22: Medium or higher-level condition risks to Aboriginal uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **very high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.4.23: Medium or higher-level condition risks to Aboriginal uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **a major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 16. Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure). 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **a major asset failure**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **a major asset failure**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **an extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 11. Improving state-wide water resource planning and risk assessment 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an extreme wet period**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an extreme wet period**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an extreme wet period**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **bushfire**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 9. Improving public reporting on water availability and use: user-focused information and reporting 11. Improving state-wide water resource planning and risk assessment 16. Managing exceptional circumstances 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **bushfire**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **bushfire**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **bushfire**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 4. Emergency water supply 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **extreme drought**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **extreme drought**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **point source discharges**	lead to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 19. Managing point source discharge to waters 22. Managing water quality events 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **point source discharges**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **flooding and overbank inundation**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **flooding and overbank inundation**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **flooding and overbank inundation**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **flooding and overbank inundation**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.4.24: Medium or higher-level condition risks to Aboriginal uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **an increase in farm dams**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **earth resources development**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	20. Managing risks from earth resources development 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **land use change which affects water condition**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **pests and weeds**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	18. Managing invasive species in waterways 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **pests and weeds**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.4.25: Medium or higher-level condition risks to Aboriginal uses from non-compliance

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the** Water Act 1989	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.4.26: Medium or higher-level condition risks to Aboriginal uses from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **the increased utilisation of water access rights**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 23. Maximising the effectiveness of the grid and markets across the state 26. Planning the take of Victoria's Share Guidance - Consideration of climate change and climate variability in setting groundwater resource limits 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions
There is a **medium risk**	that **the increased utilisation of water access rights**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **the increased utilisation of water access rights**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

3.4.4 Recreational/social uses

3.4.4.1 Availability of the water resource

Table 3.4.27: Medium or higher-level availability risks to recreational/social uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **a reduction in volume of water available**	which results in adverse impacts on **recreational/ social uses from climate change** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 15. Managing availability risks to recreational water users 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions

3.4.4.2 Condition of the water resource

Table 3.4.28: Medium or higher-level condition risks to recreational/social uses from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **high risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **very high risk**	that **climate change**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.4.29: Medium or higher-level condition risks to recreational/social uses from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16. Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

Table 3.4.30: Medium or higher-level condition risks to recreational/social uses from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	20. Managing risks from earth resources development 29. Protecting water quality- implementing the State Environment Protection Policy (Waters)

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - aesthetic enjoyment** water uses/users.	This risk has a **low** level of confidence in its assessment.	18. Managing invasive species in waterways 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health
There is a **medium risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - primary contact recreation- (e.g. swimming)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **social - secondary contact recreation – (e.g. boating)** water uses/users.	This risk has a **low** level of confidence in its assessment.	

3.4.5 Extreme events impacting on critical human water needs

Under the Basin Plan a water resource plan must describe how the water resources of the water resource plan area will be managed during extreme events (10.51). These events include:

- extreme dry periods (drought),
- extreme water quality events; and
- other events that compromise the ability to meet critical human needs.

These types of extreme events, such as extreme drought, major asset failure, bushfire and flooding, point source discharge and overbank inundation, have been included in the risk assessment.

They are assessed as a combination of their impact in terms of:

Availability

- water for consumptive purposes of very high reliability bulk entitlement
- system operation water required to deliver the water
- section 8 stock and domestic rights

Condition

- human drinking
- agricultural and irrigation

3.4.5.1 Availability of the water resource for critical human water needs

Table 3.4.31: Medium or higher-level availability risks to critical human water needs

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **changes to the inter-annual pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 16.Managing exceptional circumstances 25. Planning for supply challenges by urban water corporations 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - section 8 domestic and stock rights** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.4.5.2 Condition of the water resource for critical human water needs

- Human drinking
- Agricultural and irrigation

Table 3.4.32: Medium or higher-level condition risks to critical human water needs

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **major asset failure**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 16. Managing exceptional circumstances 22. Managing water quality events 25. Planning for supply challenges by urban water corporations 14. Maintain compliance with *Safe Drinking Water Act 2003* 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **bushfires**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	4. Emergency water supply 16. Managing exceptional circumstances 22. Managing water quality events 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 29. Protecting water quality-implementing the State Environment Protection Policy (Waters)
There is a **medium risk**	that **bushfires**	lead to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **bushfires**	lead to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	4. Emergency water supply 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving statewide water resource planning and risk assessment 12. Investigating increased flexibility and choice for licence-holders 13. Leading climate change adaptation across Victoria's water system 14. Maintain compliance with *Safe Drinking Water Act 2003* 16.Managing exceptional circumstances 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 23. Maximising the effectiveness of the grid and markets across the state 25. Planning for supply challenges by urban water corporations 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **elevated levels of pathogens (giardia, cyanobacteria)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that an **extreme wet period**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	3. Deliver long-term watering plans 11. Improving state-wide water resource planning and risk assessment 16. Managing exceptional circumstances 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions

3.4.6 Environmental water requirements for priority environmental assets and priority ecosystem functions (10.17)

The assets and functions are identified in the long-term environmental watering plans. They were assessed under the separate risk category of structural form of surface water resources based on categories that reflect priority assets and functions namely wetlands and rivers.

The risks to the assets and the ecosystem function that underpins them was assessed in terms of a:

- loss or decline in longitudinal connectivity, which is defined to comprising barriers to fish passage and other barriers such as vegetation connectivity
- loss or decline in lateral connectivity, which is defined to comprising loss of floodplain connectivity such as levees
- loss or decline in instream physical habitat, which is defined to comprising the loss or decline in condition of instream physical habitat such as sedimentation, erosion or loss of large wood.

They were also assessed in terms of the condition of the water resource for environment (State Environment Protection Policy (Waters) beneficial use category) environment/aquatic ecosystems.

Table 3.4.33: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from climate change

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **climate change**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 26. Planning the take of Victoria's Share Guidance - Consideration of climate change and climate variability in setting groundwater resource limits 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **climate change**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **climate change**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.4.34: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from extreme events

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **extreme drought**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 8. Improving our understanding of climate science and how it applies to water management 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 24. Monitoring and reporting on the benefits of environmental watering 27. Preparing for and responding to extreme events (bushfire, failure to meet critical human water needs, blue-green algae blooms, flooding, major asset failure) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **extreme drought**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **extreme drought**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.4.35: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from land use and interception

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 18. Managing invasive species in waterways 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in lateral connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **failure to continue to invest in best practice land use initiatives**	leads to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **pests and weeds**	lead to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **pests and weeds**	lead to **a loss or decline in longitudinal connectivity**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 18. Managing invasive species in waterways 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 22. Managing water quality events 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **pests and weeds**	lead to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

Table 3.4.36: Medium or higher-level risks to environmental water requirements for priority environmental assets and ecosystem functions from water access, take, utilisation and location

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **very high risk**	that **changes to the timing and locations of demands**	lead to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - rivers** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	3. Deliver long-term watering plans 5. Environmental water management in a changing climate 9. Improving public reporting on water availability and use: user-focused information and reporting 23. Maximising the effectiveness of the grid and markets across the state
There is a **very high risk**	that **changes to the timing and locations of demands**	lead to **a loss or decline in instream physical habitat**	which results in adverse impacts on **environment - wetlands** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	

3.4.7 Interception activities (10.23)

10.24(c) notes the following types of interception that may have the potential to significantly impact water resources.

Table 3.4.37: Types of interception in the Basin Plan

	Related cause and scenario in risk assessment
(a) runoff dams	Farm dams
(b) commercial plantations	Land use change (affecting availability) Land use change (affecting condition)
(c) interception by mining activities, including coals seam gas mining	Earth resource development
(d) interception by floodplain harvesting	N/A

Victoria's risk assessment also included the impact of bushfire as a potential risk to the availability and condition of the resource because of to the water requirements of regrowth after a bushfire and the water quality impacts on the resource. This is included in the extreme event category.

Table 3.4.38: Medium or higher-level risks from interception activities to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **high risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 5. Environmental water management in a changing climate 7. Implement Ministerial Guidelines for Groundwater Licensing and the Protection of High Value Groundwater Dependent Ecosystems 8. Improving our understanding of climate science and how it applies to water management 11. Improving state-wide water resource planning and risk assessment 13. Leading climate change adaptation across Victoria's water system 15. Managing availability risks to recreational water users 23. Maximising the effectiveness of the grid and markets across the state 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **high risk**	that **an increase in farm dams**	leads to **changes to seasonal pattern of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - low-reliability bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **environment - uncontrolled water (above cap water)** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **consumptive - low-reliability bulk entitlements and water shares** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **social - recreation bulk entitlement** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **medium risk**	that **land use change which affects water availability**	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

Table 3.4.39: Medium or higher-level risks from interception activities to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **medium risk**	that **land use change which affects water condition**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **land use change which affects water condition**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **land use change which affects water condition**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	14. Maintain compliance with *Safe Drinking Water Act 2003* 20. Managing risks from earth resources development 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values
There is a **high risk**	that **earth resources development**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **earth resources development**	leads to **elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - industrial and commercial use** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **low** level of confidence in its assessment.	

continued

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	1. Better recording, monitoring and accounting for significant uses of water. 11. Improving state-wide water resource planning and risk assessment 14. Maintain compliance with *Safe Drinking Water Act 2003* 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 25. Planning for supply challenges by urban water corporations 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 28. Protecting our waterways and their catchments by strengthening integrated catchment management across Victoria 29. Protecting water quality-implementing the State Environment Protection Policy (Waters) 31. Recognising and managing for Aboriginal values 35. Water resource information supports planning and decisions
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **high risk**	that **an increase in farm dams**	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **an increase in farm dams**	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **high risk**	that **an increase in farm dams**	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

3.4.8 Non-compliance with the *Water Act 1989*

Non-compliance with the *Water Act 1989*, includes the unauthorised take and/ or use of water or the construction or alteration of works without consent.

The Water Compliance Report 2017–18 (DELWP 2018), reported 1,625 cases of alleged compliance breaches of the Victorian Water Act in non-urban systems across Victoria. This included 786 advisory letters and 740 warning notices.

Fourteen prosecutions for breaches of the Victorian Water Act were initiated in 2017-18, and 10 prosecutions were finalised during this period.

While Victoria has low levels of water theft, risks to compliance can increase during drought when there is more competition for the available water or where there are constraints on delivering water during peak demand. Demand for water is increasing and we can expect increased competition in the water market. The risk assessment reviewed the risk of non-compliance with the Victorian Water Act, including the unauthorised take and/or use of water or the constructing or altering of works without consent.

This risk assessment has been based on an additional 5 percent of consumptive demand being extracted without authorisation.

In terms of groundwater, the scenario is focussed on the impacts on shallow aquifers and associated surface water resources. In these areas, non-compliant use of water from some domestic & stock bores by up to 50 percent is plausible. However a more limited figure has been adopted for this risk assessment, which is an additional 10 percent of domestic and stock bore use being extracted for non-compliant purposes.

Unauthorised works in a waterway may lead to increased discharge of contaminants in the water.

Table 3.4.40: Medium or higher-level risks from non-compliance to water resource availability for consumptive, environmental, Aboriginal and recreational/social water uses

Risk level	Risk cause	Risk threat	Risk impact	Risk confidence	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **a reduction in volume of water available**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	2. Continuously improving non-urban water metering 9. Improving public reporting on water availability and use: user-focused information and reporting 10. Improving rural water supply planning 11. Improving state-wide water resource planning and risk assessment 17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 33. Strengthening the water entitlement framework 35. Water resource information supports planning and decisions

Table 3.4.41: Medium or higher-level risks from non-compliance to water resource condition for consumptive, environmental, Aboriginal and recreational/social water uses

Risk level	Risk cause	Risk threat	Risk impact on use	Confidence in risk assessment	Strategies to address risk (see **Table 4.2.1** for an explanation of each strategy)
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - agriculture and irrigation** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	17. Managing groundwater related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks 21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period 29. Protecting water quality- implementing the State Environment Protection Policy (Waters) 30. Provide long-term investment to improve waterway health 31. Recognising and managing for Aboriginal values 32. Strengthening and modernising compliance arrangements 35. Water resource information supports planning and decisions
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - aquaculture** water uses/users.	This risk has a **moderate-high** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - fish, crustacean and molluscs for human consumption** water uses/users.	This risk has a **low-moderate** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **consumptive - human consumption after appropriate treatment** water uses/users.	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **environmental values/aquatic ecosystems of Victorian Murray** water uses/users.	This risk has a **moderate** level of confidence in its assessment.	
There is a **high risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of suspended sediment and/or nutrients**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **elevated levels of salinity**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	
There is a **medium risk**	that **non-compliance with the *Water Act 1989***	leads to **other water quality impacts (water temperature, pH and/or dissolved oxygen)**	which results in adverse impacts on **all aspects of Aboriginal uses of water.**	This risk has a **low** level of confidence in its assessment.	

4. Strategies to address risk (10.43)

4.1 Basin Plan requirements

Section 10.43 of the Basin Plan requires a risk strategy to be developed and described as part of the management of the water resources in the water resource plan area. This strategy is required for risks assessed as medium or high level, and for them to be managed in a manner commensurate with the level of risk. This includes identifying strategies that already exist as part of a Basin state's water management arrangements to manage risk.

Strategies for addressing risks may include:

- avoiding the risk by not doing the activity that gives rise to the risk
- removing the risk cause
- reducing the likelihood
- minimising the consequences
- sharing the risk
- making an informed decision to accept the risk

The risk strategies must be stated in water resource plans in a way that demonstrates that regard was had to those listed in section 4.03(3) of the Basin Plan (by, for example, providing an explanatory statement supported by evidence).

The strategies in section 4.03(3) of the Basin Plan include implementation of formal or semi-formal instruments, monitoring and more general approaches such as improving knowledge. Given the broad range of strategies that are relevant, all risks identified are associated with some level of management and mitigation. Where any management or mitigation is considered disproportionate to the risk level, the water resource plan may include an explanation as to why strategies to address that risk are not included. All risks identified have a number of corresponding categories that will ensure they are managed.

If the strategy in the water resource plan is not able to reduce the risk to a tolerable level, an explanation should be given for why this is the case. Victoria has provided one or more strategies to address every risk (see **Table 4.2.1**). In some cases, the relevant strategy may be outside the water planning framework. In the case of future risks that are beyond the life of the accredited water resource plan, appropriate strategies may focus on monitoring and review.

4.2 Victoria's strategies for addressing risk

Based on the themes identified in the risk assessment, the medium to high-level risks will be addressed through the ongoing development and implementation of existing broad-scale policies and improvement programs identified through *Water for Victoria* (DELWP, 2016) and existing policies and programs. Risks will be addressed through state- based policy and program development, collaboration with regional water managers and engagement with the community regional stakeholders and interstate water planning agencies.

Examples of such planning and policy development include:

- review and enhancement of climate change adaptation policy and practice
- review and enhancement of drought management policy and practice
- review and enhancement of State Environmental Protection Policy (Waters)
- reaffirmation of commitment to continue supporting programs of best practice including management of waterways, soil conservation, forestry, dairy, grazing and irrigation.

35 strategies were identified as part of Victoria's water and catchment management framework that will address risks to the availability and condition of water resources. These strategies are a combination of the policy directions contained and reinforced in *Water for Victoria* (DELWP, 2016) and existing regulations and guidelines.

A note on the presentation of risk strategies

The next section below identifies the strategies to address the identified medium to high-level risks.

Victoria's risk assessment was comprehensive and considered all entitlement types under the Victorian Water Act in terms of impacts on availability and on all beneficial uses of water under State Environment Protection Policy (Waters). Impacts on priority environmental assets were also considered.

This approach has led to the generation of a large number of risks across entitlement and beneficial use types, which makes the presentation of risk strategies challenging. Strategies also rarely relate to a particular entitlement type or beneficial use but to broader water availability, water condition or priority environmental asset levels and ongoing planning and management.

Risk causes are also most often managed through strategies that affect broader causes and have been consolidated. As an example, extreme event management in Victoria encompasses a number of risk causes and is managed under a single framework.

For the purpose of the identification of strategies, risks have been consolidated, where appropriate, by broader cause categories:

- climate change
- extreme events such as extreme drought, extreme wet period, flooding and overbank inundation, bushfire, major asset failure, point-source discharge
- land use and interception such as land use change affecting availability, land use change affecting condition, failure to continue to invest in best practice land use initiatives, farm dams, pests and weeds and earth resources development
- non-compliance with the Victorian Water Act
- water access, take, utilisation and location such as increased utilisation of water access rights, increases in the number of entitlements leading to increased take, timing and locations.

Impacts have been consolidated across:

- availability: consumptive, environment, Aboriginal, recreational/social
- condition: consumptive, environment, social and Aboriginal
- environmental water requirements for priority environmental assets and ecosystem functions
- priority environmental assets and ecosystem functions dependent on groundwater.

All identified risks assessed as medium or higher-level require ongoing management, planning and/or responses.

Table 4.2.1 key:

Macro Risk Cause	
CC	Climate change
EE	Extreme events
LUI	Land use and interception
NC	Non-compliance
WA	Water access, take, utilisation and location
Applies to	
(A)	Availability of the water resource
(C)	Condition of the water resource
(SF)	Structural form
Uses:	
E	Environmental
C	Consumptive
S	Recreational/social
A	Aboriginal/Indigenous

Basin Plan 10.43(1)

Table 4.2.1: Identified strategies for addressing risk

Title	Macro risk cause applicable					Description	*Water for Victoria* action/s or alternative	Use applies to (A) and/or (C)				SF
	CC	EE	LUI	NC	WA			E	C	S	A	
1. Better recording, monitoring and accounting for significant uses of water.			X			A number of emerging significant water uses are not accurately accounted for, monitored or reported. As competition for water increases, managing efficient allocation of water in the system becomes more critical. Under the section 8 private rights provisions of the Victorian Water Act, water can be taken and used for domestic and stock purposes. Currently there are limited ways to monitor and report on the volume of water used under these rights. The introduction of 'reasonable use' limits would improve accountability for the volume of water taken from the system under this right. The volume of water taken under the section 8 private rights provisions is growing and this trend will continue with the growth in population, subdivisions, and farm dams and bores. This can impact on water availability for existing water users and the environment. Water use for plantations is not included in the water entitlement framework. Plantation establishment is an 'as of right' development in the farming zone of the Victoria Planning Provisions (VPPs), meaning a planning permit is not required to establish a plantation in a farming zone unless a particular provision or overlay is triggered. A planning permit for tree planting may be required in zones other than the farming zone within the VPP. Large-scale changes in land use can also affect water availability by intercepting water that would otherwise reach streams and aquifers. This can affect the water resource, entitlement holders and the environment. Better information and data about domestic and stock water use under the section 8 rights and land use changes will inform the reviews of long-term water resource assessments and sustainable water strategies about the risks to water resources and whether action is required to mitigate impacts. This action could range from better recording to increased regulation. These reviews will need to take into account Victoria's commitments under the Murray-Darling Basin Plan to ensure that Victoria complies with its requirements in particular requirements under Part 10 of Chapter 10 of the Basin Plan relating to measuring and monitoring of water resources. This strategy also responds to the requirements of section 10.45 of the Basin Plan.	**Action 8.4—Better record and report on emerging significant uses of water** The Department of Environment, Land, Water and Planning will: • investigate the introduction of a reasonable use limit for domestic and stock rights under section 8 of the Victorian Water Act to ensure consistency and fairness in access to water resources in consultation with the community and relevant stakeholders • monitor and report on the impact of water use on other users and the environment, and report on significant uses of water in the annual Victorian Water Accounts • periodically review the long-term risks to Victoria's water resources through mechanisms such as long-term water resource assessments and sustainable water strategies	A C	A C		A C	SF
2. Continuously improving non-urban water metering				x	x	Non-urban water metering is an important tool for managing Victoria's water entitlements. It helps ensure fair and equitable sharing of water resources, and provides vital information for planning and allocation decisions. This supports the measure to address the requirement under section 10.45 of the Basin Plan. This strategy will also be informed by policy developed under the Basin Compliance Compact that was signed after completion of this Risk Assessment. As the Basin Compliance Compact was developed after the completion of the Risk Assessment, it is discussed further in Part 5 of the Comprehensive Report.	**Action: Continuously improving non-urban water metering** Victoria's policy on non-urban water metering states that where a delegate issues, renews or approves the transfer of a licence to take water in a non-urban situation, the following conditions apply: • all new licences where the water taken under the licence is to be used for irrigation or commercial purposes must be metered Existing licensed extraction sites must be metered if the licensed volume is: • 10 ML or greater for surface water • 20 ML or greater for groundwater These obligations above do not apply if, in the view of the delegated authority, a meter would be impractical or can be exempted according to the following criteria: • cost of metering can be shown to significantly outweigh the benefits • resource management objectives can still be achieved without impacting negatively on the resource, the environment or other users • an exemption exists according to the Victorian Water Act In these cases, the delegate must document clearly the reasons for its view and: • identify a substitute method for estimating the volume of water taken to meet state and Commonwealth water accounting and reporting requirements These requirements do not preclude a delegate from requiring more extensive metering.	A	A	A	A	A

Title	Macro risk cause applicable					Description	*Water for Victoria* action/s or alternative	Use applies to (A) and/or (C)				SF
	CC	EE	LUI	NC	WA			E	C	S	A	
3. Deliver long-term watering plans	x	x	x		x	The requirements for long-term watering plans are outlined in Chapter 8 of the Basin Plan. Environmental watering will not return rivers and wetlands to their pre-European condition. Many rivers and wetlands are so modified that this is not feasible. However, environmental watering can help to minimise some of the impacts of these modifications on rivers and wetlands while still being a shared resource that meets economic, cultural and recreational needs. In accordance with Chapter 8 of the Basin Plan a long-term watering plans must have regard to the Basin-Wide Environmental Watering Strategy (MDBA, 2014) and be consistent with the principles the Basin Plan sets out for environmental watering. Victoria's long-term watering plans also recognise there are Basin-wide obligations to take account of cultural outcomes. Long-term watering plans have been prepared by the Victorian Government in accordance with its obligations under the Basin Plan for water resource plan areas. Long-term watering plans describe ecological objectives and targets for priority water-dependent assets (rivers and wetlands) in water resource plan areas, and corresponding environmental watering requirements for these objectives. Key elements of long-term watering plans are identifying priority assets, priority ecosystem functions and water-dependent ecological values, and setting objectives related to the ecological values and functions. Part 6 of Chapter 10 of the Basin Plan also contains environmental watering requirements which are consistent with delivering on long-term watering plans.	**Action: Deliver long-term watering plans** Victoria's long-term watering plans are developed using a bottom-up approach, and with regard to the Basin-wide environmental watering strategy. They build on considerable environmental water planning work done at the regional and asset scale by catchment management authorities in their regional catchment strategies, regional waterway strategies and environmental water management plans. Long-term watering plans will be used to assist planning for environmental water outcomes in order to meet Basin Plan objectives and targets, and the overall environmental objectives for water-dependent ecosystems outlined in Chapter 8 of Basin Plan. While long-term watering plans are written for surface water water resource plans areas, only their development considers groundwater dependent ecosystems. Further work will be pursued in the years between now and the long-term watering plans review and update to better understand groundwater requirements for groundwater dependent ecosystems. The Victorian long-term watering plans have collated long-term environmental water planning information for priority rivers, wetlands and ecosystem functions in the water resource plan area (surface water) and they inform: Victoria's annual watering priorities • Basin-wide watering strategy and Basin annual watering priorities • water resource plans, particularly the environmental watering requirements • long-term outcomes and environmental water demands in the Commonwealth Environmental Water Holder's portfolio management plans • decisions for environmental watering by the Southern Connected Basin Environmental Watering Committee • the Murray Coordination Plan, developed by South Australia, Victoria, New South Wales and MDBA in 2016	A C		A C	A C	SF
4. Emergency water supply		X				One of the key principles of the water entitlement framework is that individual entitlement holders are responsible for managing the risks of water scarcity within their own contexts and systems. When water is limited for availability or quality-related reasons, affected farmers may sometimes need to cart water from distant sources to care for their animals. Local government authorities and water corporations own and manage water supply points to provide water supplies for water carting during drought. Some of these supply points have not been maintained between droughts and require costly refurbishment at the start of each drought. Ongoing work is needed so that water carting supply points have a basic care and maintenance program or are mothballed so they can be cost-effectively recommissioned when the next drought occurs. How water is managed during extreme drought and extreme water quality events is outlined in more detail in Part 10 of the Comprehensive Report in response to Part 13 of Chapter 10 of the Basin Plan.	**Action 4.9—Improve management of emergency water supply** The government, in partnership with local government and water corporations, will improve information on the availability of emergency water supply points. This will require: • clarifying the roles and responsibilities of local government and water corporations in the management and communication of emergency water supply points • clarifying pricing principles for emergency water supplies with local government and water corporations • evaluating the emergency water supply point network and, where necessary, working with emergency water supply point managers to upgrade and take ongoing responsibility for sites, consistent with their roles and responsibilities		A C			

Title	Macro risk cause applicable					Description	*Water for Victoria* action/s or alternative	Use applies to (A) and/or (C)				SF
	CC	EE	LUI	NC	WA			E	C	S	A	
5. Environmental water management in a changing climate	x		x		x	In the future, Victoria is likely to see less runoff entering our waterways. This will affect the availability of environmental water and the ecological objectives Victoria can achieve. Similar to water users in the urban and rural water sectors, there are a range of tools that environmental water managers can use to help manage variable water availability. Tools such as carryover, trade and structural works to improve efficiency will become increasingly important in responding to climate change impacts, reduce the risks of low environmental water availability and improve environmental outcomes. In some waterways, we may need to recover more environmental water as a result of climate change. We are already starting to collect the information we need to understand changes to water availability by updating our water models to include future climate change scenarios. We are also looking into climate change impacts for environmental water availability and meeting ecological objectives. Works and measures are vital to make the best use of existing environmental water entitlements. The Murray–Darling Basin Plan provides an opportunity to invest in more environmental works in the southern-connected Basin. Victoria has developed nine proposals for environmental works under the Basin Plan. These proposals build on the Living Murray program, which uses environmental works and water to achieve environmental outcomes at six icon sites, including the Gunbower Forest and Hattah Lakes. Environmental works such as pumps, regulators and pipes help to water sites in the absence of natural flows. This means that less water is needed to connect the river to its floodplain. Works also provide a way to target sites that cannot be watered due to the risk of third-party impacts. When there is limited environmental water available, environmental works can enable this water to be used more effectively to protect high-value flora and wetlands. Environmental water must be managed together with other complementary works such as protecting drought refuges, improving habitat connectivity for fish, improving landholder management practices and stronger integrated catchment management. This will help achieve improvements in waterway health, especially in a predicted drier and warmer future climate. Modelling can combine information about predicted species distributions, climate and the costs and benefits of management activities to make decisions about trade-offs and investment. Monitoring of the benefits of environmental water is detailed in Action 24. This information can also help set achievable objectives or provide evidence for when objectives might need to be changed. This strategy will also consider impacts of groundwater on meeting environmental watering requirements for priority environmental assets and priority ecosystem functions. This reflects requirements of Part 4 of Chapter 10 of the Basin Plan which is outlined further in Part 12 of the Comprehensive Report. Additionally, this strategy will consider the risks associated with inter-valley transfer as modelling is completed by the MDBA to determine the nature and extent of the risk.	Environmental water is critical to protect the plants, animals and overall health of rivers, wetlands, floodplains and estuaries. It also has social, cultural and economic benefits. Environmental watering can increase recreational activities, sustain healthy Country for Traditional Owners and improve water quality for farmers. **Action 3.5—Improve environmental water management in a changing climate** The government will continue to invest in environmental works and measures for priority watering sites to better use existing environmental water. The government will look into the need for future environmental water recovery through sustainable water strategies, taking into account the findings of long-term water resource assessments. Sustainable water strategies will rely on evidence-based principles, priorities and community input. The Department of Environment, Land, Water and Planning will review and strengthen the Victorian Environmental Water Holder to build on achievements made in the first five years of operation and secure future environmental outcomes in the face of climate change.	A C	C	A C	A C	SF
6. Greater flexibility for taking water under winter-fill licences	x	x	x	x	x	Since 2004, all new licences to take water from unregulated water systems have required landowners to harvest all their water between July and October. This arrangement is based on historical rainfall patterns and environmental needs. Victoria needs to continually monitor and periodically review these rules given changes in rainfall patterns resulting from climate change. Victoria has experienced a seasonal shift with less rainfall during the cool season when dams and storages usually fill. The challenge is to provide flexible management options that do not adversely impact the environment or third parties. The long-term water resource assessment and reviews of sustainable water strategies provide an opportunity to review water harvesting arrangements. One immediate option in unregulated surface water systems is to change when water is taken under winter-fill licences. Opportunities may exist to provide controlled access to high flows outside the traditional winter-fill period but still within current entitlement volumes. This could increase the reliability of supply to individuals. Key considerations include the potential adverse impacts on the environment or third parties, administrative costs and long-term viability.	**Action 8.3—Investigate increased flexibility for taking water under winter-fill licences** The Department of Environment, Land, Water and Planning will explore opportunities for individuals with winter-fill licences to extract water during high-flow periods in some systems within the sustainable limits of the resource. This option will not increase entitlement volumes but may increase the reliability of supply based on when water is taken.		A			

Title	Macro risk cause applicable					Description	*Water for Victoria* action/s or alternative	Use applies to (A) and/or (C)				SF
	CC	EE	LUI	NC	WA			E	C	S	A	
7. Implement Ministerial Guidelines for groundwater licensing and the protection of high-value groundwater-dependent ecosystems					x	These guidelines apply to high-value ecosystems that are recognised by state and Commonwealth governments as being significant for their environmental values including but not limited to: • Ramsar-listed wetlands • heritage rivers under schedule 1 of the *Heritage Rivers Act* 1992 • species and communities listed under the *Flora and Fauna Guarantee Act* 1988 (Vic) or the *Environment Protection and Biodiversity Conservation Act* 1999 (Cwlth) • priority environmental values set by waterway managers, including those identified in regional waterway strategies or their relevant sub-strategies. This applies when an application is made for a licence to take and use groundwater or transfer a groundwater licence in an area not managed under an approved management plan. This strategy is also relevant to the matters identified in Part 4 of Chapter 10 of the Basin Plan. Consideration of the rules required to mitigate groundwater impacts on meeting environmental watering are outlined in Part 12 of the Comprehensive Report.	**Action: Implement Ministerial Guidelines for groundwater licensing and the protection of high-value groundwater-dependent ecosystems** The guidelines require a risk assessment of the impact of granting the groundwater licence application on high-value ecosystems, having regard to the need to protect those ecosystems. If a risk is high, the Minister's delegate must either: • identify treatment options to be developed to reduce the risk to medium • make a decision to accept the risk and fully document the reasons • refuse the groundwater licence application The delegate must also refer the application to the relevant catchment management authority for comment for a licence greater than 20 ML or greater than 10 ML if risks are identified as high or medium.	A C				SF
8. Improving understanding of climate science and how it applies to water management	x	x	x		x	Government has a key role in applying research to water management policy, planning and practice. Victoria's investment in the Victorian Climate Initiative, in partnership with the Bureau of Meteorology and CSIRO, means that understanding of climate change and its impacts on water resources has grown substantially in recent years. Victoria will build on this understanding by continuing to invest in research and working with partners including community groups, local government, Traditional Owners, research organisations and the water sector. Improving our ability to apply this research to water management policy, planning and practice is also vital. Tools for modelling and scenario planning will help inform decisions about options for action in a future with climate change.	**Action 2.2—Understand and apply climate science to water management** The Department of Environment, Land, Water and Planning will continue to assess and report on changes in water resources, including changes in rainfall, streamflow and groundwater, to inform adaptation and evaluation of actions. Victoria will continue to build our understanding of how climate change will affect our water resources. The government will invest $2.23 million to improve Victoria's preparedness and response to climate change and the impacts of drought. The Department of Environment, Land, Water and Planning will build partnerships with communities, local government, Traditional Owners, research institutions and the water sector to share knowledge and apply research to policy, planning and practice. This initiative is taking action to mitigate climate change and provide policy direction, tools and support for water resource managers and users to adapt to changing conditions. The initiative supports implementation of Chapter 2, Chapter 4 and Chapter 8 of *Water for Victoria* (DELWP, 2016), including establishing a knowledge hub for climate science and water resource research, implementing a process to reduce emissions in the water sector and implementing measures to improve water security in drought-prone regions of Victoria.	A C	A C	A C	A C	SF
9. Improving public reporting on water availability and use: User-focused information and reporting	X	x		x	x	The current reporting on water availability and use is trusted and accurate but it is not widely available or easy to understand for general audiences. The government is committed to improving the clarity and transparency of information about the condition and use of Victoria's water resources. Improved public reporting on Victoria's water availability and use will be supported by accurate, user-friendly, readily available information. This strategy also considers the requirements under Part 10 of Chapter 10 of the Basin Plan relating to the measuring and monitoring of Basin resources. This strategy will also support further investigation into the increased risks associated with inter-valley transfer to support the development of measures to address any impacts or mitigate risks.	**Action 8.10—Provide clear information about water resources to the community** The Department of Environment, Land, Water and Planning will provide clear and transparent information on the condition and use of Victoria's water resources through accurate, trusted and timely information that is widely accessible and targeted to user needs. This will be done by: • working across government to improve and coordinate public reporting on the condition and use of Victoria's water resources • using new technologies and pathways for providing timely, targeted and fit-for-purpose water resource information • improving comprehensive water resources reporting through accessible weekly and monthly updates on the resource, aligning long-term trend reporting with user needs	A C	A C	A C	A C	SF

Title	Macro risk cause applicable					Description	*Water for Victoria* action/s or alternative	Use applies to (A) and/or (C)				SF
	CC	EE	LUI	NC	WA			E	C	S	A	
10. Improving rural water supply planning	x	x		x	x	In regulated water systems, system operators are responsible for managing the available water resource on behalf of entitlement holders: the urban water corporations, the Victorian Environmental Water Holder and individuals. Each year, system operators plan for the management of their systems to supply the specified entitlements. In future, they will be required to consult more broadly in the development of these plans, and to consider the potential for shared benefits for Traditional Owners and recreational uses. Early reserve policies in some systems are used to manage the risk of not being able to operate irrigation systems because of insufficient reserves. Additionally, this strategy will consider the risks associated with inter-valley transfer as modelling is completed by the MDBA to determine the nature and extent of the risk. System operators must also develop low-flow contingency plans for managing severe water shortages. These plans must be developed in consultation with urban water corporations. System operators will be required to consult more broadly with all entitlement holders and the community in developing and reviewing these contingency plans. System operators provide regular information to entitlement holders to assist with their planning. In future, this information will need to be easier to understand and available to the broader community. This will help different groups understand the opportunities that may be available through shared benefits, and it will also help to inform the newly created grid oversight function. Planning in unregulated surface and groundwater systems generally involves developing management arrangements so that available resources are managed equitably and sustainably. The management arrangements set out the triggers for rosters, restrictions and bans on extractions during low-flow periods. Processes for statutory planning for unregulated streams and groundwater set out in the Victorian Water Act are complex, resource intensive and frustrate stakeholders. A single planning process for unregulated surface water and groundwater would significantly reduce red tape and unnecessary delays, while ensuring appropriate consultation requirements and Ministerial oversight. Historically, the planning for groundwater and unregulated surface water resources has taken place separately while still taking into account the known interactions between the resources. The government will continue to invest in work to better understand the interactions, to inform future combined planning. Development of a streamlined process will facilitate future combined planning for groundwater and surface water resources.	**Action 8.9—Improve rural water supply planning** The government will improve rural water supply planning processes by: • as part of the review of the sustainable water strategies, examining the early reserve rules to ensure they continue to meet the needs of the system and entitlement holders • requiring system operators to develop low-flow contingency plans in consultation with other entitlement holders and the community, and considering shared benefits • ensuring that guidelines for the development of low-flow contingency plans include an appropriate range of climate scenarios • requiring rural water corporations to improve the provision of water resource availability information to all water entitlement holders and make regular water outlooks easier to understand and available to the broader community • seeking amendments to legislation to enable development of streamlined unregulated surface water and groundwater management plans ensuring that adequate consultative processes and Ministerial oversight are retained • continuing to invest in understanding where groundwater and surface water interactions have a significant impact to inform future combined management plans	A C	A C	A C	A C	SF

Title	Macro risk cause applicable					Description	*Water for Victoria* action/s or alternative	Use applies to (A) and/or (C)				SF
	CC	EE	LUI	NC	WA			E	C	S	A	
11. Improving statewide water resource planning and risk assessment	X	x	x	x	x	Victoria's water resource regulations and planning processes operate across various landscape scales and timeframes with many organisations and stakeholders. Responsibility for implementing the framework lies with water corporations or government, depending on the function of the planning process. Good quality and timely water resource management information provides a strong foundation for the planning framework. Urban water corporations will develop urban water strategies every five years that incorporate sewerage strategies and drought preparedness planning, and link to local integrated water management plans. The community will be consulted about opportunities to achieve shared benefits for Traditional Owners and recreational users. As an example, planning processes will include Traditional Owners. The government will maintain the integrity of the statewide planning process and ensure that the process is streamlined and avoids 'consultation fatigue'. Important elements of this framework include: • long-term water resource assessment and planning at the state and regional scale through long-term water resource assessments and sustainable water strategies • water planning by rural water corporations focusing on water resource management and supply • water planning focusing on urban water supply and waste disposal • environmental water planning and resource management Victoria's long-term planning arrangements as set out in the Victorian Water Act have been designed to: • provide stable and secure water supplies over time • acknowledge and cater for regional variability in water supplies and water sources • ensure stakeholders have tools available to make the most effective decisions about their water resources and to allow intervention if assumptions about water supply are no longer valid • ensure appropriate governance for independent oversight of resource assessment and the need for any corrective action • involve community and stakeholders in all stages of long-term planning	The Victorian Government will make sure the current planning framework remains adaptive and robust to respond to the challenges ahead. Victoria's framework for statewide water resource planning has two key elements: **Action 8.6—Commence the long-term water resource assessment process** Long-term water resource assessments are broader in scale and determine whether resource availability has changed and, if so, the severity of the impact on consumptive and environmental use. The assessments may determine that waterway health has declined for flow-related reasons. A review is required if an assessment identifies that either of these issues has occurred. This open, consultative review must consider social, environmental and economic matters, and determine how to restore the balance between consumptive and environmental use. This may include a permanent qualification of rights, which is a provision in the Victorian Water Act for the Minister to change water-sharing arrangements under existing entitlements in a given area. The government will ensure that permanent qualifications of rights will be used only as a last resort. Long-term water resource assessments are required every 15 years. Since they were established in legislation, the north of the state has undergone significant rebalancing of entitlements as part of the implementation of the Murray—Darling Basin Plan and state-initiated programs to return water to the environment. These processes must complement each other and avoid duplication. The government will: • commence a long-term water resource assessment in 2018 • amend legislation to align the long-term water resource assessment for northern Victoria with the Murray-Darling Basin Plan review, scheduled to take place in 2026 **Action 8.7—Commence sustainable water strategy reviews** Sustainable water strategies, which are regionally focused and identify and manage threats to the supply and quality of water resources, ensure entitlement holders have the tools including trade and carryover to manage their own risks and identify the potential to improve waterway health. The process provides a mechanism for methodical and thoughtful engagement to set priorities and directions in the regions. Between 2006 and 2011, four sustainable water strategies were developed across the state in the central, northern, Gippsland and western regions. The Victorian Water Act requires the strategies to be comprehensively reviewed at least every 10 years. The reviews of the sustainable water strategies will be informed by an appropriate range of climate change scenarios. A sustainable water strategy's consultative committee, with participation of Traditional Owners, will ensure that the reviews consider opportunities for achieving shared benefits for Aboriginal values of water. The consultative committee will also consider the recreational values of water. The government will: • begin the review of the Central Region Sustainable Water Strategy in late 2016 • undertake the five-yearly assessments of the sustainable water strategies, beginning in 2017 with the Gippsland and Western sustainable water strategies • the Northern Region Sustainable Water Strategy review will commence in October 2019 The Department of Environment, Land, Water and Planning will: • ensure an appropriate range of climate change scenarios are used to inform future sustainable water strategies • consider opportunities for achieving shared benefits, including those related to recreational values, in reviews of sustainable water strategies • include representation of Traditional Owners in consultative committees for sustainable water strategies	A C	A C	A C	A C	SF

Title	Macro risk cause applicable					Description	*Water for Victoria* action/s or alternative	Use applies to (A) and/or (C)				SF
	CC	EE	LUI	NC	WA			E	C	S	A	
12. Investigating increased flexibility and choice for licence-holders	x	x	x	x	x	Victoria has carried out significant reform of water entitlements in most regulated water systems. In these systems, water rights have been converted into water shares, delivery shares and water-use licences and registrations. This provides more flexibility and choice for entitlement holders on how they use and manage their water. Entitlement holders may mortgage or lease their water share, and trade more efficiently. This flexibility helped some entitlement holders get through the Millennium Drought. In future, climate change means less rainfall and more frequent droughts. Victoria will have to do more with less water at different times. Take and use licences in unregulated surface water systems or groundwater systems have not been converted into water shares and associated products. Conversion of these licences could provide similar flexibility and trade opportunities, enabling users to better respond to the challenges of climate change. Issues specific to unregulated surface water and groundwater systems will need to be resolved before making a decision to convert take and use licences into water shares in any particular water system. However, given the potential benefits, this issue deserves further investigation. Any changes to take and use licences would need to be considered in the light of Part 8 of Chapter 10 of the Basin Plan and further require the setting of circumstances to allow for groundwater trade to comply with the requirements under Chapter 12 of the Basin Plan. The circumstances in which groundwater trade could occur in the Goulburn-Murray water resource plan area is outlined further in Part 7 of the Comprehensive Report. Any changes also need to be consistent with the Basin Plan more broadly, including assessment of risks arising from any changes as set out in Part 9 to: current and future risks to the continued availability and condition of water resources, meeting EWRs, interception, groundwater resources and hydraulic connectivity, and water quality and salinity.	**Action 8.2—Provide greater flexibility and choice for licence-holders** The Department of Environment, Land, Water and Planning will investigate the merits of converting take and use licences (section 51 licences under the Water Act) in unregulated surface water and groundwater systems into water shares and other related products. The department will work with key stakeholders to investigate this proposal, and further work will depend on the outcome.		A			
13. Leading climate change adaptation across Victoria's water system	x	x	x		x	*Water for Victoria* (DELWP, 2016), is the Victorian Government's adaptation response to the impacts of climate change on our water resources and the availability of water in the future. Victoria's temperature has steadily increased since the 1970s and overall streamflows have decreased by about 50 percent or more over the past 20 years. In recent years, Victoria has had low rainfall overall and catchments are dry. The Millennium Drought brought with it a seasonal shift in rain towards less rainfall during the cooler months of April to October, when runoff is greatest, and storages are usually fill. Climate science predicts this is the new reality, with more extreme events such as floods, droughts and bushfires also likely to occur. Higher temperatures increase evaporation rates. These changes may impact on water demands and water use in catchments. Farmers may need more water for stock and to irrigate crops to offset increased evaporation. The amount of rainfall needed by catchment vegetation is likely to increase, causing reduced streamflows into storages. Demand for human uses is also expected to increase as the temperature rises, including through higher peak demands during heatwaves. The water sector has a long history of dealing successfully with the resource challenges of a variable and sometimes extreme climate. But adaptation is related to much more than water availability. For example, Victoria may need to alter design and requirements for new infrastructure to account for increased flooding. Victoria must make sure our water planning, assets and services are able to adapt quickly to changes in conditions as a result of climate change. The sector will consider climate change adaptation across all operations including resource, asset and risk management. Evidence-based decision making and monitoring will be important in leading climate change adaptation.	Climate change adaptation is a priority so that Victorians can continue to have safe and reliable water systems, and to optimise our investments in environmental outcomes. The actions in *Water for Victoria* (DELWP, 2016) set the direction for the water sector's climate change adaptation for the coming decades. Although the body of scientific knowledge on climate change continues to evolve, future climate projections remain uncertain. It is therefore important that a range of possible climate futures are considered when planning for the sustainability of Victorian water resources. **Action 2.3—Lead climate change adaptation across Victoria's water system** *Water for Victoria* (DELWP, 2016) sets the direction for the water sector's climate change adaptation for the coming decades. The water sector will lead climate change adaptation actions arising from Victoria's second Climate Change Adaptation Plan and review of the *Climate Change Act 2010*. The Government will monitor and evaluate climate change adaptation measures and report on progress as set out throughout *Water for Victoria* (DELWP, 2016). Water corporations will apply the guidelines for assessing the impact of climate change on water supplies in Victoria developed by the Department of Environment, Land, Water and Planning when undertaking water supply planning. The guidelines help assess the impact of climate change on groundwater resources, extreme events such as drought and operational planning, alternative water supply projects and demand projections. The guidelines outline how climate change projections can be applied for water resource planning in Victoria. As most of Victoria's water sources are climate-dependent, planning for future climate variability and climate change is important for water resource planners. Techniques are presented to extend this baseline using the full historic climate record to incorporate a wider range of natural climate variability. Four climate change scenarios are presented in a risk-based framework that considers the vulnerability of supply systems to climate variability and climate change. Victoria's water corporations are required to apply the guidelines when modelling for climate change and supply forecasting under section 6-A of the Statement of Obligations issued by the Water Minister under the Water Industry Act 1994.	A C	A C	A C	A C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
14. Maintain compliance with *Safe Drinking Water Act 2003*		x				The Department of Health and Human Services safeguards Victoria's drinking water supplies to protect and enhance public health and wellbeing. To achieve this, the department ensures drinking water is delivered to Victorians by water businesses in accordance with the requirements of the *Safe Drinking Water Act 2003* and the Safe Drinking Water Regulations 2015.	**Action: Maintain compliance with *Safe Drinking Water Act 2003*** The *Safe Drinking Water Act 2003* regulates drinking water quality. It places obligations on water suppliers and water storage managers to provide safe, high-quality drinking water. It provides a regulatory framework that includes: • a risk management framework 'from catchment to tap' • a set of standards for key water quality criteria • information disclosure requirements for water businesses' community consultation processes The Act applies to a range of designated water businesses (water suppliers and water storage managers) and other statutory authorities that supply drinking water to the public, including Parks Victoria and alpine resort management boards. The Department of Health and Human Services supports and works with these key stakeholders to ensure the Act is upheld across Victoria.		C			

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	CC	EE	LUI	NC	WA			E	C	S	A	
15. Managing availability risks to recreational water users	x	x	x		x	Connection to nature through water storages, lakes, wetlands, rivers and streams is important for health and wellbeing and the social fabric of communities, as well as regional tourism and jobs. Visitors appreciate and seek these benefits through swimming, fishing, water skiing, rowing, camping, walking, birdwatching, sporting events, social gatherings and other activities on or near waterways. Water has recreational values that depend on the type of activities possible at a waterway, the environmental health of the waterway, water quality, accessibility, facilities and safety. Victorians are preparing for a warmer, drier future with less water available, and more extreme events. Dry conditions regularly affect the north and west of the state. In dry conditions and in drought, less water is available for all uses and recreational uses of waterways can be restricted. Yet it is at these times that the presence of water and recreational opportunities provide relief and can become even more important for communities. Understandable concern can arise when water is scarce. In regulated water systems, water is captured and held for entitlement holders in storages and moved to where it is needed through rivers and channels. In these systems, water may be able to be moved in a way that provides recreational benefits without affecting existing entitlement holders. But this cannot be guaranteed, especially in dry times. In unregulated systems, how water moves cannot be controlled. This means that recreation is significantly impacted in dry conditions. While there are many activities at waterways that people can enjoy regardless of water levels, some activities such as boating, and fishing require a minimum water level or a consistent presence of water. There will be times when not enough water is available to support all recreational activities at all locations. This is likely to happen more often with climate change. There are already limits to some activities such as boating on some water storages to maintain safety and security of supply. Victoria needs to manage access to water storages according to risk, particularly at storages used for drinking water supply, which will continue to be managed in accordance with the requirements of the *Safe Drinking Water Act 2003*. Recreational users and regional communities often want to improve certainty of water supply, create new facilities or expand access to favourite sites. They may have a clear objective, but require support to make it happen.	Water management in Victoria provides significant recreational benefits but Victoria is not always able to provide them because of limits on the water available. *Water for Victoria* (DELWP, 2016) commits the government to supporting the wellbeing of rural and regional communities who enjoy the recreational benefits provided by regional waterways. Victoria will consider these values in the way we manage water. We can increase the likelihood of achieving shared benefits by improving the way we consider recreational values. **Action 7.1—Include recreational values in water and waterway planning** • the government will explicitly incorporate recreational values in statewide and regional water planning processes • water corporations, catchment management authorities and the Victorian Environmental Water Holder will plan for and provide water services that explicitly consider recreational values within our existing frameworks and with awareness of the realities of dry conditions and climate change • water corporations, catchment management authorities and the Victorian Environmental Water Holder will engage with the community to identify and prioritise opportunities to deliver recreational outcomes. They will seek input from recreational users and regional and rural community members and report back on what is agreed and what has been done • for recreational values to be appropriately considered, Victoria will invest to understand what those values are, including their social and economic value • Victoria will provide easily accessible and user-friendly information to recreational users on river, storage and lake conditions to help them plan activities **Action 7.2—Help communities understand how to achieve their recreational objectives** People may have new ideas about how to meet their recreational objectives that cannot be achieved in the day-to-day management of water and waterways. For example, recreational users could buy entitlements to improve the certainty of having water for recreation or by completing works such as building a bridge or removing rubbish to improve enjoyment of activities, or develop tourism strategies to attract visitors. But they may not know how to progress their ideas or who can assist • Public land managers will help recreational users connect with the right people including local government, tourism boards and potential investing bodies to progress actions relating to visitor experience at valued waterways for water storages. Water corporations are the right organisation to lead this where water storages are concerned • The water sector will share knowledge, user-friendly information and expertise with community members, land managers and potential investors to help achieve recreational objectives • The sector will also share information about community recreational objectives for waterways with organisations seeking to prioritise investment in regional development, recreation, community wellbeing and tourism objectives **Action 7.3—Support recreation at water storages through infrastructure and better information** Water corporations can provide infrastructure and facilities at water storages that are a priority site for recreational users. First, water corporations need to understand the recreational objectives for these sites and the benefits for communities. Water corporations will prepare land and recreation management plans for all major water storages of recreational value. In preparing and implementing the plan they will: • work closely with the community and stakeholders • consider the short-, medium- and long-term water resource management purposes and arrangements for the storage • define agreed actions including the responsible agency and funding arrangements • provide public progress reporting on the implementation of these plans and actions.			A		

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	CC	EE	LUI	NC	WA			E	C	S	A	
16. Managing exceptional circumstances		x				The government is moving to implement an 'all-hazards, all-agencies' approach to emergency management. Water corporations and catchment management authorities are a key part of the emergency response and recovery framework. The government will work with water corporations and catchment management authorities to clarify their role in emergency response and recovery to make sure it is consistent with their skills, resources and capabilities. The government will strengthen risk management arrangements and assurance processes to support water sector business continuity and manage the risks and challenges of emergencies and extreme events. How water is managed during extreme drought and extreme water quality event is outlined in more detail in Part 9 of the Comprehensive Report in response to Part 13 of Chapter 10 of the Basin Plan.	**Action 10.12—Improve emergency management capability** The government will improve the emergency management capability and resilience of the water sector by: • making relevant legislative changes to clarify the roles of water corporations and catchment management authorities in emergency management • continuing to work with the water sector to enhance capacity and capability building • enhancing information systems and processes to monitor, evaluate, communicate and continuously improve the management of water sector risks	A C	A C	A C	A C	
17. Managing groundwater-related risks (including groundwater and surface water connectivity) through Victorian planning and implementation frameworks	X	x	X	x	x	Groundwater-related risks are considered in the groundwater management plans and local management plans developed for groundwater management areas and water supply protection areas across the state. These discrete boundaries represent areas of high-value groundwater that have been identified through many decades of groundwater management. Groundwater connection to rivers plays a major role in the health and function of riverine environments in groundwater-dependent wetland ecosystems. It also plays a primary role in water quality or rivers through the delivery of salt and other constituents (e.g. nitrate). Management plans seek to ensure that the hydraulic relationships and properties between groundwater and surface water systems, and between and within groundwater systems, are maintained. The development of these plans is risk-based and intrinsically deals with the threat of a reduction in groundwater volume associated with climate change, extreme drought, land use change and bushfire. These plans incorporate groundwater level management and actions because each of the previous causes will ultimately lead to a change in the rate of recharge to the groundwater resource, which is evidenced by a change in groundwater level. These plans also detail the threat of elevated levels of salinity, and these are also represented by groundwater level triggers. This is relevant to the matters identified in Part 4 of Chapter 10 of the Basin Plan, and consideration of these rules is required to mitigate groundwater impacts on meeting environmental watering are outlined in Part 12 of the Comprehensive Report.	**Action: Delivering and updating groundwater management plans** Water corporations are responsible as delegates of the Minister for Water for licensing surface water and groundwater and may develop local management plans. Declaration of a water supply protection area by the Minister triggers the preparation of a draft water supply protection area management plan, for consideration by the Minister. The objective of water supply protection area management plans and local management plans is to support the equitable sharing of available water between authorised water users, to protect the environment and ensure the sustainability of the water resource in the applicable area. Groundwater management plans may be prepared and may also support the requirements of the Murray–Darling Basin Plan. This may occur when: • there are competing demands for water • there is risk from licensed water use to significant environmental values • there is a need to manage the resource (i.e. surface water and groundwater resources) as a whole (e.g. due to significant inter-connection) Groundwater management plans describe how water corporations will manage the taking of unregulated surface water and groundwater licensed under section 51 of the Victorian Water Act and in accordance with the policies for managing take and use licences. Where groundwater contributes to a high-value surface feature such as a stream, spring or wetland, the threat is managed through the licensing assessment process, application of statewide policies and groundwater management plans. Reporting is undertaken on the management of the resource and includes the monitoring of the resource condition. Reporting is done on an annual basis. Reporting may be on a catchment scale with sections pertaining to each area. At a minimum, reports must include information on periods when rosters or restrictions were in place, compliance and enforcement action taken for non-compliance and monitoring data relied on to introduce, enforce and lift rosters or restrictions or alter allocations.	A C	A C	A C	A C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
18. Managing invasive species in waterways			x			Invasive species in waterways and along riparian land are an increasing threat to the health of rivers, estuaries and wetlands in Victoria. Invasive species occur as a result of human activities and beyond their natural range, threatening valued environmental, agricultural or other social resources by the damage they cause. Such species can include organisms endemic to a country other than Australia, or translocated native species. The establishment and spread of invasive species is often a symptom of broader land use change and disturbance. Compared to most land, waterways (including riparian land) appear to be especially vulnerable to invasive species. Riparian land is prone to invasion due to high productivity and frequent disturbances. The spread of invasive species through waterways and riparian land is assisted by high connectivity as a result of water flowing downstream, or laterally to the floodplain and associated wetlands. It is common for significant movement of invasive species to occur during floods. Invasive species affect waterway conditions and have the potential to threaten environmental, social, cultural and economic values. Environmental impacts may include predation on, or competition with, native species, loss of habitat and changes to water quality or sediment, nutrient levels and the transmission of disease. The impacts associated with invasive species are often underestimated as there may be a time lag between their introduction and their effects being noticed, or it may be difficult to calculate the costs associated with the damage caused. Some invasive species can pose a risk to environmental values, but at the same time support social and economic values, such as recreational fishing. A balanced management approach is required to reduce the impacts of invasive species that cause substantial harm, while continuing to acknowledge that in some limited cases invasive species may provide other benefits valued by the community.	**Action: Managing invasive species in Victorian waterways** Management of invasive species is complex and requires a high degree of cooperation between international, national, state and regional agencies. The Victorian Government's environmental partnerships and the invasive plants and animals policy framework provides the strategic approach for managing invasive species across the whole of Victoria. The Victorian Waterway Management Strategy (DEPI, 2013) sets out the policy direction for issues affecting waterway health, including the threat from invasive species. The management of invasive species in waterways needs to be holistic and integrated with other waterway management activities, other pest plant and animal control work, and fisheries management activities. It is often impossible to eradicate invasive species in waterways and so management activities to prevent their introduction and establishment are critical. Prevention provides a higher return for investment than eradication, containment or managing impacts across widespread areas. Coordinated action across government agencies and working with the community is necessary to integrate environmental programs and achieve multiple outcomes for land, water and biodiversity. Victoria is a signatory to the National Environmental Biosecurity Response Agreement. This agreement sets out emergency response arrangements, including cost-sharing arrangements, for responding to biosecurity incidents that primarily impact the environment and/or social amenity and where the response is for the public good. A national biosecurity incident response under the agreement would be considered for new incursions of invasive species in waterways if such incursions were assessed as being of national significance and the invasive species was likely to be eradicable. Current research programs include: **Risk management of aquatic invasive species** The project assesses the risk of spread of selected high-priority freshwater aquatic invasive species through the Victorian water grid, and identifies pathways leading to the introduction, establishment and spread of invasive species in Victoria. Project outputs will allow informed decision to be made regarding monitoring and management of invasive species and the pathways leading to their establishment and spread. **Development of education and awareness raising material for aquatic invasive species** This project involves developing education and awareness-raising material to specifically target community and industry stakeholders about invasive species that affect waterways. **Management of invasive species in wetlands** Wetland managers seek guidance and support regarding which species should be the focus of management effort, and how they can be most effectively managed to minimise their impacts on wetlands. This project involves the development of: • a training course for the management of rabbits, foxes, pigs and carp • fact sheets outlining the impacts of these four species on wetlands • a process to prioritise 174 weeds currently known from Victorian wetlands • information on the impacts of 28 priority wetland weeds • fact sheets, reports and training details on managing wetlands **Managing willows in Victoria** Exotic species such as willows were historically planted along waterways for erosion control and aesthetic purposes. The spread of these species over time has degraded riparian land. Consequently, over the past 20 years or so, catchment management authorities have been removing willows along many Victorian waterways. These willow management programs have sometimes caused concern from the public, particularly landholders and recreational fishers, who have a strong interest in the health of our waterways. A brochure has been developed to acknowledge those concerns, improve communication and raise awareness of the 'why, what and how' about willow management in Victoria.	A C	A C	A C	A C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
19. Managing pollution-related events (e.g. point-source discharge)		X	x			A key role of Environmental Protection Authority (EPA) Victoria, under the *Environment Protection Act* 1970, is to minimise the pollution of water environments. A particular focus for the EPA is the control of point sources of waste and wastewater, with a priority on avoiding the generation of wastewater. This is important because pollutants such as toxicants, nutrients and sediment can become concentrated in point-source discharges, leading to significant impacts on receiving waters. Point-source discharges considered in the risk assessment include a continuation of existing licensed discharges, urban stormwater runoff and accidental spills. The EPA has the power to issue remedial notices during certain types of pollution events. A remedial notice is a written statutory direction that requires, by law, that a recipient undertake specific works or activities—for example, to conduct a clean- up, stop works, install controls or change a process or activity. Remedial notices are served to prevent or remedy a range of non-compliances or likely non-compliances.	**Action: Managing pollution-related events (e.g. point-source discharge)** In Victoria, the discharge of wastes or wastewater from significant point sources (e.g. wastewater treatment plants and industries) to surface waters (including stormwater drains) is licensed by the EPA. The EPA has a strong framework for licensing, monitoring and auditing wastewater discharges to surface water and process includes detailed provisions for protecting beneficial uses and the environment. Unlicensed activities may also discharge wastewater to surface waters and these need to be managed to ensure that they do not impact on beneficial uses. The disposal of wastes and wastewater to water, without approval from the EPA, is already prohibited under the *Environment Protection Act 1970*. If a licence is issued to discharge wastewater, the EPA will ensure it is consistent with the revised State Environment Protection Policies and includes an environment improvement plan. This plan drives the progressive reduction of the impact of wastewater discharges on beneficial uses, and has a monitoring program to assess the impact of the discharge on beneficial uses. **Pollution abatement notices** Pollution abatement notices are issued under section 31A of the *Environment Protection Act 1970*. These notices aim to prevent further occurrence of pollution or potential environmental risk through installation of risk controls and changes to on-site processes and practices. If found guilty of contravening a requirement of a pollution abatement notice, the recipient may be ordered by a court to pay a fine of up to 2,400 penalty units and an additional penalty of up to 1,200 penalty units for each day the offence continues. **Clean-up notices** Clean-up notices are issued under section 62A of the EP Act. They aim to prevent further contamination and impact on beneficial uses through: • removal of waste • undertaking clean-up activities • ongoing management of pollution • altered handling, storage or location of industrial or prescribed industrial waste If found guilty of contravening a requirement of a clean-up notice, the recipient may be ordered by a court to pay a fine of up to 2,400 penalty units. **Directions** Directions are issued under section 62B of the EP Act to immediately stop an activity, address an incident, or undertake an activity to prevent imminent danger to life, limb or the environment. Directions can be verbal or written, and must be followed immediately. A direction may be used when: • pollutants have been or are being released • pollution is likely to happen • industrial waste or potentially hazardous material has been abandoned or dumped • industrial waste or potentially hazardous material is being handled Failing to comply with a direction is a criminal offence and attracts a substantial fine. In 2015–16, non-compliance with a direction could result in a maximum court penalty of up to 2,400 penalty units. There is no right to request a review of a direction. However, if someone who did not cause or permit the incident to occur is issued a direction, the EPA must reimburse the costs incurred from following that direction. The EPA can in turn recover costs from a person who is responsible for the incident.	C	C	C	C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
20. Managing risks from earth resources development		x	x			A range of Victorian legislation applies directly or indirectly to the management of water at a mine site or quarry including: • *Mineral Resources Development Act 1990* • *Extractive Industries Development Act 1995* • *Environment Protection Act 1970, State Environment Protection Policies* • *Environment Protection (Scheduled Premises and Exemptions) Regulations 1996* • *Industrial waste management policies* • *Catchment and Land Protection Act 1994* • Victorian Water Act Included in these Acts are requirements for industry operators to prepare and seek approval for a work plan. As the main guidance document, the work plan describes the management of onsite water use and its context through operation, progressive rehabilitation and closure. The work plan also outlines monitoring and auditing requirements for each site that will contribute to the water management strategy. Once approved, the work plan imposes conditions on the activities undertaken in relation to water. The work plan may also include offsite disposal of wastewater with the relevant EPA Victoria approvals and licences in place. A number of additional guidelines providing information about work plans and onsite tailings storage management for mining and extractive industries can be found on the DEDJTR Earth Resource Regulation website. Water conservation is part of any sound resource management practice. Whenever possible, a mine or quarry should attempt to close the loop of water use so that a discharge is not required. If a discharge is required, the quality must comply with the applicable legislation. Careful planning and development of an appropriate water management strategy benefits the proponent for a successful mining or quarry project. Discharge from a mine or quarry must be managed in an effective and responsible manner, resulting in minimal impact on the environment and other beneficial uses.	**Action: Managing risks from earth resources development** Mine wastewater may have a number of contaminants. The discharge of low-quality mine wastewater to surface waters will have undesirable consequences such as detrimentally affecting human health, the aquatic ecosystem and agricultural interests. When considering groundwater use, consideration must be given to adverse effects on the water table caused by: • onsite groundwater extraction (dewatering) with consequent drawdown • mounding through excessive recharge of mine water to an aquifer A discharge proposal will be based on the demonstrated application of waste minimisation principles and the capacity to comply with quality parameters outlined by the licensing authority. This means that the proponent will have to design the most appropriate disposal system for the particular operation and environmental circumstances. A mine wastewater disposal feasibility study should also inform the decision regarding which method of disposal is most appropriate for a particular site. Water management may change over time depending on the amount of inflow to the mine, the level of use, evaporation from process dams and unpredictable weather. These variables must be incorporated into the strategy, particularly those related to the choice of disposal method. The quality and quantity of all discharges must be measured, recorded and reported to the appropriate authorities in accordance with licence and work plan requirements. A mine water management plan will often be required as part of the environmental management plan or work plan for the mine operations. All mining work plans are required to incorporate an environmental monitoring program. This normally includes monitoring surface and groundwater parameters, demonstrating compliance with the legislation relevant to water management at the site. Typically, a wastewater discharge monitoring program will include taking samples of the discharge wastewater as well as samples of the receiving water (from surface and groundwater), both upstream and downstream of the discharge point. Sediment samples from upstream and downstream of the discharge point will also be required. Samples will need to be collected before, during and after the life of the mine operation. Salinity is one of the most serious and widely-recognised forms of land degradation in Victoria. As a result, salinity management plans have been developed through consultation between the government and community. Any saline water discharges to land or waterways will come under the control of such plans. If a proponent is planning a mine wastewater disposal scheme in Northern Victoria, additional consultation with the salinity management plan coordinators from DELWP or the local catchment management authority will be necessary to determine whether a salinity management plan is affected. Salinity is a key issue for mining and extractive industries. State Environment Protection Policies require that the discharge of saline wastewater, including discharges from groundwater pumping and irrigation drains, should not pose an environmental risk to beneficial uses. Where discharge of saline wastewater cannot be practically avoided, reused or recycled, the impact on surface waters needs to be minimised by discharging to artificial drains, evaporation basins or through treatment. This will reduce risks posed to beneficial uses of the environment. Any discharge of saline water must also be in accordance with government-approved salinity plans and strategies and the Murray–Darling Basin Agreement. Additionally, EPA Victoria will not normally approve a saline discharge without a biological assessment of the receiving waters. The EPA will assess the specific environment, hydrological regime and water quality and set discharge limits accordingly. Limits set for the licence may take into account factors such as the beneficial uses, contaminant loads and background concentrations.	C	C	C	C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
21. Managing salinity, waterlogging and water quality including issues arising from an extreme wet period		x	x	x		Agricultural activities have the potential to cause salinity and water quality problems in neighbouring areas. Victoria's management responses have made significant progress, particularly in irrigation areas, which have supported agricultural development. Continued government investment is needed to manage the ongoing risks. This gives developers the confidence to invest, and supports the environmental credentials of Victorian agriculture in global markets. It is important that farmers understand and manage their drainage risks. Rural water corporations also need to manage their surface and sub-surface irrigation drainage networks to deal with excess water when on-farm management systems are overwhelmed by extreme rainfall. The Victorian Irrigation Drainage Program has successfully mitigated the most severe waterlogging, salinity, water quality and drainage risks in irrigation landscapes. The floods of 2010-11 demonstrated the need for an ongoing program when heavy rain caused rapid increases in groundwater levels and renewed salinity threats. The program is moving away from extending irrigation drainage networks and is focusing on farm drainage measures and coordination activities and ensuring that natural drainage courses are not inadvertently blocked. The salinity and water quality risks of agricultural intensification in existing areas and development in new areas must be managed. New problems can be prevented by guiding new developments to appropriate sites and the use of best management practices. Under the Victorian Water Act, the offsite impacts of irrigation activities are regulated through water-use licences or take and use licences. These licences are tied to the land and set out the conditions to minimise the effects of water use on others. Irrigation practices have changed significantly since water-use licences were introduced in 2007. For example, farmers have greatly increased water use efficiency. There are trends towards growing higher value crops, and the intensification of agriculture, such as glasshouse developments. Understanding of the risks to third parties and the environment from irrigation has also continued to improve. Irrigation development guidelines need to be contemporary to provide streamlined risk management of emerging trends in irrigation development. Water-use licences can be cancelled when irrigation properties have dried off for a lengthy period. A review of the timeframe for cancellation of a water-use licence will consider the rapid pace of agricultural change and opportunities for significant redevelopment of irrigation properties. Under Basin Plan requirements, a water quality management plan must be prepared in accordance with Part 7 of Chapter 10 of the Basin Plan. The water quality management plan at Appendix A of the Comprehensive Report discusses the impacts of salinity and measures to mitigate the effects.	Victoria has been working with local communities for almost 30 years to manage and reduce salinity in the rivers and catchments of the Murray–Darling Basin. Salinity, however, remains a management challenge and represents an ongoing environmental, social and economic risk. Through *Water for Victoria* (DELWP, 2016), the government has committed to managing the impacts of waterlogging and water quality including issues arising from extreme wet periods through the following actions: **Action 4.6—Manage salinity, waterlogging and water quality** The government, in partnership with water corporations and catchment management authorities, will: • invest in water quality and salinity management and monitoring activities in irrigation and dryland farming areas • develop priorities for the Victorian Irrigation Drainage Program for the next five years in consultation with landholders and other stakeholders • ensure Victoria complies with its interstate salinity and water quality commitments set out in the Murray–Darling Basin Agreement (Basin Salinity Management 2030) and the Murray–Darling Basin Plan **Action 4.7—Manage irrigation development** Over the next four years, the government, in partnership with water corporations and catchment management authorities, will: • ensure that regional irrigation development guidelines are contemporary to emerging knowledge and risks, and are applied across the state to new irrigation developments and significant redevelopments • ensure water-use licence conditions remain relevant to current and future risks at a regional level, and are effectively enforced to manage the potential offsite impacts of irrigation • review the timeframe when water-use licences may be cancelled or modified **Action 4.8—Improve salinity management in the Mallee** Uncontrolled irrigation in the Mallee region can force saline groundwater into the River Murray, causing unacceptable increases in salinity. After consulting the local community, a salinity impact zoning policy was introduced in 1994. Salinity charges are designed to steer development from high- to low-impact zones. Revenue raised is used to fund initiatives that support agricultural water use and offset the salinity impact. The government will update the setting of salinity charges to make it consistent with the new salinity management framework, Basin Salinity Management 2030. The government will continue to improve the current approach to managing salinity in the Mallee and will: • invest revenue from salinity charges annually to update contemporary knowledge of the Victorian Mallee salinity impacts and the cost of offsets consistent with Basin Salinity Management 2030 • establish an independent review process to oversee how salinity charges are set by 2019 • review policies for the high-impact zone in the Mallee to support modernisation of the Sunraysia Irrigation District by December 2019 • work with the Murray–Darling Basin Authority to ensure a level playing field across Basin states in the joint management of salinity.	C	C	C	C	C

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	CC	EE	LUI	NC	WA			E	C	S	A	
22. Managing water quality events	X	X	X			Increased temperatures and less water flowing in our waterways may cause more harmful algal blooms in waterways. Along with blackwater events, this could affect the safety of water supplies for drinking, supporting stock and recreation. The risk of water supply contamination may also increase with water shortages and increased flooding. Warmer and drier conditions means the bushfire threat is constantly increasing. As the climate continues to change, Victoria can expect more severe bushfires. Bushfires threaten the safety of communities and can also affect the quantity and quality of water flowing into storages for many years after they occur. Cyanobacteria (blue-green algae) are a common seasonal occurrence in Victoria and a natural component of most aquatic systems, including streams, lakes, estuaries and the sea. Individual cells are very small and are normally not visible in a waterbody. But numbers can increase rapidly and blooms, or scums, become easily visible across the water surface. Blooms can be triggered by nutrient levels, low inflows, lower storage volumes and warmer weather conditions. Blooms can be unsightly, ranging in colour from dark green to yellowish-brown. They develop a paint-like consistency as they dry out and often have a pungent smell. Large numbers of blue-green algae in waterbodies can produce toxins that can affect the health of humans, animals, birds and livestock as well as harm the environment. In Victoria, blue-green algae are monitored regularly by water corporations and local waterway managers through sampling and testing. An algae outbreak is managed based on the use of the waterbody and the density and nature of the bloom. The Blue-green Algae Circular informs local water managers about algal bloom coordination within Victoria. The circular has a bio-volume calculator to determine the level of cell count at which a response may be required. The circular also has a blue-green algae notification form. The Department of Health and Human Services provides advice about the potential public health impacts of blue-green algal blooms and administers the *Safe Drinking Water Act 2003*. Under Basin Plan requirements, a water quality management plan must be prepared in accordance with Part 7 of Chapter 10 of the Basin Plan. The water quality management plan at Appendix A of the Comprehensive Report discusses the impacts of salinity and measures to mitigate the effects. The Comprehensive Report at Part 9 which outlines the response to requirements under Part 13 of Basin Plan (extreme events) also provides an outline as to how blue-green algae events are managed.	**Action: Blue-green algae risk management plans** Local water managers develop blue-green algae risk management plans for waterbodies under their responsibility and monitor these waterbodies for blue-green algae to ensure early detection and management of blooms. Local water managers should update their blue-green algae risk management plans annually and take into account any changes to organisations within and outside the water sector and linkages to statewide and municipal emergency management planning strategies and developments. They should also consider the best way for their blue-green algae risk management plans to be linked to the Emergency Management Manual Victoria and to municipal emergency management plans and any other related planning instruments. Blue-green algae incident management is based on emergency management principles described in the Emergency Management Manual Victoria in terms of prevention, response and recovery and is classified as a Class 2 emergency. During a substantial regional blue-green algal bloom, regional emergency arrangements will be implemented in managing the incident by the Department of Environment, Land, Water and Planning. Management of the River Murray falls under the jurisdiction of New South Wales. However, as the River Murray is the water supply source to for many Victorian towns, regional cities and irrigation districts and receives flows from Victorian waterways, the New South Wales Murray and Sunraysia Regional Algal Coordinating Committees include representatives from regional coordinators in Victoria. Likewise, if a blue-green algal bloom in Victoria poses a risk to the River Murray, the relevant agencies in New South Wales should be included in the Regional Response Group. New South Wales has produced guidelines to the management response to harmful algal blooms for application in the Murray Region. When blue-green algae levels in the River Murray are above the trigger level, WaterNSW will inform all stakeholders. Consequence management of a blue-green algal bloom in the River Murray in Victoria will be managed through the declaration of an Area of Operation within the Victorian emergency management arrangements. Appendix B—River Murray Regional Blue-green Algae Response Arrangements—Lead Agency WaterNSW describes the proposed incident management arrangement. If a blue-green algal bloom is likely to impact on South Australian waters, relevant water managers should notify SA Health through **public.health@health.sa.gov.au.** **Action: Blue-green algae in drinking water supplies** Where a waterbody is used to supply drinking water, blue-green algae risk management plans should interface with, or be included in the risk management plan that has been developed to comply with the *Safe Drinking Water Act 2003*. Blue-green algal blooms in drinking water supplies that may pose a risk to public health or may result in widespread public complaint, for example through taste and odour issues, must be notified to the Department of Health and Human Services using the notification arrangements under section 22 of the *Safe Drinking Water Act 2003*. **Action: Blue-green algae in recreational water** Notifications are required when a blue-green algal bloom poses a public health risk in waterbodies used for primary contact recreation. Blue-green algal blooms in recreational waterbodies are considered to pose a potential public health risk, for primary contact recreation. When a bloom is detected, the Department of Health and Human Services must be notified along with recreational users of the waterbody (e.g. through signage) or media (as appropriate), and stakeholders such as local government, tourism bodies and recreation clubs. **Action: Blue-green algae in other water supplies** Currently there is insufficient data to set risk-based trigger levels for blue-green algae in waterbodies used for other purposes, such as domestic and stock supplies or irrigation water. Local water managers should undertake a risk assessment for blue-green algal blooms in these waterbodies to determine whether the water is potentially hazardous. If it is considered that a risk may be posed due to the presence of blue-green algae, all relevant users of the water should be notified. For untreated domestic water uses (such as showering and bathing, cooking or other kitchen purposes and domestic garden watering), the use of the drinking water trigger levels for blue-green algae are recommended. While this is likely to be conservative, it can be used in the absence of a more detailed risk assessment for the specific scenario in question. Less conservative approaches can be adopted if a detailed risk assessment is completed.	C	A C	A C	A C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
23. Maximising the effectiveness of the grid and markets across the state					x	The regulated surface water market operating in northern Victoria is the longest established market in the state. The northern Victoria water market is valued at more than $4 billion and is highly complex, with interstate considerations. The water grid and markets in northern Victoria are part of the Murray–Darling Basin and the southern-connected Murray system. Water trade occurs across the southern-connected market including with New South Wales and Victoria. For six of the past eight years, Victoria has been a net importer of water. The Murray–Darling Basin Plan trading rules, which came into effect in July 2014, apply to water markets in northern Victoria. In this context, the government facilitates and resolves water resource planning and investment decisions between broader Murray–Darling Basin considerations and regional water corporations and their local communities. The agricultural landscape in northern Victoria has changed markedly in recent years. Individuals and businesses have responded to commodity prices, export arrangements, consumer demand and other economic factors coupled with more scarce water resources. From 2010-15, about 600 GL of high-reliability water shares in northern Victoria were traded from irrigation holdings to environmental holdings as part of the Murray–Darling Basin Plan. Over the same period, the volume of water allocation traded doubled, from about 400 GL to more than 800 GL per year. Within the interstate water market in northern Victoria, as water movement increases, pressure on different parts of the grid can change. Trading rules may need to be refined over time to reflect this. The government will continue to examine broader system operational issues, including changes resulting from environmental water holdings and delivery, and changing patterns of land and water use in the agricultural sector. This is otherwise referred to as inter-valley transfer risks in Victoria's North and Murray Comprehensive Report. This strategy complements meeting requirements under Part 8 of Chapter 10 of the Basin Plan which requires the setting of circumstances to allow for groundwater trade to comply with the requirements under Chapter 12 of the Basin Plan. The circumstances in which groundwater trade could occur in the Goulburn-Murray groundwater resource plan area is outlined further in Part 7 of the Comprehensive Report.	**Action 9.6—Improve trading rules in northern Victoria** The Department of Environment, Land, Water and Planning will: • ensure trading rules in northern Victoria are appropriate given physical and operational constraints • work with the Murray–Darling Basin Authority to: - provide appropriate and timely information for northern Victorian water users about the risk of congestion in the southern-connected Murray system - improve transparency in applying water trading rules in the southern connected system • specific actions will be guided by the relevant recommendations from the review completed as part of *Water for Victoria* (DELWP, 2016) action 9.3 **Action 9.7—Develop trading rules in other water systems** In most groundwater systems, each water market has relatively few buyers and sellers, low demand and the economic value of water is low. In the Campaspe and Loddon systems in northern Victoria and in parts of the south-west, management plans support trade between groundwater trading zones. Demand in these areas is driven by a significant reduction in regulated surface water availability and recognition of the greater reliability of groundwater. This demand has led to vibrant groundwater markets. However, in most other groundwater systems there are limited markets due to factors including conditions on the use of the resource and relatively few buyers and sellers. The government, in close consultation with water corporations and key stakeholders, will examine the factors limiting groundwater market development. This will not impact on existing entitlement holders, the environment and groundwater resources. This review will investigate the merits of converting take and use licences to water shares and opportunities to streamline groundwater management plans. In some groundwater systems, the total licensed volume is still less than the cap (generally also known as permissible consumptive volumes). In these systems, water users can apply to the relevant rural water corporation for new entitlements. Again, long-term water resource assessments can improve understanding of the potential impact of climate change on water resources in these systems. The Department of Environment, Land, Water and Planning will: • continue to refine trading rules and explore opportunities to further develop markets in western Victoria • review statewide unregulated surface water trading rules to improve trading opportunities • develop policy to facilitate trade in groundwater systems and investigate the potential for trade where groundwater and surface water are connected	A C	A C		A C	SF
24. Monitoring and reporting on the benefits of environmental watering	x	x			x	The primary objective of environmental water entitlements is to protect the environment. The way Victoria manages environmental water provides shared or complementary benefits for other water users. Environmental watering may support Aboriginal values with water that can be used for cultural purposes, and may increase opportunities for recreational activities including fishing and boating. In regulated water systems, storage managers can provide shared benefits by releasing water in ways to optimise other uses. Victoria will continue to look for opportunities to provide shared benefits through environmental watering. Better monitoring and reporting will provide communities with information about outcomes they value.	**Action 3.6—Better monitor and report on the benefits of environmental watering** The government will increase monitoring and reporting back to communities on progress towards expected environmental outcomes from environmental watering, with a focus on digital reporting from 2017. The Victorian Environmental Water Holder will report annually on where environmental watering has achieved shared benefits. The Commissioner for Environmental Sustainability will: • report on the outcomes of environmental watering in Victoria, as part of the five-yearly State of the Environment Report (a requirement under section 8 of the *Commissioner for Environmental Sustainability Act 2003*) • recommend ways to improve future public reporting, consistent with the objectives of the Commissioner set out in section 7 of the *Commissioner for Environmental Sustainability Act 2003*	A C	C	A C	A C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
25. Planning for supply challenges by urban water corporations	X	X				Urban water corporations have a vital role in urban water security to manage the supply of water to meet the needs of their customers. Urban water corporations must develop an urban water strategy based on an outlook of 50 years that looks at a range of climate change scenarios and future demands. The urban water strategies, which include drought preparedness planning, recognise that they must actively prepare for drought, not just respond to it. In developing these plans, water corporations will work with their communities to find the best way of securing supply for each system during drought. By being involved, the community will better understand the likely water security risks over coming years. Urban water corporations will continue to track the status of water supplies and demands as well as their projections for the year ahead. This information is released each year on 1 December in an annual water outlook. The Department of Environment, Land, Water and Planning will prepare a statewide outlook drawing on water corporation outlooks. The newly developed water grid oversight role will inform the urban water strategies and statewide outlook. These will provide valuable information on supply and demand, and guide integrated water management.	**Action 5.2—Better urban water planning to address key challenges** Urban water corporations will develop urban water strategies that include: • climate and population projections that are comparable across water corporations • drought preparedness planning • drinking and non-drinking water sources and the appropriate use of each source to protect human health		A C			
26. Planning the take of Victoria's Share Guidance—consideration of climate change and climate variability in setting groundwater resource limits	x					This document provides guidance for use by Victoria's rural water corporations and the Department of Environment, Land, Water and Planning. It provides tools to assist with risk assessments that inform groundwater resource share decision- making and supports groundwater management planning. The guidance supports the Minister responsible for administering the Victorian Water Act and delegates when managing groundwater resources. Section 22 of the Act provides that the Minister must undertake: • a continuous program of assessment of the state's water resources • a program of long-term water resources assessments in accordance with the Act • a program of sustainable water strategies for the state in accordance with the Act Subject to and in accordance with the Act, the Minister may also allocate the available water resources. Improving management of Victoria's groundwater resources is consistent with the principles of the National Water Initiative and the Victorian Waterway Management Strategy (DEPI, 2013). The guidance recognises that under global climate models, worst-case dry scenario catchments in the Victorian Murray Basin are predicted to vary from 10 to 30 percent additional recharge, to 35 to 45 percent less recharge, with a median of 10 to 15 percent less recharge (Crosbie et. al., 2011). Overall analysis suggests a reduction in recharge is most likely, although the degree of change is variable, as is the nature of the change. For example, the intensity of events and seasonality of rainfall may vary.	**Action: Planning the take of Victoria's Share Guidance—consideration of climate change and climate variability in setting groundwater resource limits** In considering climate change, a key planning tool is the recognition that the climate will change, and that planning has to adapt to change in a timely manner. It is difficult to make decisions today for resource use conditions in 25 or 50 years' time, however it is reasonable to expect change. Water resource planning can respond to the impacts of climate change through changing the total available resource, as expressed by a permissible consumptive volume, for example, or through changing assumptions about the reliability of the resource. This emphasises the importance of understanding the reliability of the resource in planning. Victoria's Share Guidance contains the following considerations to assist resource planners: • Water-sharing arrangements should acknowledge that climate change is likely to occur. An evaluation of the best available assessment of the impacts of climate change should be included, with a description of the likely impacts on groundwater resources • Ensure water-sharing instruments have a clear process for how climate variability will be considered in the context of the available resource (entitlement) and/or reliability of the resource. A factor in determining the frequency of review should be information about how rapidly climate change may impact, to ensure that review is undertaken with sufficient time to amend the water-sharing instrument • Resource planning will explicitly consider climate variability, which is the already observed wet and dry cycles. This will inform understanding of how resource share decisions may vary under wet and dry conditions	A C	A	A	A	SF

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27. Preparing for and responding to extreme events, such as bushfire, failure to meet critical human water needs, blue-green algal blooms, flooding, major asset failure		x				In Victoria, a multi-agency framework is responsible for emergency management. This enables the exercise of roles and responsibilities, and the capacity to adapt to new or changed circumstances, within a systematic framework. Some elements of the structure are legislated and others have been established by agreement. Victoria's emergency management arrangements are set out in the *Emergency Management Act 1986,* supported by the Emergency Management Manual Victoria. Together these documents establish the 'all-hazards, all-agencies' approach underpinning Victoria's emergency management arrangements. Bushfires, floods, storms and other hazards can have significant impacts on communities, the economy, environment and essential services, including water and wastewater services. The Emergency Management Manual Victoria nominates the Department of Environment, Land, Water and Planning as the control agency for a range of emergencies including disruption to water and wastewater services and dam safety. In order to meet its obligations under the Emergency Management Manual Victoria, the Department of Environment, Land, Water and Planning has developed emergency management documents to help mitigate the impact of these events. Department of Environment, Land, Water and Planning works with support agencies and relevant organisations in managing such incidents. In particular, the Department of Environment, Land, Water and Planning works in close partnership with water corporations to maintain public safety and the continuity of essential water and wastewater services. The Water Security and Continuity Network provides an 'all-hazards' planning forum for water corporations and the Department of Environment, Land, Water and Planning to share ideas, identify emerging issues and agree on improved practices. How water is managed during extreme drought and extreme water quality events is outlined in more detail in Part 10 of the Comprehensive Report in response to Part 13 of Chapter 10 of the Basin Plan.	**Action: Preparing for and responding to extreme events** Recovery and rehabilitation of essential water supply after extreme events is undertaken by number of agencies. DELWP is the control agency for: • fire in state forest, national parks and protected public land • water and wastewater service disruption. DELWP is a support agency for: • fire on private land • electricity disruption (issues affecting water supply to generators) • blue-green algal blooms • drinking water contamination • floodplain management/flood DELWP is responsible for relief coordination of: • drinking water for households DELWP is responsible for recovery functional area coordination of: • water and wastewater • natural environment, public land and waterways DELWP event/asset-specific responsibilities Blue-green algal bloom: • provides advice to government and emergency management agencies regarding the impacts of algal blooms on drinking water supplies and recreational waterbodies Dam safety, water and wastewater services: • prevention/mitigation/risk reduction activities • formulation of policy and regulation for dam safety, water and wastewater services • administration of dam safety provision in the Victorian Water Act and water corporation obligations in the Statements of Obligations • manages escalated response activities to minimise the impact on the community and the environment from dam safety, water and wastewater service-related incidents Fire: • prevention/mitigation/risk reduction activities • formulation of policy and regulation for bushfire management in state forest, national parks and protected public lands • planning and delivery of programs to reduce the risk of bushfire. • control agency for bushfires in state forest, national parks, and protected public lands in accordance with the State Bushfire Plan and the State Emergency Response Plan • support agency for other fires on private land. Floodplain management/flood: • prevention/mitigation/risk reduction activities • formulation of policy and regulation for floodplain management • planning and delivery of management programs to reduce the risk of major flood • provides real-time access to streamflow data collection for flood warnings • provides flood mapping information and flood advice • provides a coordinated response to manage any residual water after major flooding.	A C	A C	A C	A C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
28. Protecting waterways and their catchments by strengthening integrated catchment management across Victoria	x	x	x			The health of waterways across Victoria has been affected by inappropriate, historical land use. Climate change and drought, along with extreme events, such as floods, bushfires and heatwaves, are also likely to impact waterway health. The trend of decreasing cool season rainfall is likely to continue and in some catchments Victoria may see average annual streamflow reductions of about 50 percent by 2065. Integrated catchment management is a holistic way of managing land, water and biodiversity from the top to the bottom of a catchment. Improving integrated catchment management will provide significant benefits for waterways. Released in 2017, *Our Catchments, Our Communities* (DELWP, 2016) is the first statewide strategy for integrated catchment management in Victoria. The strategy will achieve more effective community engagement, better connections between levels of planning, and strengthened regional catchment strategies. The strategy will also clarify roles, strengthen accountabilities and coordination, and improve monitoring, evaluation and reporting. Catchment management authorities will lead 10 integrated catchment management projects across the state from 2016 to 2019, in collaboration with catchment management partners. Projects are under development in each region. Protecting and improving the health of waterways and their catchments is a critical task for the decades to come. Investing in protection is more cost-effective than paying to restore health. Over the next four years, the Victorian Government will invest $200 million to improve waterway health and $22 million to strengthen catchment management. As Victoria prepares for a warmer and drier future, Victoria needs to find the best investment opportunities to improve waterway health. We can do this by increasing our capability to do predictive modelling and scenario planning and ensuring we have the best information ready to make future decisions. Making the best use of water recovered for the environment will become even more important. Victoria is already making a major investment in riparian restoration to connect and increase resilience of waterways. This strategy complements the obligations under the Victoria's North and Murray Water Resource Plan in response to requirements under Part 6 of Chapter 10 of the Basin Plan relating to environmental watering and meeting environmental watering requirements.	Under the Victorian Water Act, Victoria has a water entitlement framework that limits how much water Victoria can take for human use. It also requires licences for works on waterways. Where applicable, planning controls are used to define the way land may be used or developed. Within a planning scheme, overlays can be used to show land that has particular values, such as significant environmental features. The *Environment Protection Act 1970* protects water quality for surface and groundwater. Regional waterway strategies and regional catchment strategies identify environmental, social, cultural and economic values in partnership with communities to achieve common objectives. Regional catchment strategies guide strategic land use planning to protect and improve catchment values. In urban and regional areas, Victoria needs to better align planning to achieve common objectives. There are opportunities to use planning tools, such as Environmental Significance Overlays, to protect areas with riparian vegetation and other native plants and animals that support land and water habitat and quality. **Action 3.3—Invest in integrated catchment management** The government will invest $22 million over four years to strengthen integrated catchment management across Victoria and implement the actions in *Our Catchments, Our Communities* by 2019. Catchment management authorities will lead 10 new integrated catchment management projects across the state from 2016 to 2019. The first projects to be developed are: • Mallee-Lake Tyrrell to Birchip in the Southern Mallee waterways • Wimmera—enhancing the health, environment and liveability of the Wimmera catchment • Goulburn Broken—resilient landscapes, vibrant communities • North Central—leveraging integrated catchment management	A C	A C	A C	A C	X
29. Protecting water quality-implementing the State Environment Protection Policy (Waters)	x	x	x	x	x	Water quality supports a range of different uses, such as water for drinking, water for recreation and water suitable for native plants and animals. The Environment Protection Act requires policies to set out specific values or beneficial uses, and related water quality objectives and indicators for protecting those values across Victoria's diverse environments. *Salinity* In terms of condition, salinity was found to be a common threat across the water resource plan areas. Salinity was found to be an issue associated with both extreme wet periods (rising salinity) and extreme dry periods (saline pools in river systems). *Suspended sediment and nutrients* Suspended sediments and nutrients were identified as a common threat to the water resources of the water resource plan areas (surface water). The threat arises from multiple causes including climate change, extreme wet periods, extreme drought, and land use change. *Toxicants* Increasing toxicant levels has been identified as a potential risk to the groundwater resources. The risks could arise from earth resource development, point-source discharges, and changes to land use. Under Basin Plan requirements, a water quality management plan must be prepared in accordance with Part 7 of Chapter 10 of the Basin Plan. The water quality management plan at Appendix A of the Comprehensive Report discusses the implementation of the State Environment Protection Policy to management water quality issues.	**Action 3.2—Protect water quality through the State Environment Protection Policy** The new State Environment Protection Policy (Waters) provide a modern risk-based approach to protect water quality. The government will protect beneficial uses of water across Victoria through the policy that is consistent with the government's response to the independent inquiry into EPA Victoria by: • confirming the beneficial uses of Victorian groundwater and surface water, and where these uses apply • setting water quality indicators and objectives to protect beneficial uses • establishing a modern, risk-based framework to manage unlicensed point and diffuse pollution sources in rural and urban areas • developing regional target settings and plans to improve water quality • ensuring water quality offsets can be used within catchments to maintain regulatory compliance within waterways The Department of Environment, Land, Water and Planning and EPA Victoria will work with water corporations to look into using water quality offsets more broadly to achieve better environmental outcomes for the least community cost by 2018.	C	C	C	C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
30. Provide long-term investment to improve waterway health	x	x	x		X	The Victorian Waterway Management Strategy (DEPI, 2013) provides the framework for the government, in partnership with the community, to maintain or improve the condition of rivers, estuaries and wetlands. The framework is based on regional planning processes and decision making, within the broader system of integrated catchment management in Victoria. The vision for Victoria's waterways is: Victoria's rivers, estuaries and wetlands are healthy and well-managed; supporting environmental, social, cultural and economic values that are able to be enjoyed by all communities. The strategy addresses the obligations for waterway management described in the Victorian Water Act and *Catchment and Land Protection Act 1994* as well as other relevant legislation and international agreements. Regional water strategies, required under the Victorian Water Act, provide a single planning document for river, estuary and wetland management for each catchment management authority region. They drive the implementation of the statewide management approach developed in the Victorian Waterway Management Strategy (DEPI, 2013), and are consistent with the objectives for waterways described in the regional catchment strategies. The regional water strategies identify high-value waterways and priority management activities over an eight-year period. They are based on a transparent, regional priority-setting process and have been developed in close consultation with key partners, including regional agencies and boards, Traditional Owners and the regional community. This process ensures that investment in on-ground works and environmental water management is targeted at priority waterways to achieve the greatest community gain. The strategies build on the success of the previous regional river health strategies by expanding their scope to include wetlands and estuaries (where applicable). They also comprehensively integrate priorities for environmental water management with other waterway management activities. The regional water strategies include a regional work program of management activities for priority waterways. They guide investment into multi-year projects and annual work programs.	**Action 3.4—Provide long-term investment to improve waterway health** The government is investing $90 million over four years to implement regional waterway strategies and improve waterway health by focusing on large-scale projects for 36 waterways. The government is investing $30 million over four years to implement the Regional Riparian Action Plan and speed up riparian works across regional Victoria. The management approach for waterways is implemented through the Victorian Waterway Management Program. The Department of Environment, Land, Water and Planning is responsible for overseeing the program and for establishing the state policy framework for waterway management. The program's regional implementation is led by the waterway managers (the catchment management authorities). This program is an eight-year adaptive management cycle. The approach for managing waterways involves: • recognising the importance of waterways with formal international, national and state significance • implementing and maintaining on-ground works and managing environmental water in priority waterways • fostering strong community partnerships • using regulation (legislation and statutory processes) Aspirational targets are included for long-term resource condition outcomes (eight-plus years) and management outcomes (one to eight years). Targets for outputs are developed as part of the regional water strategies. The long-term resource condition outcome targets are to maintain or improve the condition of: • priority river reaches • high-value wetlands • high-value estuaries Policy directions and specific actions for more effective and efficient management of waterways are provided in the Victorian Waterway Management Strategy (DEPI, 2013) for: • recreational use of waterways • environmental water management • riparian management • water quality • river channels • wetlands • estuaries • waterways in urban areas • extreme events of flood and bushfire • invasive species management in waterways	A C	C	A C	A C	SF

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	CC	EE	LUI	NC	WA			E	C	S	A	
31. Recognising and managing for Aboriginal values and uses	x	x	x	x	x	Victorian Traditional Owners have cultural, spiritual and economic connections to land, water and resources through their associations and relationship with Country. They have managed land and water sustainably over thousands of generations. Connectedness to land, waters and resources on Country is important for Aboriginal health and wellbeing. In *Water for Victoria* (DELWP, 2016), for the first time there is a clear roadmap to deliver water for Aboriginal cultural, spiritual and economic values. The environmental and consumptive uses of water are relatively well understood as water resource planning concepts. However, Aboriginal uses of water are not as well understood. This is reflected in the results of the risk assessment which identified a wide array of risks to Aboriginal uses of water, significantly more so than on any other use or user. This conservative assessment reflected the current low level of knowledge of Aboriginal water use requirements by water planners and the 'poor level of confidence' identified for the risks associated with Aboriginal water use. In addition, the assessment reflects the fact that there are currently no Aboriginal water allocations in Victoria. Cultural benefits may be achieved as a secondary outcome from the management of water systems and water entitlements. Water access has been provided primarily through the Native Title process; however, only rights to use water for domestic and personal purposes have been recognised. To date Victoria's Traditional Owners have had limited involvement in decision making in Victoria's water planning and management framework. There are many reasons why these processes have not been accessible to Aboriginal people, including historical factors and cycles of intergenerational trauma, and past and present experiences of Aboriginal people with mainstream services. As a result, Aboriginal water values and uses have not always been protected, and traditional ecological knowledge has not benefited Victoria's water management and planning. Victoria's water management framework, including existing instruments and processes, may be used to address both aspects of Aboriginal water. An evidence- based approach is necessary to identify the appropriate implementation options. It is expected these will be different in different locations. Part 14 of Chapter 10 of the Basin Plan also requires consultation to occur with Traditional Owners to support development of Victoria's water resource plans. Consultation undertaken for the purposes of water resource plan development is intended to further the work under the *Water for Victoria* (DELWP, 2016) Aboriginal Water Policy. Ongoing policy development around Aboriginal water and involvement in water resource management in Victoria will continue to be informed by Basin Plan requirements.	*Water for Victoria* (DELWP, 2016) commits the Victorian Government to: • recognise the values that water has for Traditional Owners and Aboriginal Victorians. The water sector will support Aboriginal participation in Victorian water planning and management frameworks through consultative structures that address the rights and interests of Victoria's Traditional Owners. The government is investing $9.7 million to support Aboriginal participation in water management and improve outcomes for Traditional Owners. **Action 6.1—Recognise Aboriginal values and objectives of water** The government is investing $4.7 million over four years to establish the Aboriginal Water Program, a statewide approach to incorporate Aboriginal values and expertise into water management. The Department of Environment, Land, Water and Planning and the Aboriginal Water Reference Group will co-design the Aboriginal Water Program. This will include investment in local projects across the state to identify local Aboriginal water values, uses and objectives. **Action 6.2—Include Aboriginal values and traditional ecological knowledge in water planning** The water sector will partner with Traditional Owners to include Aboriginal values and knowledge in water resource planning. To do this, the sector will: • make sure that the legislated objectives of the Victorian Environmental Water Holder consider identified Aboriginal water-related environmental outcomes • incorporate traditional ecological knowledge into water planning and management using Aboriginal Waterway Assessments and other tools developed by Traditional Owners • notify and engage with Traditional Owners to achieve shared benefits • establish Aboriginal water officers in regional Victoria **Action 6.3—Support Aboriginal access to water for economic development** The government will invest $5 million and work in partnership with Traditional Owners and Aboriginal Victorians to develop a roadmap for access to water for economic development. Water corporations will notify Traditional Owners when opportunities to access water entitlement arise. Sustainable water strategies will consider opportunities for access to water for economic development for Traditional Owners. The government will continue to partner with Traditional Owners and Aboriginal Victorians to identify seed funding and seek business finance opportunities for Aboriginal enterprises to invest in water. **Action 6.4—Build capacity to increase Aboriginal participation in water management** The Department of Environment, Land, Water and Planning and the Aboriginal Water Reference Group will co-design a capacity-building program to increase Aboriginal participation and inclusive practices in water management, as part of the Aboriginal Water Program. The water sector and Traditional Owners will look for opportunities to trial different ways of providing access to water and shared benefits.	A C		A	A C	SF
32. Strengthening and modernising compliance arrangements				x	x	Victoria's water resource compliance and enforcement framework is designed to protect the environment and existing entitlement holders from illegal take and use of water. Compliance with conditions of water entitlements is vital to maintain entitlement reliability and market integrity and to give stakeholders and the community confidence in how water is being managed. Victoria's water corporations are responsible for managing compliance of individuals and approaches to compliance vary across the state. The compliance and enforcement regime in the Victorian Water Act is outdated. The government will modernise the enforcement regime to align with best practice regulation. Additionally, this strategy will consider the risks associated with inter-valley transfer as modelling is completed by the MDBA to determine the nature and extent of the risk. Consideration will be give as to how the compliance arrangements can support measures to address inter-valley transfer risks.	**Action 8.5—Ensure a modern compliance regime that works** Water corporations will adopt a consistent risk-based approach to manage compliance and enforcement with improved oversight and reporting. The government will modernise the compliance and enforcement regime for water corporations to reflect best practice regulation. The government will implement the Murray–Darling Basin Compliance Compact as agreed.	A C	A C	A C	A C	SF

Title	Macro risk cause applicable					Description	*Water for Victoria* action/s or alternative	Use applies to (A) and/or (C)				SF
	CC	EE	LUI	NC	WA			E	C	S	A	
33. Strengthening the water entitlement framework				x	x	Victoria's water resource and system management arrangements, as set out in the Victorian Water Act, have developed over time in response to specific needs and increased complexity in the roles of water corporations. No single instrument in a given area draws together all relevant rules and obligations. Arrangements are spread across multiple regulatory instruments, such as bulk entitlements, trading rules and storage and resource management appointments. There are now inconsistencies and duplication in the obligations, roles and responsibilities of water corporations. This limits the transparency of water resource management and makes it difficult for water managers, water users and the community to understand the arrangements, and rights and obligations. This makes it difficult to get the community involved in improving water resource management. Additionally, this strategy will consider the risks associated with inter-valley transfer as modelling is completed by the MDBA to determine the nature and extent of the risk. Consideration will be give as to how the entitlement framework can support measures to address inter-valley transfer risks.	**Action 8.1—Ensure a strong and responsive water entitlement system** The Department of Environment, Land, Water and Planning will work with water corporations and the Victorian Environmental Water Holder to review and streamline regulatory instruments to improve transparency, and clarify roles and responsibilities to reduce red tape and improve water literacy. The first phase of this work is to: • clarify roles and responsibilities set out in bulk entitlements and associated instruments for the management of water systems, and ensure consistency, transparency and accountability to water users and the community • rationalise and simplify existing regulatory instruments • investigate opportunities to increase community involvement in system management arrangements and achieve shared benefits for Traditional Owners and recreational users	A C	A C	A C	A C	SF
34. Traditional Owner engagement in groundwater planning						Where the take and use of groundwater may significantly impact on rivers or surrounding vegetation, engagement with Traditional Owners is needed so that Aboriginal cultural values can be identified. Part 14 of Chapter 10 of the Basin Plan also requires consultation to occur with Traditional Owners to support development of Victoria's water resource plans. Consultation undertaken for the purposes of water resource plan development is intended to further the work under the *Water for Victoria* (DELWP, 2016) Aboriginal Water Policy. Ongoing policy development around Aboriginal water and involvement in water resource management in Victoria will continue to be informed by Basin Plan requirements.	**Action: Traditional Owner engagement in groundwater planning** Victoria's groundwater-sharing guidance document outlines the principles for identifying Aboriginal values and considering these when planning resource arrangements for groundwater (see below). Victoria will continue to engage with Traditional Owners in groundwater planning. Principles for engagement with Traditional Owners: • consider the rights and interests of Traditional Owners regarding the management of waterways, including the right to speak for Country and how it is managed • identify the correct representatives to speak for a particular Country before undertaking engagement processes or activities. Advice may be sought from organisations such as the Victorian Aboriginal Heritage Council or Native Title Services Victoria. Where Traditional Owner corporations exist, these bodies should be approached rather than individual Traditional Owners • recognise that Traditional Owners have a long history of managing landscapes, and can have valuable traditional knowledge to contribute to waterway and groundwater management. Consider that there may be existing protocols about using this knowledge that must be adhered to • seek the approval and consent of Country representatives before gathering or using traditional knowledge • take into account Traditional Owner objectives for waterways where whole-of-Country and/or joint/cooperative management plans exist and include specific objectives for waterways.	A C		A C		SF
35. Water resource information supports planning and decisions	x	x	x	x	x	Water resource information includes basic water quality and quantity data from Victoria's key surface and groundwater collection networks. This ongoing monitoring from Victoria's key gauging stations and groundwater observation bores improves understanding of long-term trends in the state's water resources. It is vital for long-term and short-term planning and licensing decisions, compliance and enforcement. Water resource modelling and analysis provides water managers with crucial insights for making operational and policy decisions. Modelling and analysis are fundamental tools to ensure water resource decisions are made in an objective and informed way. These tools provide water managers and water users with insights that are essential for understanding the resource, including longer-term water availability outlooks and climate change projections. One of the key principles of the water entitlement framework is that individual entitlement holders are responsible for managing the risks of water scarcity within their own contexts and systems. Victoria's water markets allow farmers, the Victorian Environmental Water Holder and water corporations to buy and sell water entitlements and seasonal allocations, so they can manage their own risk according to their willingness to pay. The water markets allow us to share water security benefits in ways that are equitable, responsive and transparent.	**Action 8.11—Improve water resource information to support planning and decisions** The Department of Environment, Land, Water and Planning will work with water corporations and catchment management authorities to: • continue to invest in ongoing statewide surface water and groundwater monitoring networks • improve the quality and accuracy of monitoring data through investment in infrastructure upgrades and new technologies to receive more timely data • strengthen water resource assessments and modelling by including up-to-date information on catchment characteristics to better understand water availability, use and climate change This action underpins many others that require water resource information, particularly those related to climate change, water entitlements and planning, and realising the potential of the grid and markets.	A C	A C	A C	A C	SF

5. Conclusion

The risk assessment conducted by Victoria meets Basin Plan requirements as defined in Chapter 10 Part 9 of the Basin Plan – Approaches to addressing risks to water resources.

This includes sections

- 10.41 – Risk identification and assessment methodology
- 10.42 – Description of risks
- 10.43 – Strategies for addressing risks

As per section 10.41 (1) Victoria's water resource plans will be prepared having regard to the current and future risks to the condition and continued availably of the water resources to the water resource plan area.

6. References

Alluvium 2016. water resource plan preliminary risk assessment: Risk register, Microsoft Excel spreadsheet, prepared for DELWP

CSIRO and SKM. (2010). *The groundwater SDL mehodology for the Murray-Darling Basin Plan.* Canberra: Murray-Darling Basin Authority.

DELWP. (2016). *Our Catchments Our Communities.* Melbounre: Department of Environment, Land, Water and Planning.

DELWP. (2016). *Water for Victoria.* Melbourne: The Department of Environment, Land, Water and Planning. Retrieved October 23, 2018, from https://www.water.vic.gov.au/__data/assets/word_doc/0033/58848/Water-Plan-strategy-accessible.docx

DELWP. (2018, Dec 17). *Water Compliance Report 2017-18*. Retrieved 12 17, 2018, from DELWP: Water and Catchments: https://www.water.vic.gov.au/water-for-agriculture/taking-and-using-water/compliance-report-2017-18

DEPI. (2013). *The Victorian waterway Management Strategy.* The Department of Environment and Primary Industries. DEPI. Retrieved from https://www.water.vic.gov.au/waterways-and-catchments/rivers-estuaries-and-waterways/strategies-and-planning

DSE. (2011). *Northern Region Sustainable Water Strategy.* Melbourne: Department of Sustainability and Environment.

DSE. (2011). *Western Region Sustainable Water Strategy.* Melbourne: Victorian Government Department of Sustainability and Environment.

MDBA. (2014). *Basin-wide environmental watering strategy.* Canberra: Murray-Darling Basin Authority.

Moran, R., & Sharpels, J. (2011). *Guidelines for the development of a water supply-demand strategy: Technical Supplement for Section 3.5 - Forecasting Supply.* Department of Sustainability and Environment. Melbourne: DELWP.

SKM. (2009). *Combined impact of the 2003 and 2006/07 bushfires on stream flow.* Melbourne: Department for Sustainability and Environment.

Schedule 1 - Data used (10.41(7))

A.1 Guidance documents

Commonwealth Water Act 2007

DELWP 2015. Context paper for the development of water resource plan Risk Assessments. DELWP water resource plan Working Group 2015.

MDBA 2012. Basin Plan. Commonwealth of Australia, 22 November 2012.

MDBA 2013. Handbook for Practitioners - Water resource plan requirements. Commonwealth of Australia (Murray–Darling Basin Authority) October 2013.

Peters, G., Doeg, T. & Heron, S. 2009. Aquatic Value Identification and Risk Assessment (AVIRA) Risk Assessment Process, Report for the Victorian Government Department of Sustainability and Environment by Riverness, April 2009.

Standards Australia 2009. AS/NZS ISO 31000:2009 Risk management – Principles and guidelines

A.2 Relevant policies and strategies

A.2.1 Statewide strategies

Victorian Waterway Management Strategy (DEPI 2013)

Environmental Guidelines: Management of Water in Mines and Quarries (DEDJTR 2015)

Guidelines for the development of a water supply-demand strategy (Moran and Sharples 2011)

Victorian regulatory framework relating to farm dams, groundwater and afforestation (DSE 2008)

Manual for Victoria' Salinity Accountability in the Murray-Darling Basin (DSE 2011)

Victorian Long Term Watering Plan - Northern Victoria; Victorian Murray and Wimmera-Mallee (DELWP 2015)

Resource Share Guidance, Planning the Take of Victoria's groundwater resources (DELWP 2015)

A.2.2 Regional strategies

Gippsland Sustainable Water Strategy (DSE 2011) and supporting technical reports:

- Bushfire impacts on water quality and quantity (DEPI 2011).

Northern Region Sustainable Water Strategy (DSE 2009), and background reports:

- Impact of future water availability scenarios on reliability of supply in regulated systems (SKM 2008)
- Farm dam interception in the Campaspe Basin under climate change (SKM 2008).
- Reliability of Supply in unregulated catchments under climate change (SKM 2008)
- Protecting water users and the environment from uncontrolled growth in domestic and stock water use (SKM 2009)
- Indigenous Engagement Project (Goulding Heritage Consulting 2009).

Western Region Sustainable Water Strategy (DSE 2011) and supporting technical reports:

- Managing adverse water resource impacts of land use changes (DSE 2011)

A.2.3 Catchment strategies

Wimmera Regional Catchment Strategy 2013-2019

Wimmera Water Quality Strategy (WCMA 2002)

Wimmera Waterway Strategy 2014-2022

Mallee Waterway Strategy 2014-2022

Mallee Regional Catchment Strategy 2013-2019;

North Central Waterway Strategy 2014-2022

Goulburn Broken Regional Catchment Strategy 2013-2019

Goulburn Broken Waterway Strategy 2014-2022

Goulburn Broken Water Quality Strategy 1996-2016

North East Waterway Strategy 2014-2022

North East Regional Catchment Strategy 2013-2019

A.2.4 Water supply strategies

Water Supply Demand Strategy. Grampians Wimmera-Mallee Water (2012)

Victorian Mallee Irrigation Region Land and Water Management Plan (MCMA 2011)

Loddon Campaspe Irrigation Region Land & Water Management Plan (NCCMA 2007)

Mid Goulburn Broken and Upper Goulburn Sustainable Irrigation Action Plan (GBCMA 2008)

A.2.5 Groundwater supply strategies

Katunga Water Supply Protection Area Groundwater Management Plan (GMW 2006)

Mid-Loddon Groundwater Management Area. Local Management Rules (GMW 2009)

Upper Ovens River Water Supply Protection Area Water Management Plan (GMW 2011)

Lower Campaspe Valley Water Supply Protection Area Groundwater Management Plan (GMW 2012)

Loddon Highlands Water Supply Protection Area Groundwater Management Plan (GMW 2012)

Lower Ovens Groundwater Management Area. Local Management Plan (GMW 2012)

Upper Goulburn Groundwater Management Area. Local Management Plan (GMW 2013)

Strathbogie Groundwater Management Area. Local Management Plan (GMW 2013)

Central Victorian Mineral Springs GMA. Local Management Plan (GMW 2013)

Mid-Goulburn Groundwater Management Area Local Management Plan (GMW 2014)

Kiewa Groundwater Management Area Local Management Plan (GMW 2014)

Shepparton Irrigation Region Groundwater Management Area. Local Management Plan (GMW 2015)

West Wimmera Groundwater Management Strategy (GWMWater 2011)

Murrayville Area Groundwater Management Plan (MGWPACC 2001)

A.2.6 Cause related

A.2.6.1 Bushfire

DEPI Undated. Technical Report 3: Bushfire impacts on water quality and quantity, Gippsland Sustainable Water Strategy.

MDBC 2007. Risks to shared water resources, Impact of the 2003 alpine bushfires on stream flow - Summary report. Prepared by SKM and the University of Melbourne for the Victorian Department of Sustainability and Environment, and the Murray-Darling Basin Commission.

SKM 2009. Combined impact of the 2003 and 2006/07 bushfires on stream flow. Report for the Department of Sustainability and the Environment. (SKM, 2009)July 2009

van Dijk, A., Evans, R., Hairsine, P., Khan, S., Nathan, R., Paydar, Z., Viney, N. and Zhang, L. 2006. Risks to the shared water resources of the Murray-Darling Basin. Report for the Murray-Darling Basin Commission by the CSIRO.

A.2.6.2 Climate change

CSIRO 2012, Climate and water availability in south-eastern Australia: A synthesis of findings from Phase 2 of the South Eastern Australian Climate Initiative (SEACI), CSIRO, Australia, September 2012,

DSE 2008. Impact of future water availability scenarios on reliability of supply in regulated systems, Background Report 2, Northern Region Sustainable Water Strategy, October 2008.

DSE 2008. Impact of future water availability scenarios on rivers and wetlands in regulated systems, background report 3a, Northern Region Sustainable Water Strategy, October 2008.

Moran, R. and Sharples, J. 2011. Guidelines for the development of a water supply-demand strategy: Technical Supplement for Section 3.5- Forecasting Supply. Victorian Government Department of Sustainability and Environment, Melbourne, August 2011. (Moran & Sharpels, 2011)

Murphy, B., Timbal, B., Hednon, H. and Ekström, M. 2014. Victorian Climate Initiative: Annual Report 2013–14. CAWCR Research Report 076. Centre for Australian Weather and Climate Research. November 2014.

SKM 2008. Background Report: Farm dam interception in the Campaspe Basin under climate change, A working paper for the Draft Northern Region Sustainable Water Strategy. For the Victorian Government Department of Sustainability and Environment, by SKM, September 2008.

SKM 2008, Background Report: Reliability of Supply in Unregulated Catchments under Climate Change. A working paper for the development of the draft Northern Region Sustainable Water Strategy. October 2008.

A.2.6.3 Land use change

Chiew, F., Vaze, J., Viney, N. Jordan, P., Perraud, J.M., Jin Teng, L.Z., Arancibia, J.P., Morden, R., Freebairn, A., Austin, J., Hill, P., Wiesemfeld, C. and Murphy, R. 2008. Rainfall-runoff modelling across the Murray-Darling Basin. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project.

DEPI 2013. Managing water impacts of new forest plantations, Water Bill Exposure Draft Information Sheet. Victorian Government Department of Environment and Primary Industries, Office of Living Victoria, December 2013.

DEPI (date unknown). Western Region Sustainable Water Strategy Technical Report 6: Managing adverse water resource impacts of land use changes: Selecting areas for managing new forestry developments. Victorian Government Department of Environment and Primary Industries.

DELWP 2015 (Unpublished) water resource plan Risk Assessment: Background information related to land use change.

DSE undated. Managing the adverse water impacts of rural land use changes, publication details unknown.

Murphy, R. E., Hill, P. I., Grace, D., Bell, A.B., Day, G. and Moran, R. 2009. Implications of climate change on changes in evapotranspiration resulting from afforestation in North Eastern Victoria. Hydrology and Water Resources Symposium. Newcastle, NSW, Engineers Australia.

SMEC 2010. Afforestation Risks to Water Resources in the Murray-Darling Basin. Canberra, Murray-Darling Basin Authority, November 2010.

SKM 2008. State-wide Estimates of Water Use for Key Land Use Types, Report prepared for the Department of Sustainability and Environment, October 2008.

SKM 2009. Development of Hydrologic Impact Zones: Methodology, Report prepared for the Department of Sustainability and Environment, November 2009.

A.2.6.4 Earth resources development

ACIL Tasman 2009. Vision 2020 Project: The Australian Minerals Industry's Infrastructure Path to Prosperity. Prepared for the Minerals Council of Australia, May 2009, ACIL Tasman Pty Ltd.

DEDJTR 2014. Environmental Guidelines: Management of Water in Mines and Quarries Victorian Legal and Policy Requirements, Department of Economic Development, Jobs, Transport and Resources, Victoria. <http://www.energyandresources.vic.gov.au/earth-resources/licensing-and-approvals/minerals/guidelines-and-codes-of-practice/management-of-water-in-mines-and-quarries> Page last updated 11-Feb-2014, viewed 17-Nov-2015, State Government of Victoria.

DEDJTR 2015. Key Resource Opportunities, Department of Economic Development, Jobs, Transport and Resources, Victoria. <http://www.energyandresources.vic.gov.au/earth-resources/industry-and-investment/key-resource-opportunities> Page last updated 28-Jul-2015, viewed 17-Nov-2015, State Government of Victoria.

De Rose R, Barrett D, Marks A, Caitcheon G, Chen Y, Simon D, Lymburner L, Douglas G, & Palmer M 2005. Linking Sediment Dynamics, Riparian Vegetation and Aquatic Ecology in the Ovens River Part 1: Regional Patterns of Riparian Vegetation, Erosion and Sediment Transport in the Ovens River Basin. The Murray-Darling Freshwater Research Centre. Report prepared for the North East Catchment Management Authority November 2005

DSE 2011. Western Region Sustainable Water Strategy. Victorian Government Department of Sustainability and Environment, November 2011

DSE 2011. Gippsland Region Sustainable Water Strategy. Victorian Government Department of Sustainability and Environment, November 2011

Earth Tech 2004. Reedy Creek - Geomorphology and management recommendations. Report for the North East Catchment Management Authority. September 2004

Erskine, WD 2001. Management priorities for the lower ovens. State forests of New South Wales Pennant Hills, for North East Catchment Authority. August 2001

Gawne, B. and Gigney, H. 2005. Linking Sediment Dynamics, Riparian Vegetation and Aquatic Ecology in the Ovens River – Part 2: Impact of Sediment Movement on the Aquatic Ecology of the

Ovens River. The Murray-Darling Freshwater Research Centre. Report prepared for the North East Catchment Management Authority November 2005

Gawne B, Gigney H, De Rose R, Barrett D, Marks A, Caitcheon G, Chen Y, Simon D, Lymburner L, Douglas G, & Palmer M 2005. Linking Sediment Dynamics, Riparian Vegetation and Aquatic Ecology in the Ovens River Overall Executive Summary of Reports. The Murray-Darling Freshwater Research Centre. Report prepared for the North East Catchment Management Authority November 2005

GWMWater 2012. Water Supply Demand Strategy. Grampians Wimmera-Mallee Water

RMCG 2011. Water Demands in Unregulated Catchments – Southern Victoria. Report prepared for the Department of Sustainability and Environment – Office of Water, August 2011.

Yates G, Doody T, Pritchard J, Walker K, Karim F, Carey H, Wallace L, Galinec V and Sundaram B (2015) Context statement for the Gippsland Basin bioregion. Product 1.1 from the Gippsland Basin Bioregional Assessment. Department of the Environment, Bureau of Meteorology, CSIRO and Geosciences Australia, Australia.

A.2.6.5 Farm dams

DSE 2009. Background und Report 13: Protecting water users and the environment from uncontrolled growth in domestic and stock water use, Northern Region Sustainable Water Strategy. The Victorian Government Department of Sustainability and Environment Melbourne, November 2009.

MDBC 2008. Risks to Shared Water Resources, Mapping the growth, location, surface area and age of manmade water bodies, including farm dams, in the Murray-Darling Basin. Murray–Darling Basin Commission/Geosciences Australia, Agreement No. MD949, August 2008

SKM 2008. Background Report: Farm dam interception in the Campaspe Basin under climate change, A working paper for the Draft Northern Region Sustainable Water Strategy. For the Victorian Government Department of Sustainability and Environment, by SKM, September 2008.

A.2.7 Threat related

A.2.7.1 Water quality

DSE 2009. Northern (DSE, Northern Region Sustainable Water Strategy, 2011)Region Sustainable Water Strategy. Victorian Government Department of Sustainability and Environment, November 2011

DSE 2011. Western Region Sustainable Water Strategy. Victorian Government Department of Sustainability and Environment, November 2011

DSE 2011. Gippsland Region Sustainable Water Strategy. Victorian Government Department of Sustainability and Environment, November 2011

DEPI 2013. Victorian Waterway Management Strategy, Victorian Government Department of Environment and Primary Industries, September 2013.

GBCMA 2013. Goulburn Broken Regional Catchment Strategy 2013-2019, Goulburn Broken Catchment Management Authority, Shepparton. (DSE, Western Region Sustainable Water Strategy, 2011)

GBCMA 2014. Goulburn Broken Waterway Strategy 2014-2022, Goulburn Broken Catchment Management Authority, Shepparton.

MCMA 2013, Mallee Regional Catchment Strategy 2013-2019, Mallee Catchment Management Authority, Mildura

MCMA 2014, Mallee Waterway Strategy 2014-2022, Mallee Catchment Management Authority, Mildura

NCCMA 2013, North Central Regional Catchment Strategy 2013-2019, North Central Catchment Management Authority, Huntly

NCCMA 2014, North Central Waterway Strategy 2014-2022, North Central Catchment Management Authority, Huntly

NECMA 2014. North East Waterway Strategy 2014-2022, North East Catchment Management Authority, Wodonga

WCMA 2013. Wimmera Regional Catchment Strategy 2013-2019, Wimmera Catchment Management Authority, Horsham

WCMA 2014. Wimmera Waterway Strategy 2014-2022, Wimmera Catchment Management Authority, Horsham

MCMA 2011. Victorian Mallee Irrigation Region Land and Water Management Plan 2011, Mallee Catchment Management Authority, Mildura.

NCCMA 2007. Loddon Campaspe Irrigation Region Land & Water Management Plan Summary, North Central Catchment Management Authority, Huntly 2007.

RMCG 2008. Mid Goulburn Broken and Upper Goulburn Sustainable Irrigation Action Plan, Land and Water Management Plan for Irrigation in the Goulburn Broken Dryland Catchment Year 2008 - 2013, prepared for the Goulburn Broken Catchment Management Authority.

WCMA 2002. Wimmera Water Quality Strategy. Wimmera Catchment Management Authority

REWQC 1997. Goulburn Broken Water Quality Strategy 1996-2016, Goulburn Broken River Environment and Water Quality Committee.

DELWP 2015. Murray-Darling Basin Salinity Management Strategy Victoria's 2013/14 Annual Report. The State of Victoria Department of Environment, Land, Water & Planning 2015

DSE 2011. Manual for Victoria' Salinity Accountability in the Murray-Darling Basin, Victorian Government Department of Sustainability and Environment, Melbourne April 2011.

MDBA 2014. General review of salinity management in the MDB. Murray–Darling Basin Authority, Canberra 2014

SKM 2011. Risk of Climate Change Impacts on Salinity Dynamics and Mobilisation Processes in the Murray-Darling Basin. Report for the Murray–Darling Basin Authority, the Commonwealth of Australia by SKM Pty Ltd, February 2011.

Billington, K., Deere, D., Ryan, U., Stevens, D., Davison, A., (2011) Public health issues associated with stock accessing waterways upstream of drinking water off-takes. Report produced for Department of Health Victoria by Water Futures, Pty Ltd.

GMW 2014. Spreadsheet: SDWA Catchment wide risk assessment spreadsheet, last reviewed 30/05/0214

GMW 2015. GMW Risk Management Plan (as a Water Storage Manager under the *Safe Drinking Water Act 2003*) unpublished version (pending adoption early 2016)

Kookana, R S, Barnes, M B, Correll, R L and Kibria, G. (2003). First-Tier Assessment of the Risks Associated with Pesticides Used in Goulburn-Murray Irrigation Areas - A Pesticide Risk Reduction Program for G-MW Channels. Report prepared under a research collaboration

agreement between GMW & CSIRO. Goulburn-Murray Rural Water Authority (G-MW), Tatura and CSIRO, Adelaide.

MDBA 2010. Water quality summaries and proposed water quality targets for the protection of aquatic ecosystems for the MDB. Murray–Darling Basin Authority, the Commonwealth of Australia, Karoo Consulting Pty Ltd, February 2010.

MDBA 2011. Acid Sulfate soils in the Murray-Darling Basin. MDBA Publication No. 147/11, Murray-Darling Basin Authority on behalf of the Commonwealth of Australia. May 2011.

A.2.7.2 Groundwater

Aquade 2014. Goulburn-Murray Sedimentary Plain Groundwater Sustainable Diversion Limit Review, Synthesis Report. Aquade Groundwater Services Pty Ltd, August 2014.

Barnett, S.R. and Osei-bonsu, K., 2006. Mallee PWA – Murrayville WSPA Groundwater Model, South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2006/27.

DELWP 2015. Resource Share Guidance, Planning the Take of Victoria's groundwater resources. The State of Victoria Department of Environment, Land, Water and Planning 2015

GHD 2010. Ovens Valley Water Resource Appraisal Volume 2: Groundwater - Surface Water Modelling Report, report for Goulburn-Murray Water, May 2010

GHD 2010. Ovens Valley Water Resource Appraisal Volume 1: Data Analysis and Conceptual Model Development report for Goulburn-Murray Water

GHD 2010. Report for Goulburn Broken Catchment Groundwater Resource Appraisal Catchment Conceptualisation. Report for Goulburn-Murray Water by GHD July 2010

GHD 2011. Upper Goulburn Groundwater Resource Appraisal, Environmental Flow Risk Assessment report for Goulburn-Murray Water July 2011

GHD 2014. State Groundwater Trend Reporting. Statistical analysis and catalogue of hydrograph suites. Prepared for DELWP.

GMW 2006. Groundwater Management Plan for the Katunga Water Supply Protection Area.

GMW 2009. Mid-Loddon Groundwater Management Area. Local Management Rules.

GMW 2011. Upper Ovens River Water Supply Protection Area Water Management Plan.

GMW 2012. Lower Campaspe Valley Water Supply Protection Area Groundwater Management Plan.

GMW 2012. Loddon Highlands Water Supply Protection Area Groundwater Management Plan.

GMW 2012. Lower Ovens Groundwater Management Area. Local Management Plan.

GMW 2013. Upper Goulburn Groundwater Management Area. Local Management Plan.

GMW 2013. Central Victorian Mineral Springs Groundwater Management Area Background Report. Goulburn-Murray Water May 2013

GMW 2013. Strathbogie Groundwater Management Area. Local Management Plan

GMW 2013. Central Victorian Mineral Springs Groundwater Management Area. Local Management Plan.

GMW 2013. Determining the acceptable level of groundwater entitlement in the Strathbogie and Upper Goulburn GMAs – A baseflow approach used by Goulburn-Murray Water, March 2013

GMW 2014. Mid Goulburn Groundwater Management Area Local Management Plan Background Report. Goulburn-Murray Water October 2014

GMW 2014. Kiewa GMA Local Management Plan.

GMW 2014. Development of the Kiewa and Upper Murray Groundwater Management Areas Part 1: Catchment Conceptualisation. July 2014

GMW 2014. Mid Goulburn Groundwater Management Area. Local Management Plan.

GMW 2015. Shepparton Irrigation Region Groundwater Management Area. Local Management Plan.

GMW 2015. Broken Groundwater Management Area Part 1A: Catchment Conceptualisation. May 2015

GMW 2015. Eildon Groundwater Management Area Part 1B: Catchment Conceptualisation. Goulburn-Murray Water May 2015

GMW Undated. Strathbogie Groundwater Local Management Plan objectives.

GMW Undated. Spreadsheet: Loddon Highlands WSPA Project Risk Assessment.

GMW Undated. Spreadsheet: Loddon Highlands WSPA DSE Risk Assessment

GMW Undated. Spreadsheet: Lower Campaspe valley pre and post plan risk assessment review. Goulburn-Murray Water

GWMWater 2011, West Wimmera Groundwater Management Strategy, Grampians Wimmera-Mallee Water, June 2011.

MGWPACC 2001. Murrayville Area Groundwater Management Plan 2001. Murrayville Groundwater Supply Protection Area Consultative Committee.

MGWPACC 2001. Murrayville Area Groundwater Management Plan 2001. Murrayville Groundwater Supply Protection Area Consultative Committee.

Neville 2015. Ministerial Guidelines for groundwater licensing and the protection of high value groundwater dependent ecosystems. Hon Lisa Neville MP, Minister for Environment Climate Change and Water

Review Panel 2013. Report to the MDBA by the Review Panel of the Western Porous Rock Groundwater SDL Resource Unit in NSW.

SKM 2011. Groundwater Resource Appraisal - Upper Loddon and Campaspe Catchments report for Goulburn-Murray Water

SKM 2011. Loddon Highlands WSPA Groundwater Modelling. Report for Goulburn-Murray Water 2011

SKM 2011. Risk Assessment (Issues Register) Methodology, Shepparton Irrigation Region – Developing a Framework for Determining Resource Condition Limits. Report for Goulburn-Murray Water

SKM 2014. Western Porous Rock Groundwater Sustainable Diversion Limit Review, Interim Synthesis Report for the Murray-Darling Basin Authority, February 2014.

Unknown Author Unknown Year. Appendix B Detailed impact method_Gippsland Issue E: Groundwater Impact Assessment Method

Unknown Author Unknown Year. Resource Assessment and Planning Process for Groundwater and Unregulated Surface Water Systems. Background Discussion paper

URS 2015. Katunga WSPA Groundwater Resource Assessment. Report for Goulburn-Murray Water July 2015

A.2.8 Beneficial use related

A.2.8.1 Aboriginal

Altman J., and Arthur, B. 2009. Water licences and allocation to Indigenous people for commercial purposes: An Australia wide exercise. Report prepared for the National Water Commission by the Australian National University Centre for Aboriginal Economic Policy Research, February 2009.

Arthur 2010. The Murray-Darling Basin regional and basin plans: Indigenous water and land data, June 2010, Australian Government, Murray-Darling Basin Authority.

CBD 2004. Akwé: Kon: Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessment regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities. Secretariat of the Convention on Biological Diversity. Montreal, Quebec.

COAG 2015. DRAFT Module to the National Water Initiative (NWI) Policy Guidelines for Water Planning and Management, Engaging Indigenous Peoples in Water Planning and Management. Prepared by the Council of Australian Governments (COAG), Committee in Confidence, MAY 2015.

Finn, M. and Jackson, S. 2011. Protecting Indigenous values in water management: A challenge to conventional environmental flow assessments. Ecosystems 14:1232-1248, 2011.

FVTOC 2014. Victorian Traditional Owner Water Policy Framework, Federation of Victorian Traditional Owner Corporations, November 2014

Ganesharajah, C. 2009. Indigenous health and wellbeing: the importance of country. The Native Title Research Unit Australian Institute of Aboriginal and Torres Strait Islander Studies.

Goulding, M. 2009. Northern Region Sustainable Water Strategy: Indigenous Engagement Project, A technical report prepared for the Office of Water, Department of Sustainability and Environment. Goulding Heritage Consulting Pty Ltd, September 2009.

Goulding, M., Schell, P. and Albrecht, M. 2008. Cultural Heritage Values Assessment Gaps Analysis, Northern Region Sustainable Water Strategy. Report for the Department of Sustainability and Environment. Ochre Imprints and Goulding Heritage Consulting Pty Ltd, 2008.

Jackson, S. and Altman, J. 2009. Indigenous rights and water policy: perspective from tropical northern Australia. Australian Indigenous Law Review Vol. 13 No. 1 2009. Indigenous Law Centre, University of New South Wales.

Jackson, S. and Langton, M. 2012. Trends in the recognition of Indigenous water needs in Australian water reform: the limitation of 'cultural' entitlements in achieving water equity. The Journal of Water Law (22(2/3):109-123, January 2012.

Jackson, S. Moggrdige, B. and Robinson, C. 2010. Summary of the scoping study: effects of change in water availability in Indigenous people of the Murray-Darling Basin. CSIRO: Water for a Healthy Country Flagship Report series ISSN: 1835-095X.

Jackson, S., Tan, P., Mooney, C., Hoverman, S., White, I., 2012. Principles and guidelines for good practice in Indigenous engagement in water planning. Journal of Hydrology. 474, 57–65.

Jackson, S., Pollino, C., Maclean, K., Bark, R., and Moggridge, B. (2015) Meeting Indigenous peoples' objectives in environmental flow assessments: Case studies from an Australian multi-jurisdictional water sharing initiative. Journal of Hydrology 522 (2015) 141-151

Lindsay, B. 2015. Water citizenship, advancing community involvement in water governance in Victoria. Environmental Justice Australia, January 2015. <https://envirojustice.org.au/blog/water-citizenship-advancing-community-involvement-in-water-governance> viewed 15/10/2015.

NRMMC 2010. Australia's Biodiversity Conservation Strategy 2010-2030. Natural Resource Management Ministerial Council 2010, Australian Government, Department of Sustainability, Environment, Water, Population and Communities, Canberra

NWI 2010. National Water Initiative Policy Guidelines for Water Planning and Management 2010, Council of Australian Governments.

A.2.8.2 Environmental

DELWP 2015. Victorian Long Term Watering Plan - Northern Victoria (Draft for Review). Prepared for Basin Plan obligations. The State of Victoria Department of Environment, Land, Water and Planning 2015

DELWP 2015. Victorian Long Term Watering Plan - Victorian Murray (Draft for Review). Prepared for Basin Plan obligations. The State of Victoria Department of Environment, Land, Water and Planning 2015

DELWP 2015. Victorian Long Term Watering Plan - Wimmera-Mallee (Draft for Review). Prepared for Basin Plan obligations. The State of Victoria Department of Environment, Land, Water and Planning 2015

GHD 2013. Baseflow Estimation Method Pilot Trial, Characterising Groundwater Contribution to Baseflow Dependent Waterways. Report for the Department of Sustainability and Environment, February 2013

GHD 2013. Groundwater Assessment - Baseflow Dependent Rivers (Sevens Creek Goulburn Catchment). Characterising Groundwater contribution to baseflow dependent waterways, Report for the Department of Environment and Primary Industries, November 2013.

GMW 2015. Communications Strategy Delivery of Environmental Flows, Goulburn-Murray Water (Draft)

Groundwater Assessment - Baseflow Dependent Rivers. Risk Assessment of Groundwater-Dependent Ecosystems using Baseflow Estimations. Report for the Department of Environment and Primary Industries, May 2014.

SKM 2011. Upper Wimmera River Environmental Water Needs. Report for Wimmera CMA March 2011

SKM 2011. Upper Wimmera Catchment Environmental Water Needs. Report for Wimmera CMA June 2011

VEWH 2015. Seasonal Watering Plan 2015-16. Victorian Environmental Water Holder.

VEWH, GMW, GBCMA 2014. Operating arrangements for the environmental water holdings of the Goulburn system (Draft)

A.2.8.3 Unregulated water systems

DELWP 2013. Improving our waterways, Victorian Waterway Management Strategy. The State of Victoria Department of Environment and Primary Industries, September 2013

Unknown Author, Unknown Year. Unregulated Surface Water Trade - Draft Discussion Paper for Risk Assessment 20151019.

Unknown Author, Unknown Year. Resource Assessment and Planning Process for Groundwater and Unregulated Surface Water Systems. Background Discussion paper for Risk Assessment 20151019

Walsh, P. 2014. Policies for Managing Take and Use Licences, *Water Act 1989*. Peter Walsh Minister for Water

A.2.9 General strategies

DSE 2008. Victorian regulatory framework relating to farm dams, groundwater and afforestation. Prepared as part of the MDBC Risks to Shared Water Resources Program. Victorian Government Department of Sustainability and Environment, Melbourne, March 2008

DSE 2009. Victorian Risk Assessment 2008 - Final Draft. Provided to the Murray-Darling Basin Authority as part of the Murray-Darling Basin Risks to Shared Water Resources Program, August 2009.

DSE 2011. Victorian Risk Assessment 2010 - Final Draft. Provided to the Murray-Darling Basin Authority as part of the Murray-Darling Basin Risks to Shared Water Resources Program, 2011.

GHD 2009, Report for Monitoring of Irrigation Drainage Water, Stage 1 Report, October 2009. Prepared for Lower Murray Water by GHD

GHD 2009, Report for Monitoring of Irrigation Drainage Water, Stage 2 Report, November 2009. Prepared for Lower Murray Water by GHD

MDBC 2003. Preliminary review of selected factors that may change future flow patterns in the River Murray System. Publication No. 01/07, Murray-Darling Basin Commission, Canberra.

MDBA 2012. Basin Plan. Commonwealth of Australia, 22 November 2012.

MDBA 2013. Handbook for Practitioners - Water resource plan requirements. Commonwealth of Australia (Murray–Darling Basin Authority) October 2013.

NCCMA 2014, North Central Waterway Strategy 2014-2022, North Central Catchment Management Authority, 2014

NWI 2010. NWI Policy Guidelines for Water Planning and Management. Council of Australian Governments (COAG).

NWI 2010. NWI Policy Guidelines for Water Planning and Management, Risk Assessment Module. Council of Australian Governments (COAG).

Peters, G., Doeg, T. & Heron, S. 2009. Aquatic Value Identification and Risk Assessment (AVIRA) Risk Assessment Process, Report for the Victorian Government Department of Sustainability and Environment. by Riverness, April 2009

RMCG 2015, Risk Assessment of Irrigation Drainage in the Goulburn-Murray Water Area, final report prepared by RMCG and Feehan Consulting for the Department of Environment, Land, Water and Planning, December 2015

A.2.10 Risk registers and operations

GBCMA 2011. Risk Framework Procedure, Goulburn Broken Catchment Management Authority Risk Management Procedure, RSK 002. Created 2011, reviewed 2015.

GMW 2007-2014. Land and on-water management plans: Goulburn-Murray Water (Individual plans prepared for: Kow Swamp (2014), Lake Boga (2011), Lake Eildon (2012), Lake Eppalock (2013), Nagambie waterways (2012), Lake Mulwala (2008), Lake Hume (2007), Lake Nillahcootie (2011), Waranga Basin (2011).

GMW 2015. Individual Risk Action Report Operational. Goulburn-Murray Water

GMW 2015. Strategic Risk Report. Goulburn-Murray Water

GMW 2015. Spreadsheet: Summary of groundwater resource risk assessments. Goulburn-Murray Water

MCMA 2015. SDL Adjustment. Lindsay Island Business Case - Risk components (p39-p142). Mallee CMA

VEWH 2015. Risk Register Report: Extract for Alluvium-20151218

VEWH 2015. extract from the draft Risk Management Framework

Interview transcripts

DEDJTR 2015. Interview Transcript 23/12/2015

GBCMA 2015. Interview transcript 3/12/15

GMW 2015. Interview Transcript 26/11/2015

GWMWater 2015. Interview Transcript 26/11/15

MCMA 2015. Interview Transcript 2/12/2015

NCCMA 2015. Interview Transcript 30/11/2015

NECMA 2015. Interview Transcript 08/12/2015

LMW 2015. Interview Transcript 7/12/2015

Vic Water 2015. Interview Transcript 2/12/2015

VEWH 2015. Interview Transcript 7/12/2015

Appendix C Methods Report

Appendix C Methods Report

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Summary of methods

This Appendix summarises the methods for determining the volume of permitted take and actual take. The determination of these volumes supports Victoria's reporting against sustainable diversion limit compliance.

Annual permitted take in the Northern Victoria water resource plan area, Victorian Murray water resource plan area and the Goulburn-Murray water resource plan area is either calculated or estimated based on the best available information for that form of take and the water resources in the water resource plan area. The methods are outlined in **Table 6** for surface water and **Table 11** for groundwater.

Annual actual take is the volume of water actually taken from the system within an accounting period. At the end of each water accounting period, actual take is subtracted from the annual permitted take. The difference is recorded as either an annual debit or credit, as outlined in section 6.11 of the Basin Plan. To remain compliant with sustainable diversion limits (SDL), cumulative debit cannot be equal to or greater than 20 percent of the SDL as required by section 6.12 of the Basin Plan. The obligation to comply with permitted take is provided in response to section 10.11 of the Basin Plan.

A summary of whether permitted take and actual take are estimated or calculated is shown in **Table 1**.

Where the form of take relates to take under an entitlement, the method relies on volumes recorded in the Victorian Water Register (VWR). The VWR provides the most up-to-date information about entitlement volumes for an area or resource as it records the volume taken under a particular entitlement. These volumes are measured rather than estimated.

Where there is no recorded entitlement data, such as for domestic and stock rights, or net take by commercial plantations, an estimate is required to determine the permitted take for the accounting period. Equally, where there is no recorded entitlement data for a form of take, an estimate will be required to determine actual take.

Table 1: Summary of permitted take and actual take methods

Form of take	Method	
	Permitted take	Actual take
Surface water		
Take from a regulated river (excluding basic rights)	Determined using a water resource plan model adjusted for water recovered for the environment and trade	Calculated using usage data on the Victorian Water Register
Take from a regulated river under basic rights and take from a watercourse under basic rights	Determined based on best available hydrological model information	Estimated based on best available hydrological model information
Take from a watercourse (excluding basic rights) – modelled component	Determined using a water resource plan model adjusted for water recovered for the environment and trade	Calculated using usage data on the Victorian Water Register
Take by runoff dams (excluding basic rights)	Determined based on entitlement data on the Victorian Water Register	Calculated based on entitlement data on the Victorian Water Register
Take from a watercourse (excluding basic rights) – out of model component*	Determined as the long-term average take for the period between 1997-98 to 2009-10*	Estimated as the long-term average take for the period between 1997-98 to 2009-10*
Take by runoff dams under basic rights	Determined based on best available hydrological model information	Estimated based on best available hydrological model information
Net take by commercial plantations	Determined using the SoilFlux model	Estimated using the SoilFlux model
Groundwater		
Take from groundwater (excluding basic rights)	Determined by the relevant SDL	Calculated using usage data and estimates on the Victorian Water Register
Take from groundwater (basic rights)	Determined based on best available water user information	Estimated based on best available water user information

** interim method is subject to a 2-year review (see **Part 2.2.1**, **Part 3.1.3.2** and **Table 6**)*

1. Background information

1.1 Basin Plan requirements

Division 2—Take for consumptive use

Note: This Division sets out the principal provisions for how a water resource plan incorporates and applies the sustainable diversion limit for each SDL resource unit. Sustainable diversion limits take effect from 1 July 2019. Water resource plans may be accredited before then and ordinarily have effect for 10 years. See section 64 of the Commonwealth Water Act.

10.10 Annual determinations of water permitted to be taken

For each SDL resource unit in a water resource plan area, and for each form of take, the water resource plan must set out the method for determining the maximum volume of water that the plan permits to be taken for consumptive use during a water accounting period.

The method for subsection (1) may include modelling, and must be designed to be applied after the end of the relevant water accounting period, having regard to the water resources available during the period.

The method must:

- *account for the matters in subsection 10.12(1); and*
- *be consistent with the other provisions of the water resource plan*

The plan must also set out a demonstration that the method relates to the SDL of each resource unit in such a way that, if applied over a repeat of the historical climate conditions, it would result in meeting the SDL for the resource unit, including as amended under section 23B of the Act.

Note 1: Under the Basin Plan, the SDL is the same as the long-term annual diversion limit because the temporary diversion provision for each SDL resource unit is zero. Section 6.04 and Schedules 2 and 4 set out the SDLs for each SDL resource unit.

Note 2: Amendments under section 23B of the Act are made following proposals for adjustment under Chapter 7.

If, as a result of an amendment under section 23B of the Act, the SDL for a surface water SDL resource unit is expressed as a formula that changes with time, the SDL for subsection (4) is taken to be:

- *for a water accounting period beginning on or after 1 July 2019—the SDL as it stood on 30 June 2019; and*
- *for a water accounting period beginning on or after 1 July 2022—the SDL as it stood on 30 June 2022; and*
- *for a water accounting period beginning on or after 1 July 2024—the SDL as it stood on 30 June 2024*

10.12 Matters relating to accounting for water

3. *For paragraph 10.10(3)(a), the following matters must be accounted for:*

- *all forms of take from the SDL resource unit and all classes of water access right;*
- *water allocations that are determined in one water accounting period and used in another, including water allocations that are carried over from one water accounting period to the next;*
- *for a surface water SDL resource unit—return flows, in a way that is consistent with arrangements under the Agreement immediately before the commencement of the Basin Plan;*
- *subject to subsection (3)—trade of water access rights;*
- *water resources which have a significant hydrological connection to the water resources of the SDL resource unit;*
- *circumstances in which there is a change in the way water is taken or held under a water access right;*
- *changes over time in the extent to which water allocations in the unit are utilised; Note: Paragraph (g) includes what is commonly known as a growth-in-use strategy;*
- *water sourced from the Great Artesian Basin and released into a Basin water resource, by excluding that water; and*
- *water resources which are used for the purpose of managed aquifer recharge*
- *Subject to this section, the method may account for other matters*
- *For paragraph (1)(d), the water resource plan must account for the disposal and acquisition of held environmental water separately and in a way that does not affect the method under section 10.10*

Division 3—Actual take

10.15 Determination of actual take must be specified

1. *A water resource plan must set out how the quantity of water actually taken for consumptive use by each form of take from each SDL resource unit will be determined after the end of a water accounting period using the best information available at the time.*

Note: The annual actual take for the SDL resource unit is the sum of the quantity of water actually taken by each form of take for consumptive use: see subsection 6.10(2).

Paragraph 71(1)(c) of the Act requires the annual actual take to be set out in a report to the Authority within 4 months after the end of the water accounting period.

2. *For a particular form of take, and subject to the requirement that a determination use the best information available at the time, a determination may be made by:*

- *measuring the quantity of water actually taken; or*
- *estimating the quantity of water actually taken; or*
- *a combination of the above*

Where a determination for a form of take is made by estimating the quantity of water actually taken, the water resource plan must provide for the estimate to be done consistently with the method under subsection 10.10(1) that relates to that form of take.

The quantity of water actually taken must:

- *include water that was held environmental water which was disposed of and then used in the SDL resource unit for consumptive use; and*
- *exclude water sourced from the Great Artesian Basin and released into and taken from a Basin water resource*

1.2 Best available information summary

Victoria has used the best available information to develop the models and methods in this report.

The information is considered the best available because:

- it is the most current at the time at which the model or method must account for water taken from the system
- it is based on an updated model and more accurately reflects the management of Victoria's water resources
- it is obtained in a manner that is cost effective and fit for purpose
- the Victorian Water Register holds the most accurate and up-to-date information regarding water entitlements

It is not proposed to use methods of obtaining information to assess consumptive water take from the system where the cost and effort involved in obtaining the information is not commensurate with the benefit or increased certainty achieved by including the data.

For the purposes of determining take by entitlement holders, the Victorian Water Register is the most accurate means of determining the number of entitlements and the total volume authorised to be taken under those entitlements. All entitlements issued in Victoria are recorded on the register in accordance with the requirements in the Victorian Water Act.

1.3 Utilisation

The sustainable diversion limit (SDL) represents the long-term average of the environmentally sustainable limit on the volume of water that can be taken from the Murray-Darling Basin resource. In Victoria, water entitlements (water access rights) are not issued above the sustainable limit for the relevant resource. This sustainable limit will now be represented by the SDL in Victoria's water resource plan areas.

In determining whether entitlements can be issued, there is an assumption of full use of an entitlement. This means that in considering whether a new entitlement can be issued in respect of a resource or system, consideration is given to the total volume of water authorised to be taken from that resource or system under existing entitlements.

In circumstances where water users are not using the total volume of water allocated under their entitlement, it is not assumed that underutilised water from an existing entitlement is water available for new users. Victoria's commitment to secure entitlements to water is based on water management decisions that advance security and reliability of a user's entitlement to the extent possible.

As a result, there may be circumstances where the total volume of water allocated under entitlements is higher than the volume of water actually taken by the entitlement holders in a system. However, this does not result in the allocation of new entitlements to take up the unused water.

2. Baseline diversion limit and sustainable diversion limit estimates

2.1 Sustainable diversion limits (SDL)

2.1.1 Shared and local reduction amounts

Sustainable diversion limits are focused on confining consumptive water use to an environmentally sustainable limit. The difference between baseline diversion limits and SDLs is the volume of water that needs to be recovered. The sustainable diversion limits take effect from 1 July 2019 and are made up of local reduction amounts, shared reduction amounts and offsets achieved through the Sustainable Diversion Limit Adjustment Mechanism (SDLAM).

Local reduction amounts are long-term average volumes of water identified to be recovered in a specific SDL resource unit. The volumes are listed in Schedule 2 of the Basin Plan in reference to estimated BDLs.

The shared reduction amounts are long-term average volumes of water that can be allocated between SDL resource units and must be recovered to meet the southern Basin Victoria zone shared reduction target of 425.3 GL per year. This is because this volume is intended to contribute to broader environmental outcomes across the Basin. Shared reduction targets for northern Victorian catchments by SDL resource unit are shown in **Table 2**.

In Victoria, the water has been recovered through a number of projects and partly through Commonwealth purchases. The recovery to date has been from regulated systems.

2.1.2 Sustainable diversion limit adjustment mechanism

The Basin Plan allows for changes to water recovery targets through the Sustainable Diversion Limit Adjustment Mechanism.

The adjustment mechanism allows for up to 605 gigalitres (GL) of the Basin Plan's total water recovery target to be achieved through offsets from projects that deliver equivalent environmental outcomes without the need for more water, and therefore increases the sustainable diversion limit. Projects may include environmental works and measures or operational rule changes. The projects are explained further in **Schedule 1**.

The 605 GL Basin-wide offset has been apportioned to each SDL resource unit in Victoria's North and Murray water resource plan area as shown in **Table 2**. The Basin Plan limits the offset to 5 percent of the Basin's SDL which at the time was equal to 543 GL. Therefore, an additional 62 GL of efficiency measures must be implemented by 2024 across the Basin for the full 605 GL adjustment to be available.

As the efficiency measures are progressively completed, the SDL will change between 2019 and 2024 to reflect this. Section 10.10(5) of the Basin Plan allows for a staged SDL if the method for determining permitted take is a formula that changes with time. Efficiency measures are outlined in **Schedule 1**.

Table 2: Local and shared reduction amounts and SDL offsets by SDL resource unit

SDL resource unit[1]	Local reduction amount (GL/yr)	Shared reduction amount (GL/yr)[2]	Apportioned supply contribution (GL/yr)[3]	Target recovery at 30 June 2019[2,3]
Victorian Murray	253.0	210.8	72.8	391
Kiewa	0	1.1	1.3	(0.2)
Ovens	0	2.7	3	(0.3)
Goulburn	344.0	186.4	174.5	355.9
Broken	0	1.3	1.1	0.2
Campaspe	18.0	13.2	2.6	28.6
Loddon	12.0	9.8	10.9	10.9
Total	627	425.3	266.2	786.1

1. *does not include Wimmera-Mallee SDL resource unit*
2. *brackets indicate a negative number, where a negative target recovery is given this is a net zero change from BDL to SDL. Note: the target recovery does not include the current efficiency contribution which is required as part of the SDL adjustment amount (see Schedule 6A of the Basin Plan).*
3. *full apportioned supply contribution only applies if 62 GL of efficiency measures are complete*

2.1.3 Sustainable diversion limits and Basin Plan section 10.10(5) requirements

Taking into account the information in **Part 2.1.1** and **Part 2.1.2**, the sustainable diversion limit for the relevant water year will be determined based on the target recovery as at 30 June of the preceding year. The target recovery will be determined by the volume of target environmental water to be recovered as at 30 June of the relevant water year, accounting for any offsets achieved. That is;

Target recovery = local reduction amount + shared reduction amount - SDL adjustment amount

If less than 62 GL of efficiency measures are complete, the SDL adjustment amount is determined in accordance with the formula outlined in section Schedule 6A of the Basin Plan. Column 5 in **Table 2**, gives the apportioned supply contribution for 30 June 2019 assuming that the full 62 GL of efficiency measures are complete. These volumes can be found in subsection S6A.02(1) of Schedule 6A of the Basin Plan.

As the sustainable diversion limit is a formula that changes with time, section 10.10(5) of the Basin Plan applies. This means:

- As at 1 July 2019: SDL = BDL – target recovery as at 30 June 2019
- As at 1 July 2022: SDL = BDL – target recovery as at 30 June 2022
- As at 1 July 2024: SDL = BDL - target recovery as at 30 June 2024

The SDLs in **Table 3** for Victoria's estimate assume that zero GL of efficiency measures are complete.

2.2 Comparison to Basin Plan estimates of baseline diversion limits and sustainable diversion limits

This section provides a brief discussion and comparison of Victoria's estimates of baseline diversion limits (BDL) and sustainable diversion limits provided in **Table 3**, compared to the estimates of these numbers provided in schedules 2–4 of the Basin Plan.

In each case the revised estimate is based on the same level of development as specified in the Basin Plan, 30 June 2009, for all SDL resource units in the Victorian Murray and Northern Victoria water resource plan areas. Refer to **Part 3** of this report for more detailed discussion of the method used to determine the SDL in each case.

2.2.1 Surface water

The total surface water BDL for the Victorian Murray water resource plan area was estimated to be 1731.6 GL/year in the Basin Plan compared to 1,745.7 GL/year in Victoria's estimate. For the Northern Victoria water resource plan area, the total surface water BDL was estimated to be 2161 GL/year in the Basin Plan compared to 2,066.6 GL/year in Victoria's estimate.

Victoria's SDL estimates in **Table 3** for take from a regulated river (excluding basic rights) and take from a watercourse (excluding basic rights) for the Kiewa, Ovens and Victorian Murray SDL resource units, account for the local reduction amounts, shared reduction amounts and offsets achieved from the Sustainable Diversion Limit Adjustment Mechanism. This estimate assumes zero efficiency measures are complete.

For the out of model component of take from a watercourse (excluding basic rights), early discussions with the MDBA identified a revised method of total entitlement volume as the method for determining BDL, SDL and permitted take. This would have increased the BDL and SDL in some SDL resource units. This remains Victoria's preferred method as under Victoria's water management framework, take and use licence holders and unregulated bulk entitlement holders are able to take the full volume of their entitlement in a given water year, subject to the licence or bulk entitlement conditions.

In late 2018 the MDBA advised that this would not be an acceptable method. Victoria has proposed a two-year review be undertaken to revise the BDL, SDL and permitted take method for this form of take. Whilst the review is completed, the BDL equals the SDL, permitted take and actual take (see **Part 3.1.3.2** and **Table 6**).

The Basin Plan estimate for the total combined BDL for Goulburn, Broken, Campaspe and Loddon SDL resource units for this form of take has been adopted as shown in **Table 3**. The total combined volume has been reapportioned by Victoria based on recent actual take data. The Basin Plan estimate for the Victorian Murray out of model component of 5.5 GL/year has been adopted and is also subject to the two-year review.

The adoption of the interim method does not:

- limit the ability of a holder of a take and use licence to utilise their entitlement during the two-year review process;
- prejudice Victoria from identifying a method on review that would enable the accumulation of credits if actual take is below what would be permitted in a given year,
- prejudice Victoria from adopting a method in 2 years which may result in an increased BDL
- prevent a revised SDL compliance assessment to be undertaken of the period since 1 July 2019, once a revised BDL and permitted take method is agreed (consistent with the MDBA's SDL reporting and compliance framework).

For all other forms of take, the SDL equals the baseline diversion limit. An explanation of the differences between the Basin Plan BDL estimates and Victoria's BDL estimates is given in **Table 4**, and the methods are further explained in **Table 6**.

2.2.2 Groundwater

The Basin Plan estimates of baseline diversion limits and sustainable diversion limits for groundwater have been adopted as shown in **Table 5**.

Table 3: Comparison of Victoria's and Basin Plan surface water baseline diversion limit and sustainable diversion limit estimates for each form of take for all SDL resource units in the Victorian Murray and Northern Victoria water resource plan areas.

Form of take: SDL resource unit			(a) Take from a regulated river (excluding basic rights)	(b) Take from a watercourse (excluding basic rights)	(c) Take from a waterway (regulated river and watercourse) under basic rights	(d) Take by run off dams	(d)(i) Runoff dams (excluding domestic and stock)	(d)(ii) Runoff dams (domestic and stock)	(e) Net take of water by commercial plantations
Victorian Murray (SS2)	Basin Plan	BDL (GL/yr)	n/a	1,662	n/a	23	n/a	n/a	22
		SDL (GL/yr)	n/a	1,279.4 [a]	n/a	23	n/a	n/a	22
	Victoria	BDL (GL/yr)	n/a	1,673.2 [bd]	8.2	12.4	4.8	7.6	24.2
		SDL (GL/yr)	n/a	1,274.7 [bc]	8.2	12.4	4.8	7.6	24.2
Kiewa (SS3)	Basin Plan	BDL (GL/yr)	n/a	11	n/a	6.6	n/a	n/a	7
		SDL (GL/yr)	n/a	11	n/a	6.6	n/a	n/a	7
	Victoria	BDL (GL/yr)	n/a	11.2 [d]	1	8.2	4.5	3.7	7.3
		SDL (GL/yr)	n/a	11.2 [c]	1	8.2	4.5	3.7	7.3
Ovens (SS4)	Basin Plan	BDL (GL/yr)	n/a	25	n/a	26	n/a	n/a	32
		SDL (GL/yr)	n/a	25	n/a	26	n/a	n/a	32
	Victoria	BDL (GL/yr)	n/a	25.4 [d]	2.9	25	12.5	12.5	32.5
		SDL (GL/yr)	n/a	25.4 [c]	2.9	25	12.5	12.5	32.5
Goulburn (SS6)	Basin Plan	BDL (GL/yr)	1,552	29	n/a	86	n/a	n/a	23
		SDL (GL/yr)	1,190.1 [a]	29	n/a	86	n/a	n/a	23
	Victoria	BDL (GL/yr)	1,552.7 [d]	18.3 [b]	6.3	51.5	27.1	24.4	22.4
		SDL (GL/yr)	1,178.9 [c]	18.3 [b]	6.3	51.5	27.1	24.4	22.4

Form of take: SDL resource unit			(a) Take from a regulated river (excluding basic rights)	(b) Take from a watercourse (excluding basic rights)	(c) Take from a waterway (regulated river and watercourse) under basic rights	(d) Take by run off dams	(d)(i) Runoff dams (excluding domestic and stock)	(d)(ii) Runoff dams (domestic and stock)	(e) Net take of water by commercial plantations
Broken (SS5)	Basin Plan	BDL (GL/yr)	13	0	n/a	30	n/a	n/a	13
		SDL (GL/yr)	12.5 [a]	0	n/a	30	n/a	n/a	13
	Victoria	BDL (GL/yr)	13.2 [d]	2.9 [b]	1.6	16.7	10.4	6.3	14.9
		SDL (GL/yr)	12.9 [c]	2.9 [b]	1.6	16.7	10.4	6.3	14.9
Campaspe (SS7)	Basin Plan	BDL (GL/yr)	111	2	n/a	39	n/a	n/a	1
		SDL (GL/yr)	81.9 [a]	2	n/a	39	n/a	n/a	1
	Victoria	BDL (GL/yr)	115.8 [d]	0.9 [b]	1.6	20.5	6.1	14.4	1.8
		SDL (GL/yr)	87.0 [c]	0.9 [b]	1.6	20.5	6.1	14.4	1.8
Loddon (SS8)	Basin Plan	BDL (GL/yr)	89	0	n/a	85	n/a	n/a	5
		SDL (GL/yr)	77.1 [a]	0	n/a	85	n/a	n/a	5
	Victoria	BDL (GL/yr)	85.8 [d]	8.9 [b]	4.8	34.6	18.1	16.6	5.5
		SDL (GL/yr)	73.8 [c]	8.9 [b]	4.8	34.6	18.1	16.6	5.5

a. includes the local and shared reduction amounts, and the full offset volume apportioned from the SDL adjustment mechanism, assuming 62GL of efficiency measures are complete

b. interim volumes subject to a two-year review (see **Table 6**, *and* **Section 3.1.3.2**)

c. expected SDL from 1 July 2019 - see **Section 2.1.3;** *assumes zero GL efficiency measures achieved. Any efficiency measures achieved to be apportioned as the SDL offset apportionment, as explained in Schedule 6A of the Basin Plan.*

d. the BDLs are the best estimate at the time Victoria's North and Murray Water Resource Plan was accredited. They may be subject to change as the models are progressively updated with improved information

Table 4: Explanation for differences between Basin Plan BDLs and Victoria's BDLs

Form of take		Explanation of difference between Basin Plan and Victoria's estimates
(a)	Take from a regulated river (excluding basic rights)	Changes in estimates are based on updated information and models see - Hydrologic Models for Basin Plan Compliance in the Northern Victoria Water Resource Plan Area (DELWP, 2019).
(b)	Take from a watercourse (excluding basic rights) – modelled component	Changes in estimates are based on updated information and model see - Revised BDL Estimate for NSW, Victoria and SA Murray and Lower Darling SDL Units, Technical Report no. 2019/02 (MDBA 2019)
(b)	Take from a watercourse (excluding basic rights) – out of model component	The Basin Plan estimate is based on long-term average take between 1997-98 and 2009-10. The same method will be used until a more appropriate method is developed (as explained in **Part 2.2.1**, **Part 3.1.3.2** and **Table 6**). The estimate for the Goulburn, Broken, Campaspe and Loddon SDL resource units is different to Basin Plan as the total BDL has been reapportioned for accounting purposes and to better align with recent actual take data. The BDLs are subject to the two-year review identified in **Part 3.1.3.2**.
(c)	Take from a waterway under basic rights	The volume is estimated based on a model of stock and domestic use. This volume also includes a best estimate of take under section 8A rights by Traditional Owners who have a natural resource agreement under the *Traditional Owner Settlement Act 2010*.
(c) (i)	Take from a regulated river under basic rights	This is being estimated together with take from a watercourse under basic rights, see above.
(c) (ii)	Take from a watercourse under basic rights	This is being estimated together with take from a regulated river under basic rights see above.
(d)	Take by runoff dams	Volume is based on more accurate data and comprises consumptive take and take for domestic and stock purposes by runoff dams
(d) (i)	Runoff dams (excluding domestic and stock)	This volume was estimated based on the sum of existing entitlements recorded on the Victorian Water Register as of July 2016
(d) (ii)	Runoff dams (domestic and stock)	Estimate is based on modelling using the number and volume of dams shown in aerial imagery as at 2005 adjusted to account for the entitlements shown in item (d)(i)
(e)	Net take of water by commercial plantations	Estimate is based on modelling recently undertaken by DELWP using the Soilflux model.

Table 5: Basin Plan groundwater baseline diversion limit and sustainable diversion limit estimates for each form of take

Form of take		BDL (ML)[a]	SDL (ML)[b]
Goulburn-Murray: Shepparton Irrigation Region SDL resource unit			
1	Take from groundwater (excluding basic rights)	244,100	244,100
2	Take from groundwater under basic rights		
Goulburn-Murray: Highlands SDL resource unit			
1	Take from groundwater (excluding basic rights)	38,300	68,700
2	Take from groundwater under basic rights		
Goulburn-Murray: Sedimentary Plain SDL resource unit			
3	Take from groundwater (excluding basic rights)	203,500	223,000
4	Take from groundwater under basic rights		
Goulburn-Murray: deep SDL resource unit			
5	Take from groundwater (excluding basic rights)	0	20,000
6	Take from groundwater under basic rights	0^	0^

a. estimates from column 3, Schedule 4 of the Basin Plan have been adopted

b. estimates from column 4, Schedule 4 of the Basin Plan have been adopted

^ *at the time of setting these estimates there was no take from the deep SDL resource unit under basic rights, but this may be revised in the future.*

2.3 SDL resource units for compliance with sustainable diversion limits

Part 3 of Chapter 10 of the Basin Plan provides the basis for how Victoria must report and demonstrate compliance with SDLs.

The SDL compliance test is provided for in sections 6.10, 6.11 and 6.12 of the Basin Plan for surface water and sections 6.12A, 6.12B and 6.12C for groundwater. Under these sections, SDL compliance reporting is done in this way:

- a determination of annual permitted take is made in accordance with the methods provided in Victoria's North and Murray Water Resource Plan in accordance with section 10.10 of the Basin Plan
- a determination of annual actual take is made in accordance with the methods provided in Victoria's North and Murray Water Resource Plan in accordance with section 10.15 of the Basin Plan
- an assessment is made as to whether actual take exceeded permitted take for the accounting year, a debit or credit is recorded in accordance with section 6.12 and 6.12C of the Basin Plan
- an assessment is made as to whether the cumulative excess take is equal to or more than 20 percent of the relevant sustainable diversion limit

Section 6.12(2)(a) of the Basin Plan allows for the combined limits for Victorian Murray, Kiewa and Ovens SDL resource units to be treated as a single SDL resource unit. Section 6.12(2)(b) of the Basin Plan also allows the combined limits for Goulburn, Broken, Campaspe and Loddon SDL resource units to be treated as a single SDL resource unit.

The volume of annual actual take and the volume of annual permitted take for each form of take for consumptive use in each SDL resource unit will be reported. In addition, the difference between annual actual take and annual permitted take will be reported at the SDL resource unit scale as well as for the combined SDL resource units for the purposes of determining overall compliance with the SDL across those areas.

This means that when reporting compliance with SDLs, the Victorian Murray water resource plan area will include the resources of the Ovens SDL resource unit and the Northern Victoria water resource plan area will exclude the Ovens SDL resource unit. Victoria's obligation is to ensure that water taken does not exceed these limits:

- combined Victorian Murray sustainable diversion limit
- combined Northern Victoria sustainable diversion limit
- Goulburn-Murray groundwater sustainable diversion limit

The Murray-Darling Basin Authority is required to publish a register of the amount of water taken each year across the basin. Further information on this process and how MDBA and basin states will respond to non-compliance with sustainable diversion limits can be found in *Sustainable Diversion Limit Reporting and Compliance Framework – Summary* (Murray-Darling Basin Authority, 2018).

3. Surface water

3.1 Determination of permitted and actual take

Under section 10.10(1) of the Basin Plan, Victoria's North and Murray Water Resource Plan is required to set out the method for determining permitted take for each form of take in the water resource plan areas.

Section 6.10 of the Basin Plan defines permitted take to be the maximum volume of water permitted to be taken by each form of take for consumptive use from the sustainable diversion limit resource unit. Section 6.10 defines actual take as the sum of the volume of water actually taken by each form of take for consumptive use from the SDL resource unit.

Permitted take is determined for each form of take using the methods detailed here. The method for determining permitted take will be applied at the end of each water accounting period (yearly), using the best available information at the time.

The Victorian Murray water resource plan area and the Northern Victoria water resource plan area consider the following forms of take:

- take from a regulated river (excluding basic rights)
- take from a watercourse (excluding basic rights)
- take from a regulated river under basic rights
- take from a watercourse under basic rights
- take by runoff dams (excluding basic rights)
- take by runoff dams under basic rights
- net take by commercial plantations

Actual take is the water diverted or taken by water users from the resource or system to be stored or used. **Chapter 15** Measuring and monitoring of the Victoria's North and Murray Water Resource Plan Comprehensive Report discusses actual take and how take is metered or measured.

Section 10.15 of the Basin Plan requires that Victoria's North and Murray Water Resource Plan sets out how the volume of water actually taken for consumptive use will be determined for each form of take within each SDL resource unit.

Actual take must be assessed against permitted take and the difference is recorded as either a debit or credit. The cumulative volume of water actually taken cannot exceed or equal a debit of 20 percent of the sustainable diversion limit.

3.1.1 Methods

The following sections provide a summary of the water management framework and assessment tools used to determine actual take and permitted take for above forms of take. **Table 6** outlines the methods used for determining actual and permitted take for each form of take in the Northern Victoria water resource plan area and the Victorian Murray water resource plan area.

Where the form of take relates to take under a Victorian entitlement (water access right), the Victorian water management framework has measures in place to make sure that actual take during the accounting period responds to water availability during that same period. These mechanisms are outlined below.

For forms of take that rely on the estimation of use because they are not actively monitored, and take is not metered, the tools used to estimate the volume of actual use are also outlined here.

Basin Plan s10.10(1) & s10.15(1)

Table 6: Methods for determining permitted take—surface water

Item	Form of take	Permitted take (accredited text for 10.10(1))	Actual take (accredited text for 10.15(1))	Best available information
	This method applies to the following SDL resource units: Victorian Murray (SS2) and Kiewa (SS3) located in the Victorian Murray water resource plan area and Ovens (SS4) located in the Northern Victoria water resource plan area			
1	Take from a watercourse (excluding basic rights) – modelled component	The method used for determining permitted take from a regulated river (excluding basic rights) in the Victorian Murray (SS2), Kiewa (SS3) and Ovens (SS4) SDL resource units includes the Source Murray Model which was developed by: • Updating the BDL model with known operating changes since 30 June 2009 (note: where no recovery is included, this is equivalent to the BDL) • Scaling modelled diversions to match the BDL minus recovery included in the model The Source Murray Model will be used at the end of each year as follows: 1. extend the inputs (inflows, rainfall, evaporation and demands) to 30 June, being the end of the last water accounting year 2. run the model from 1 July 2019 to the end of the last water accounting year by initialising the simulation with recorded storage volumes at the end of June 2019 3. determine the annual permitted take using the consumptive diversions calculated by the model and adjusting it for: • any water recovery not included in the model using a scaling method that accounts for different entitlement types; • an annualised adjustment of any incomplete water recovery; • an annualised adjustment for the volume of water achieved through supply contribution • an annualised adjustment for the volume of water achieved through efficiency measures; and • adjusting for any actual net temporary trade volume into the SDL resource unit from the Victorian Water Register.	The actual take is the sum of all diversions taken under an entitlement from a regulated river excluding take of environmental water held (or HEW) by VEWH and CEWH as recorded in the Victorian Water Register as of 30 June in each year.	The model is based on policy and operating rules that are applicable from 1 July 2019 and is therefore consistent with the other provisions of the water resource plan, see *Source Murray Model - method for determining permitted take* (MDBA 2019).

Item	Form of take	Permitted take (accredited text for 10.10(1))	Actual take (accredited text for 10.15(1))	Best available information
	This method applies to the following SDL resource units: Goulburn (SS6), Broken (SS5), Campaspe (SS7) and Loddon (SS8) located in the Northern Victoria water resource plan area			
2	Take from a regulated river (excluding basic rights)	The method used for determining permitted take from a regulated river (excluding basic rights) in the Goulburn (SS6), Broken (SS5), Campaspe (SS7) and Loddon (SS8) SDL resource units includes a WRP model which was developed by: • Updating the BDL model with known operating changes since 30 June 2009 (reserve rules, carryover and change in storage volume) • Scaling modelled diversions to match the BDL minus recovery included in the model (note: where no recovery is included, this is equivalent to the BDL) The WRP model will be used at the end of each year as follows: 1. extend the inputs (inflows, rainfall, evaporation and demands) to 30 June, being the end of the last water accounting year 2. run the model from 1 July 2019 to the end of the last water accounting year by initialising the simulation with recorded storage volumes at the end of June 2019 3. determine the annual permitted take using the consumptive diversions calculated by the model and adjusting it for: – any water recovery not included in the model using a scaling method that accounts for different entitlement types; – an annualised adjustment of any incomplete water recovery; – an annualised adjustment for the volume of water achieved through supply contribution – adjusting for the volume of water achieved through efficiency measures; and – an annualised adjustment for any actual net temporary trade volume and any back-trade of legacy exchange rate trade that has occurred since 30 June 2009 but not included in the model, into the SDL resource unit, as recorded on the Victorian Water Register.	The actual take for the Northern Victoria (surface water) water resource plan area is the sum of all diversions taken under an entitlement from a regulated river excluding take of environmental water held (or HEW) by VEWH and CEWH as recorded in the Victorian Water Register as of 30 June in each year.	The model is based on policy and operating rules that are applicable from 1 July 2019 and is therefore consistent with the other provisions of the water resource plan. See *Hydrologic Models for Basin Plan Compliance in the Northern Victoria Water Resource Plan Area* (DELWP, 2019). The method described in column 2 will be used to determine annual permitted take until better information is available to allow WRP conditions to be modelled to a satisfactory level of certainty. The adjustment for environmental water recovery includes a 30 ML take and use licence that was recovered in the Campaspe SDL resource unit.

Item	Form of take	Permitted take (accredited text for 10.10(1))	Actual take (accredited text for 10.15(1))	Best available information
	This method applies to the Goulburn, Broken, Loddon and Campaspe SDL resource units in the Northern Victoria water resource plan area and the out of model component for the Victorian Murray SDL resource unit in the Victorian Murray water resource plan area			
3	Take from a watercourse (excluding take under basic rights) – out of model component	Determined as the sustainable diversion limit. Where the SDL is equal to the BDL.		The method will be used for two years whilst Victoria undertakes a review of a more accurate method of determining permitted take from a watercourse (excluding basic rights). It is not cost effective or fit for purpose to develop a simulation model for the small volume of the SDL that applies to this form of take. Until Victoria can determine a more appropriate and cost-effective method for determining permitted take from a watercourse (excluding basic rights) that recognises adjustments under bans and restrictions it is proposed that the permitted take and actual take is equal to the sustainable diversion limit. Annual actual take from the Victorian Water Register will continue to be reported under section 71 reporting requirements. The SDL is equal to the BDL as there is only a small volume of water recovered from this form of take – a 30 ML take and use licence in the Campaspe SDL resource unit which will be accounted for in take from a regulated river (excluding basic rights), see item 2 above. The Basin Plan BDL was estimated using long-term average take data for the period between 1997-98 to 2009-10. This method will also be considered as part of the two-year review to assess whether a better, more robust and cost-effective method is available. In the interim, the total volume of the combined BDL for this form of take will not increase from the Basin Plan BDL, but will be reapportioned between the Goulburn, Broken, Loddon and Campaspe SDL resource units based on recent actual take data from the last three years. The Victorian Murray BDL for this form of take was estimated as 5.5 GL/year and will remain the same in the interim, but will also be subject to the review.

Item	Form of take	Permitted take (accredited text for 10.10(1))	Actual take (accredited text for 10.15(1))	Best available information
				Given that advice from MDBA regarding the appropriateness of the method was not provided until late 2018 Victoria has agreed to a two-year review period within which a new more appropriate method will be developed. The adoption of the interim method does not; • limit the ability of a holder of a take and use licence to utilise their entitlement during the two-year review process • prejudice Victoria from identifying a method on review that would enable the accumulation of credits if actual take is below what would be permitted in a given year • prejudice Victoria from adopting a method in two years which may result in an increased BDL • prevent a revised SDL compliance assessment to be undertaken of the period since 1 July 2019, once a revised BDL and permitted take method is agreed (consistent with the MDBA's SDL reporting and compliance framework).

Item	Form of take	Permitted take (accredited text for 10.10(1))	Actual take (accredited text for 10.15(1))	Best available information
Methods apply to the Goulburn, Broken, Loddon, Campaspe and Ovens SDL resource units in the Northern Victoria water resource plan area and the Victorian Murray and Kiewa SDL resource units in the Victorian Murray water resource plan area				
4	Take from a regulated river under basic rights Take from a watercourse under basic rights	Estimated as the sum of: a) a modelled estimate of the volume of water taken from freehold land and Crown frontage based on estimated domestic demand of 0.3 ML/house/year and stock drinking water of 0.03 ML/year/per ha of land grazed; and b) an estimate of the volume of expected water demand under section 8A of the Victorian Water Act where the Traditional Owners have a natural resource agreement under the *Traditional Owner Settlement Act 2010*.		This is the baseline diversion limit (BDL) method. Water taken under this form of take can only be used for stock and domestic or in accordance with a section 8 right and represents a relatively consistent pattern of use compared to commercial uses of water. As such, the volume of water taken is not expected to vary greatly from year to year. The method to determine annual permitted take is based on estimates of the long-term average of water taken each year having regard to the water resources available in the water accounting period. This is explained in Stock and Domestic Water Use Modelling Resource Manager's Handbook (RMCG, 2011) and is based on best available information. The modelled estimate uses the upper limit to account for the uncertainty in domestic and stock estimates. The method for determining permitted take and actual take is fit-for purpose for this form of take. The data and information used in the model will be reviewed five yearly, to determine whether it is still the best available. For example, GIS modelling used to determine the number of properties with access to a main waterway will be reviewed to account for any subdivisions. To date there has been no water taken under section 8A of the Victorian Water Act in the Northern Victoria water resource plan area. For this reason, an estimate has been made of the expected demand for the Northern Victoria water resource plan area or the Victorian Murray water resource plan area. Further work is being undertaken in response to Part 14 of Chapter 10 of Basin Plan to build capacity of Aboriginal communities and explore how section 8A can be utilised. As the level of take increases the method will be reviewed to consider whether it needs to be amended. Where take under basic rights increases to a level that may impact on compliance with sustainable diversion limits, section 10.13 of the Basin Plan applies (for more information see **Chapter 9** of Victoria's North and Murray Water Resource Plan Comprehensive Report). Note: no water recovery applies to this form of take.

Item	Form of take	Permitted take (accredited text for 10.10(1))	Actual take (accredited text for 10.15(1))	Best available information
5	Take by runoff dams (excluding basic rights)	Sum of the total volume of licences and registrations associated with runoff dams based on the volume of existing entitlements in the Victorian Water Register as at July 2016. Note: Total volume of licences and registrations refers to the maximum volume authorised to be taken under take and use licences and registration licences.		This is the baseline diversion limit method. The method for determining permitted take and actual take is fit-for-purpose for this form of take and has appropriate regard to the water resources available in the water accounting period for this form of take. This is the volume of existing entitlements as at 30 June 2009 based on data from the Victorian Water Register as at July 2016. Information on the register is considered to be the best available information regarding entitlements in Victoria, and no further licences or registrations for runoff dams have been issued since 30 June 2009. Further information on runoff dams can be found in **Chapter 11** on Interception in the Victoria's North and Murray Water Resource Plan comprehensive report. Bulk entitlements are not included as no bulk entitlements have been issued for this form of take in the Northern Victoria water resource plan area or the Victorian Murray water resource plan area. Note: no water recovery applies to this form of take.

Item	Form of take	Permitted take (accredited text for 10.10(1))	Actual take (accredited text for 10.15(1))	Best available information
6	Take by runoff dams (basic rights)	Estimate is based on modelling using the number and volume of dams shown in aerial imagery as at 2005, adjusted by subtracting the volume of runoff dams which are associated with entitlements which are not basic rights to ensure these are fully excluded. Entitlement information was adopted as given in the Victorian Water Register as at July 2016.		The methods are the same as the baseline diversion limit method. As forecast information is not reliable at the present time and introduces additional uncertainty into the estimate, the 2005 aerial imagery is considered to be the best available information for the BDL estimate. This is the volume of existing entitlements as at 30 June 2009 based on data from the Victorian Water Register as at July 2016. Information on the register is considered to be the best available information regarding entitlements in Victoria, and no further licences or registrations for runoff dams have been issued since 30 June 2009. Changes in the extent of runoff dams within the Northern Victoria water resource plan area or the Victorian Murray water resource plan area will be determined using aerial imagery periodically at least every 10 years. This information is proposed to be reviewed at least every 10 years as part of the review of Victoria's sustainable water strategies and the plan will be amended as required to reflect any update in the method. Water taken under this form of take can only be used for stock and domestic purposes under section 8 rights, or where a section 8A right applies, and represents a relatively consistent pattern of use compared to commercial uses of water. As such, the volume of water taken is not expected to vary greatly from year to year, and the method for permitted take uses the long-term averages taken. The method for determining permitted take and actual take is fit-for-purpose for this form of take. For more information see **Section 11.4.1** and **Section 11.4.2** of the Comprehensive Report. Note: no water recovery applies to this form of take.

Item	Form of take	Permitted take (accredited text for 10.10(1))	Actual take (accredited text for 10.15(1))	Best available information
7	Net take by commercial plantations	Net take is estimated as the difference between the long-term average rate of evapotranspiration from commercial plantations that were present as at 30 June 2009 and from the vegetation type that was thought to be present before the commercial plantations were established. The long-term average rate of evapotranspiration is estimated using the SoilFlux model (HARC, 2016), (Jacobs, 2016). The long-term average rate of evapotranspiration from commercial plantations present in 2009 was estimated by using the SoilFlux model with the following inputs: • areas of plantations present as at 2009 using data from the Victorian Land Use Information System (VLUIS) dataset 2009 and improved using aerial imagery and plantation industry data. This is considered the best available data of current commercial plantation conditions and best available evidence suggests that this has not changed between June 2009 and June 2016. • climate data between 1961 and 2016 from the Bureau of Meteorology The long-term average rate of evapotranspiration from plantations present before the commercial plantations were established was estimated by using the SoilFlux model with the following inputs: • Estimated land use types present prior to establishment of plantations present in 2009 using nearby land use data from the Victorian Land Use Information System (VLUIS) dataset and expert judgement. • climate data between 1961 and 2016 from the Bureau of Meteorology.		The methods are the same as the baseline diversion limit method. Victoria's estimate is based on modelling recently undertaken by DELWP, whereas the Basin Plan volume was an estimate prepared by the MDBA. The method is based on the SoilFlux model, (HARC, 2016), (Jacobs, 2016), which is considered to be the best available information. Changes in the extent of plantations within Northern Victoria water resource plan area or the Victorian Murray water resource plan area will be determined using information that is provided on an annual basis by the managers and owners of large plantation estates for bushfire and emergency management purposes. This information will be reviewed every ten years subject to any significant changes in the industry which would cause a review to occur earlier. Take by this form is relatively consistent from year to year, and the method uses the long-term average rate of evapotranspiration to calculate take. The method has appropriate regard to the water resources available in the water accounting period. Note: no water recovery applies to this form of take.

3.1.2 Consistency with permitted take method

Section 10.15(3) of the Basin Plan also requires that the determination of actual take where it is estimated is done consistently with the method used to determine permitted take. **Table 6** identifies the methods for actual and permitted take. For all forms of take where actual take is estimated, the same method is used to determine permitted take.

3.1.3 Managing forms of take under methods for permitted take

3.1.3.1 Take from regulated rivers (excluding under basic rights)

This form of take accounts for the largest proportion of total surface water take in the Northern Victoria water resource plan area and the Victorian Murray water resource plan area. This discussion also applies to modelled component of take from a watercourse (excluding basic rights).

There are seven declared water systems covered in the water resource plan areas, the Murray, Ovens, Broken, Goulburn, Campaspe, Bullarook and Loddon. These systems have been declared in accordance with section 6A of the Victorian Water Act.

In a declared water system, individual water rights and take and use licences have been converted into unbundled entitlements, which means individuals hold water shares, water-use licences or water-use registrations, and works licences or delivery shares.

Goulburn-Murray Water (GMW) is the Authority appointed under section 64GA of the Victorian Water Act to make seasonal determinations in these systems. GMW is responsible for determining the volume of water available to entitlement holders each year in the regulated river systems of the Victorian Murray water resource plan area and the Northern Victoria water resource plan area.

Seasonal determinations are made by Goulburn-Murray Water regularly throughout the season and these inform entitlement holders of the percentage of their entitlement that is available to them in the current year.

Seasonal determinations are based on a water budget which accounts for how much water is in the dams and the expected inflows over a planning period. It also accounts for the volume of water already allocated (i.e. in the current year, carried over from previous years, or water held in inter-valley trade accounts), losses from storages, river and channels, passing flows, reserves for the following year and supplements.

The method for making seasonal determinations is set out in Goulburn-Murray Water's bulk entitlements for each system.

Detailed calculation methods are set out for the larger systems as:

- Murray System: Schedule 3 of Bulk Entitlement (River Murray – Goulburn-Murray Water) Conversion Order 1999
- Goulburn System: Schedule 8 of Bulk Entitlement (Eildon-Goulburn Weir) Conversion Order 1995
- Loddon System: Schedule 4 of Bulk Entitlement (Loddon System – Goulburn-Murray Water) Conversion Order 2005

In the Goulburn and Murray systems, an early reserve exists to improve the security of system operations. Under the early reserve rule for each system, when seasonal determinations against high-reliability water shares for the current season reach 30 percent, half of the further resource improvements are reserved for the following season until specific volumes are set aside. The volume is 270 GL in the Goulburn system and 218 GL in the Murray system. This water is set aside for the following year's water balance.

In the Campaspe and Loddon systems, if full allocation to high-reliability entitlements is possible where the seasonal determination is 100 percent high-reliability water shares, the water budget is calculated over a two-year period. This means inflows and commitments to the end of the following season are considered. This is a less secure reserve than the Goulburn and Murray systems, but it creates some reserves to secure operating water the following year if conditions turn dry.

In the Broken and Bullarook systems, once seasonal determinations reach 100 percent high-reliability water shares, additional resource is attributed to increasing allocation of low-reliability water shares, up to 100 percent.

Victoria's seasonal determination policy is where possible to secure the following year's allocation of high-reliability entitlements before making seasonal determinations to low-reliability entitlements. The security of our high-reliability entitlements has supported the development of high-value irrigated agriculture in Victoria.

These methods are replicated in the models used as part of the method for determining annual permitted take at the end of each year, and this is how the method responds to water availability as required under section 10.10(2) of the Basin Plan.

Method and models for Victoria's North and Murray water resource plan

Hydrological models are used as part of the method for determining permitted take from regulated rivers (excluding basic rights) and the modelled component of take from a watercourse (excluding basic rights). The models are further described in the methods for determining permitted take in **Table 6** and the key model runs are listed in **Table 7**. The models are run at the end of the water accounting period to determine the consumptive diversions expected under the observed climate conditions. The Source Murray Model is used as part of the method for the Ovens and Kiewa SDL resource units and the modelled component for the Victorian Murray SDL resource unit. The Source Murray Model uses a regression equation based on diversions and climatic variables for the Kiewa SDL resource unit and Ovens REALM model outputs for the Ovens SDL resource unit.

The REALM Goulburn/Broken/Coliban/Campaspe/Loddon (GBCCL) model is used as part of the method for the Goulburn, Broken, Lodon and Campaspe SDL resource units.

Adjustments are made to the modelled diversions to determine the annual permitted take. This includes adjusting for trade and water recovered for the environment, including any offsets. The models and methods are explained further in the following sections and in **Table 6**.

Method for Victorian Murray, Kiewa and Ovens SDL resource units

The Source Murray Model has been developed in consultation with the Murray-Darling Basin Authority and other Basin States for the modelled component of the Victorian Murray, Kiewa and Ovens SDL resource units. The model has been developed using the eWater Source modelling platform for the water resource plan areas that cover the Murray and Lower Darling River systems (see MDBA, 2019).

Method for Goulburn, Broken, Campaspe and Loddon SDL resource units

Victoria has developed an interim water resource plan model (interim WRP model) for the Goulburn, Broken, Campaspe and Loddon SDL resource units, using the REALM modelling platform. (see DELWP, 2019). At the time of accrediting the Victoria's North and Murray Water Resource Plan, there were uncertainties in modelling some projects that were still in progress, such as Goulburn-Murray Water Connections Project and New Goulburn Constraints Measure. Additionally, there was uncertainty in how recovered environmental water would be used.

Both the Source Murray Model and the GBCCL REALM model are 'interim WRP models' as further information is required to model water resource plan conditions. Until the better information is available to allow these conditions to be modelled to a satisfactory level of certainty, the method for determining permitted take uses a version of the WRP model developed from the BDL model. The model will reflect the best available knowledge of water resource plan conditions post 30 June 2019, but without Basin Plan water recoveries. It may include some Basin Plan water recoveries if these are deemed to have been recognised and/or formalised, and modelling details for these recoveries have been agreed upon at the time of application of this method. The model will have average annual diversions under historical climate conditions equal to the baseline diversion limit if no water recovery is included, or equal to the BDL adjusted for modelled water recoveries if some are included. This model can be used to determine annual permitted take through the appropriate scaling of modelled diversions to adjust for water recoveries not included in the model.

Any changes to infrastructure or operational rules that impact on the application of the model to adequately determine permitted take during the life of the Victoria's North and Murray Water Resource Plan will be considered in accordance with the review process outlined at **Section 1.7** of the Comprehensive Report.

Table 7: Model runs documented in the modelling technical reports

Run description	Key files^	Model run period	Analysis period
Model for the Victorian Murray, Kiewa and Ovens SDL resource units			
Interim WRP model	Software: Source 4.8.0.b8359 Beta Model: River Murray 4.8.0.rsproj Run no.: WRP Scenario 9486	July 1891–June 2018	July 1895 – June 2009
Interim BDL model	Software: Source 4.8.0.b8359 Beta Model: River Murray 4.8.0.rsproj Run no.: BDL Scenario 9484	July 1891–June 2018	July 1895– June 2009
Model for the Goulburn, Broken, Campaspe and Loddon SDL resource units			
Interim WRP model	Goul1934.sys L934.scn L934.log	July 1891–June 2018	July 1895 – June 2009
Interim BDL model	GoulV931.sys O935.scn O935.log	July 1891–June 2018	July 1895 – June 2009

^ Note: the WRP model is subject to improvement as better information becomes available. The model run above reflects the best available information at the time Victoria's North and Murray Water Resource Plan was accredited.

3.1.3.2 Take from watercourses that are not regulated rivers (excluding basic rights)

This form of take relates to take from unregulated rivers (excluding basic rights).

It includes take by small urban water supply systems and take and use licensees. The authorisation to take water under bulk entitlement is for urban water supply is based on full utilisation of each entitlement, however these instruments do specify rules that limit take that can respond to water availability year to year, including:

- minimum passing flows to be met before diversions can occur, and in some cases the months of the year when no diversion is permitted
- capacity of on-stream storage
- maximum rates of diversion
- volumetric limits on take

Take and use licences are used to authorise the take and use of water by individual water users from the system. A total of 27,869 ML is authorised to be taken under take and use licences issued to individuals on various unregulated watercourses in the Victorian Murray water resource plan area and 49,890 ML in the Northern Victoria water resource plan area (these volumes exclude the amount determined to be associated with take from runoff dams). Similar to bulk entitlements, while full utilisation is assumed when authorising take under these instruments, take and use licence holders are required to comply with rosters, bans or restrictions. These rosters, bans and restrictions are articulated in either local management plans or water supply protection area water management plans.

The interim method for determining permitted take and actual take is outlined in **Table 6**. The existing simulation models for systems in Victoria's North and Murray water resource plan area do not include take on these unregulated streams, for Goulburn, Broken, Campaspe, Loddon SDL resource units and for a portion of the Victorian Murray SDL resource unit.

Victoria does not support the development of a new simulation model suitable for determining annual SDL compliance for this component of take because of the high cost for a very limited return.

Incorporating rules that apply to bulk entitlements and take and use licences that affect the rate and volume of water that can be diverted in response to water availability is difficult due to the varied nature in which they are applied. In late 2018 the MDBA advised that Victoria's proposed method of using total entitlement volume to determine permitted take was not appropriate. Therefore alternative approaches must be investigated to determine the most appropriate method for determining permitted take.

Until Victoria can determine a more appropriate and cost-effective method for determining permitted take for the out of model component of take from a watercourse (excluding basic rights) that recognises adjustments under bans and restrictions it is proposed that the permitted take method is the same as the sustainable diversion limit.

By setting permitted and actual take equal to the sustainable diversion limit, Victoria will not be able to accumulate credits under SDL reporting for water not taken under the SDLs year to year until the method is updated. This is appropriate given the alternative method of using total entitlement volume is not reflective of adjustments that are made during the year to respond to water availability and therefore may result in the accumulation of credits in years of low availability when the water could not actually be taken.

This approach also reflects that the BDL and SDL methods also need to be revised to determine a more accurate means of representing levels of take as at 2009 for this form of take. The BDLs in the Basin Plan were determined using actual take data from the period between 1997-98 to 2009-10. The total volume of the Basin Plan BDLs for Goulburn, Broken, Loddon and Campaspe

SDL resource units has been reapportioned to better align with recent actual take data for accounting purposes. Adopting the interim method does not limit the ability of a holder of a take and use licence to utilise their entitlement during the two-year review process.

Accreditation of the interim method does not prejudice Victoria from identifying a method on review that would enable the accumulation of credits if actual take is below what would be permitted in a given year, or that would result in an increased BDL. The interim method will be reviewed in two years. The review will allow for the permitted take method to be an annual representation of the sustainable diversion limit. The SDL will equal the BDL, and the BDL will be revised to determine the best representation of water available under unregulated bulk entitlements and take and use licences based on the quantity of water that could be taken under State water management law as at 30 June 2009.

3.1.3.3 Take from a regulated river and watercourses under basic rights

Basic rights are defined under the Basin Plan to include rights to take water for domestic and stock purposes and Traditional Owner rights. Under Victorian legislation, basic rights are prescribed in section 8 of the Victorian Water Act and Traditional Owners' rights are described in section 8A of the Victorian Water Act.

Under section 8, waters users have a right to take water, free of charge, from a waterway for domestic and stock purposes under prescribed circumstances. In general terms, a person can exercise that right if they occupy the land over which the water is flowing, or their land is next to a waterway of which the bed and banks remain the property of the Crown. See **Chapter 7** of the Comprehensive Report for more detail on basic rights.

The right of Traditional Owners to take water under section 8A where the Traditional Owners have a natural resource agreement under the *Traditional Owner Settlement Act 2010* aligns with the requirements under section 8 regarding the circumstances in which the right can be exercised.

Traditional Owner rights to take water under section 8A are outlined in more detail in **Chapter 7** of the Comprehensive Report. At the time of producing this report there are no circumstances of Traditional Owner groups exercising this right in the Northern Victoria water resource plan area. However, this may change as a result of the implementation of the Aboriginal Water policy outlined in *Water for Victoria*.

Take under basic rights is generally not metered and the volume of take is difficult to estimate precisely. Take under this right may be metered in circumstances where bores or pumps are used to take water for other purposes under an entitlement, along with water taken under domestic and stock rights. In these cases, a meter may be attached to the works. However, where the works provide only for take for domestic and stock rights there is no requirement to install a meter to monitor volumes of take.

While take under this right is not metered, the total take is relatively small. Water taken under this right cannot be used for commercial purposes and most of the regulated parts of the Northern Victorian rivers and their tributaries are covered by a Crown Reserve. As a result the landowners who are separated from the waterway by Crown land are not eligible to exercise the right under section 8 of the Victorian Water Act.

Also because of irregular seasonal flows in this region, the majority of stock and domestic take in these circumstances is likely to be harvested and stored in runoff dams, which are already included as a separate form of take.

3.1.3.4 Take by runoff dams (excluding basic rights)

Runoff dams, often referred to in Victoria as small catchment dams, are small dams not located on a defined watercourse. Runoff dams used for commercial and irrigation purposes are required to be licensed or registered in Victoria. Refer to **Chapter 11** of the Comprehensive Report for further details on runoff dams.

Some hydrological modelling of this form of take was done as part of addressing take by runoff dams under basic rights. Due to significant uncertainties in the modelling, the modelled results were not used. Instead, the recorded entitlement volume was considered to be the best available estimate of the 'long-term annual average limit' of take as required by Schedule 3 of the Basin plan for this form of take.

The annual volume of water authorised to be taken by these runoff dams by individuals is estimated to be 74,200 ML in the Northern Victoria water resource plan area and 9,400 ML in the Victorian Murray water resource plan area. The estimate was obtained from the Victorian Water Register as of July 2016.

3.1.3.5 Take by runoff dams under basic rights

Under section 8 of the Victorian Water Act, occupiers of land may take water free of charge for domestic and stock use under prescribed circumstances. As with other section 8 rights, the take is not required to be metered.

Victoria has estimated the number and volume of runoff dams used for domestic and stock purposes in the Northern Victoria water resource plan area and Victorian Murray water resource plan area, and also the total annual extraction which varies with climatic conditions. These estimates were made from desktop studies and hydrologic modelling using maps and aerial photographs from 2005.

Many dams identified in aerial photographs were already licensed and so were already counted as a different form of take. These licensed dams were separated, based on the data available, to avoid double counting of take.

The annual volume of water authorised to be taken by unlicensed runoff dams used for stock and domestic (basic rights) purposes is 74,000 ML within the Northern Victoria water resource plan area and 11,300 ML within the Victorian Murray water resource plan area.

When estimating the volume of permitted take and actual take for runoff dams under basic rights, the volume determined does not represent a legislative limit for take under section 8 rights. The Victorian Water Act does not set a volumetric limit on the right to take water under section 8. The right to take water under section 8 is limited by the method of access and the purposes for which the water may be used.

3.1.3.6 Net take by commercial plantations

Commercial plantations are a significant industry in the Upper Murray, Kiewa and Ovens valleys, but less so in other valleys in the Victorian Murray and Northern Victoria water resource plan areas. Plantations depend on rainfall and typically occur in regions with more than 600 to 800 mm of annual rainfall (SMEC, 2010). Sufficient rainfall for commercial timber plantations occurs only in the eastern parts of the Victoria's North and Murray water resource plan areas.

Commercial plantations cover an area of 667 km^2 of the Northern Victoria water resource plan area and this plantation area has remained stable since 2009. A small reduction occurred in the Goulburn River Basin, where the area of plantations decreased by 3 km^2 since 2009. In all other areas, there was no change in the area of plantations between 2009 and 2016.

Where a small reduction did occur in the Goulburn River Basin, this change will increase runoff and recharge at a small local scale where plantations have been removed, and therefore reduce interception, depending on what replaces the plantations. Little or no growth in commercial plantations or the scale of existing plantations is expected to occur over the next decade, so interception by commercial plantations is expected to remain equal to 2009 levels.

The effect of commercial forestry plantations on the water balance in the Northern Victoria water resource plan area and Victorian Murray water resource plan area is not accurately monitored and good data is not readily available.

The annual permitted take of water by commercial plantations will be estimated as the difference between the long-term average rate of evapotranspiration from plantations that were present in 2009 and from the vegetation type that was thought to be present before the plantation was established. The long-term average rate of evapotranspiration will be estimated using the SoilFlux model.

The long-term annual average net take by commercial plantations is estimated to be 77,000 ML in the Northern Victoria water resource plan area, and 31,500 ML in the Victorian Murray water resource plan area.

3.2 Accounting for water availability

Section 10.10(2) of the Basin Plan requires the method to be designed to be applied after the end of the relevant water accounting period, having regard to the water resources available during that period.

In respect of take from a regulated river excluding basic rights, the impact of water availability is managed in practice on a monthly basis throughout the accounting period. Water available during the period is accounted for in the models used as part of the method to determine permitted take at the end of the period, based on seasonal conditions in the preceding year and the allocation rules detailed in **Part 3.1.3.1** and **Table 8** of this report.

For take from watercourses (excluding basic rights), the method for determining permitted take is linked to actual take (discussed above in **Part 3.1.3.2**). As actual take adjusts to water availability it is considered the most appropriate method until a more appropriate method is developed that recognises adjustments under bans and restrictions. Actual take in this circumstance will be adjusted by measures that response to water availability (see **Section 6.7** of the Comprehensive Report) or water shortages during extreme dry periods (see **Section 9.3** of the Comprehensive Report).

For all other forms of take, there is no mechanism to allocate or restrict water take on an annual basis and the estimates are based on long-term averages. As a result, the method for permitted take does not take into account water availability on an annual basis.

3.3 Matters accounted for in the permitted take method (10.12)

The matters identified in section 10.12 of the Basin Plan are accounted for in the methods proposed for determining the maximum volume of water that the plan permits to be taken for consumptive use during a water accounting period. **Table 8** outlines how the matters were taken into account (the alphabetical numbering corresponds to the paragraph numbering in section 10.12 of the Basin Plan).

Basin Plan s10.12(1)

Table 8: Matters relating to accounting for water (surface water)

	Section 10.12(1) Basin Plan	How the matters were accounted for by the requirements methods for determining permitted take
(a)	All forms of take from the SDL resource unit and all classes of water access right	For the Northern Victoria water resource plan area and the Victorian Murray water resource plan area all forms of take from each SDL resource unit and all classes of water access rights are accounted for by the methods specified for the purposes of 10.10(1), as detailed in **Part 3.1** of this report. The classes of water access right accounted for by the methods are: • bulk entitlement, environmental entitlement, water share and take and use licence (take from a regulated river and a watercourse) • take and use licence (runoff dams excluding basic rights) • section 8 and section 8A rights to take water (basic rights) For take from regulated rivers (excluding basic rights) and the modelled component of take from a watercourse (excluding basic rights) the relevant water access rights are documented in Source Murray Model - method for determining permitted take (MDBA, 2019) and Hydrologic Models for Basin Plan Compliance in the Northern Victoria Water Resource Plan Area (DELWP, 2019).
(b)	Water allocations that are determined in one water accounting period and used in another, including water allocations that are carried over from one water accounting period to the next (also referred to as carryover)	Carryover applies to take from a regulated river (excluding basic rights). It is enabled in all of the regulated surface water systems of Northern Victoria and Victorian Murray water resource plan areas, except the Ovens SDL resource unit where storages are too small to support carryover. Carryover is accurately accounted for in the model for the form of take being taken from the relevant regulated rivers (see model reports DELWP, 2019 and MDBA, 2019). Under the relevant bulk and environmental entitlements, carryover is accounted for and included when the appointed authority Goulburn-Murray Water makes seasonal determinations (see **Section 7.2.2.5** of the Comprehensive Report). Carryover is not relevant to other forms of surface water take.

	Section 10.12(1) Basin Plan	How the matters were accounted for by the requirements methods for determining permitted take
(c)	For a surface water SDL resource unit, return flows must be taken into account in a way that is consistent with arrangements under the Murray–Darling Basin Agreement immediately before the beginning of the Basin Plan	Return flows are enabled in the regulated rivers of the Northern Victoria and Victorian Murray water resource plan areas under bulk and environmental entitlements held by the VEWH and water corporations. Goulburn-Murray Water, as the Resource Manager in the regulated river systems, is required to approve any return flow credits if the application meets the conditions outlined in the bulk entitlement. Return flows are accounted for and included in the equation used by Goulburn-Murray Water, as the authority appointed to make seasonal determinations. Return flows are accounted for in the models used to determine permitted take from a regulated river (excluding basic rights) and the modelled component of take from a watercourse (excluding basic rights) as described in the model reports (DELWP, 2019 and MDBA, 2019).
(d)	Trade of water access rights	For take from a regulated river (excluding basic rights) and the modelled component of take from a watercourse (excluding basic rights), the models used as part of the method for determining permitted take account for legacy exchange rate trade from the Goulburn (as at 30 June 2009) using the inter-valley trade account and tagged trade from the Goulburn is modelled as an end of system demand. Further information can be found in the model reports (DELWP, 2019 and MDBA, 2019). All other changes to entitlements or allocation as a result of trade is recorded in the VWR and is taken into account in the method used to determine permitted take for both take from a regulated river (excluding basic rights) and take from a watercourse (excluding basic rights). This includes separate accounting of held environmental water (section 10.12(3) of the Basin Plan). The trade of water from consumptive use to HEW or from HEW to consumptive use is not part of the methods used to determine permitted take under section 10.10 of the Basin Plan since the net balance of any disposals or acquisitions of HEW will be used to adjust the cumulative balance of take at the end of the water accounting period, as outlined in section 6.12 of the Basin Plan.

	Section 10.12(1) Basin Plan	How the matters were accounted for by the requirements methods for determining permitted take
(e)	Water resources which have a significant hydrological connection to the water resources of the SDL resource unit	The Kiewa, Ovens, Goulburn, Campaspe and Loddon (Bullarook) rivers are natural waterways that flow into the River Murray. Further, part of the flow in the Broken river may also flow into the River Murray as the Broken River splits at Casey's Weir and the main branch (west branch), the continuation of the Broken River, flows into the Goulburn River and then to the River Murray. The east branch flows north and directly into the River Murray. Surface water transfers via infrastructure from the Goulburn River to the Murray, Campaspe and Loddon Rivers are included in the method for determining permitted take for regulated systems (excluding basic rights). Details of how these matters are accounted for are provided in the model reports (DELWP, 2019 and MDBA, 2019). Details of all significant hydrological connections for the Northern Victoria and Victorian Murray water resource plan areas can be accessed at the Victorian Water Register where there are details in bulk entitlements about supplements and are explained in **Chapter 4** of the Comprehensive Report. For all other forms of take (Items 3-7 of Table 6), the permitted take is equal to the SDL, which is equal to the BDL, and the matter is taken into account when determining the BDL. Consequently, it is unnecessary for this matter to be addressed in the method for these forms of take.
(f)	Circumstances in which there is a change in the way water is taken or held under a water access right	The method used to determine permitted take for regulated rivers (excluding basic rights) and the modelled component of take from a watercourse (excluding basic rights) includes simulation of environmental demand patterns that differ from previous consumptive demand patterns. The impacts of changes in consumptive demand patterns will be taken into account, like a result of any future trade or conversion of additional water savings to held environmental water. This will be done by adjusting permitted take for trade of allocation in a single year or in updates to the method and water resource plan as a result of any permanent changes.

	Section 10.12(1) Basin Plan	How the matters were accounted for by the requirements methods for determining permitted take
(g)	Changes over time in the extent to which water allocations in the unit are used. Note: Paragraph (g) includes what is commonly known as a growth-in-use strategy	Changes over time in the extent to which water allocations in the SDL resource unit are utilised will be addressed through the related provisions in section 10.11(1) which will ensure SDL compliance. Changes to the permitted take method will be given effect consistent with the responses implemented by Victoria. See **Section 9.3.3** of the Comprehensive Report for Victoria's accredited response to section 10.11(1) of the Basin Plan. For take from regulated rivers (excluding basic rights) and the modelled component of take from a watercourse (excluding basic rights), Victoria allocates water in a system based on an assumption of full use and meeting required reserves for the following water year. The total licensed volume of entitlements is included in the models used in the method and the models replicate allocation rules used in the seasonal determinations. Analysis done until now does not indicate any growth in use. Any changes to this will be resolved through the accredited response to section 10.11 of the Basin Plan. The MDBA's reporting and compliance framework allows for further investigation to be undertaken if the cumulative balance of the difference between annual actual take and annual permitted take exceeds 20 percent of the sustainable diversion limit (MDBA, 2018). If the investigation determines an exceedance is the result of increased utilisation under the allocation framework, Victoria will consult with stakeholders on the appropriate corrective actions that are outlined in the accredited response to section 10.11 of the Basin Plan. For example, subsequent allocations could take into account any excess take that must be offset. This is similar to the existing clause in Bulk Entitlement (River Murray - Goulburn-Murray Water) Conversion Order 1999 that requires corrective actions to be implemented to mitigate non-compliance with consumptive diversion limits. For take from watercourses (excluding basic rights), growth-in-use is not expected to impact on SDL compliance using the current interim permitted take method. Consideration of how the revised permitted take method will demonstrate SDL compliance and consider potential growth-in-use responses will inform the two-year review (see **Table 6**). For take under basic rights, where there is growth in use that may affect compliance with sustainable diversion limits, section 10.13 of the Basin Plan applies (for more information see **Chapter 9** of the Comprehensive Report).

	Section 10.12(1) Basin Plan	How the matters were accounted for by the requirements methods for determining permitted take
(h)	Water sourced from the Great Artesian Basin and released into a Basin water resource, by excluding that water.	This matter is not relevant to the Northern Victoria and Victorian Murray water resource plan areas.
(i)	Water resources which are used to manage aquifer recharge.	This matter is not relevant to the Northern Victoria and Victorian Murray water resource plan areas.

3.4 Demonstration of method

Section 10.10(4) of the Basin Plan requires that Victoria's North and Murray Water Resource Plan sets out a demonstration that the method relates to the sustainable diversion limit of each SDL resource unit in such a way that, if applied over a repeat of the historical climate conditions, it would result in the meeting of the SDL for the SDL resource unit. This includes amendments under section 23B of the Commonwealth Water Act.

3.4.1 Take from a regulated river (excluding basic rights)

The methods for determining take from a regulated river (excluding basic rights) and the modelled component of take from a watercourse (excluding basic rights) in **Table 6** are scaled to ensure that under historical climate conditions (1985-2009), the long-term average diversions are equal to the sustainable diversion limit.

The sustainable diversion limit is defined on 30 June of the preceding water year based on the formula in the Schedule 6A of the Basin Plan and published by the MDBA on its website annually. For the purposes of section 10.10(4) and section 10.10(5) of the Basin Plan, the SDL assumes zero efficiency measures have been achieved in the Basin and are set out **Table 3**.

3.4.2 Take from a watercourse (excluding basic rights)

As explained in **Part 2.1.1** and **Part 3.1.3.2**, Victoria is undertaking a review of the method for the out of model component of take from a watercourse (excluding basic rights). Until the review is completed, permitted take and actual take are equal to the sustainable diversion limit, where the SDL is equal to the BDL. Any water recovered from this form of take is captured in the adjustments for take from a regulated river (excluding basic rights).

3.4.3 All other forms of take

In Victoria, the method for determining permitted take is the same method used for determining the sustainable diversion limit, which is equal to the BDL, for all other forms of take. This means that methods are based on the same climate sequences and therefore the permitted take method would always produce the same result as the SDL model. Therefore, the requirement under section 10.10(4) of the Basin Plan is considered satisfied for all forms of surface water take.

Given that Victoria is required to run the method for permitted take on an annual basis, only the long-term average of permitted take can be compared to the sustainable diversion limit to demonstrate compliance with SDLs over the life of the Victoria's North and Murray Water Resource Plan.

Table 9 and **Table 10** identify the same volumes for sustainable diversion limit and long-term average permitted take on the basis that the methods for calculating permitted take and SDL are identified and based on identical climate sequences, and therefore always provide the same result.

Basin Plan s10.10(4)

Table 9: SDL volume and permitted take volume (demonstration under section 10.10(4) Basin Plan) for Victorian Murray water resource plan area

Form of take	Victorian Murray		Kiewa	
	SDL (GL/year)	Long-term average permitted take (GL/year)	SDL (GL/year)	Long-term average permitted take (GL/year)
Take from a regulated river (excluding basic rights) and modelled component of take from a watercourse (excluding basic rights)	See Part 3.4.1			
Take from a watercourse (excluding basic rights) – out of model component	5.5*	5.5*	n/a	n/a
Take from a waterway under basic rights which includes: • take from a regulated river under basic rights • take from a watercourse under basic rights	8.2	8.2	1.0	1.0
Take by runoff dams (excluding basic rights)	4.8	4.8	4.5	4.5
Take by runoff dams under basic rights	7.6	7.6	3.7	3.7
Take by commercial plantations	24.2	24.2	7.3	7.3

** these volumes are subject to a two-year review as explained in Part 3.1.3.2 and Table 6.*

Basin Plan s10.10(4)

Table 10: SDL volume and permitted take volume (demonstration under section 10.10(4) Basin Plan) for Northern Victoria water resource plan area

Form of take	Ovens		Goulburn		Broken		Campaspe		Loddon	
	SDL (GL/year)	Long-term average permitted take (GL/year)	SDL (GL/year)	Long-term average permitted take (GL/year)	SDL (GL/year)	Long-term average permitted take (GL/year)	SDL (GL/year)	Long-term average permitted take (GL/year)	SDL (GL/year)	Long-term average permitted take (GL/year)
• Take from a regulated river (excluding basic rights) and; • the modelled component of take from a watercourse (excluding basic rights)	*See* **Part 3.4.1**									
Take from a watercourse (excluding basic rights) - out of model component	n/a	n/a	18.3*	18.3*	2.9*	2.9*	0.9*	0.9*	8.9*	8.9*
Take from a waterway under basic rights which includes: • take from a regulated river under basic rights • take from a watercourse under basic rights	2.9	2.9	6.3	6.3	1.6	1.6	1.6	1.6	4.8	4.8
Take by runoff dams (excluding basic rights)	12.5	12.5	27.1	27.1	10.4	10.4	6.1	6.1	18.1	18.1
Take by runoff dams under basic rights	12.4	12.4	24.4	24.4	6.3	6.3	14.4	14.4	16.6	16.6
Take by commercial plantations	32.5	32.5	22.4	22.4	14.9	14.9	1.8	1.8	5.5	5.5

** these volumes are subject to a two-year review as explained in* **Part 3.1.3.2** *and* **Table 6**.

4. Groundwater

4.1 Determination of permitted take and actual take

4.1.1 Permitted take

Under section 10.10(1) of the Basin Plan, Victoria's North and Murray Water Resource Plan is required to set out the method for determining permitted take for each form of take in the water resource plan area. The method for determining permitted take must be applied at the end of each accounting period (yearly). Actual take must be assessed against permitted take to ensure that the volume of water actually taken during the year does not exceed permitted take and therefore will not exceed the sustainable diversion limit.

The Basin Plan at section 6.10 defines permitted take to be the maximum volume of water permitted to be taken by each form of take for consumptive use from the SDL resource unit. Section 6.10 defines actual take as the sum of the volume of water actually taken by each form of take for the consumptive use from the SDL resource unit.

The determination of permitted take in the Goulburn-Murray water resource plan area varies depending on the form of take. **Table 8** outlines the methods used for determining permitted take for each form of take in the Goulburn-Murray water resource plan area.

4.1.2 Actual take

Section 10.15 of the Basin Plan requires that a water resource plan set out how the volume of water actually taken will be determined after the end of the water accounting period, using the best information available.

Actual take of groundwater incorporates entitlement use as recorded in the Victorian Water Register and estimates of domestic and stock use (basic rights). The method incorporates information from the register, which is considered to have the most accurate information regarding the inputs into the method.

Water used as part of a Managed Aquifer Recharge (MAR) Scheme is not relevant to the Goulburn-Murray water resource plan area where there are no MAR schemes operating. At such time as MAR schemes do operate this will be incorporated into the accounting of actual take in accordance with the estimated net take of groundwater and surface water.

4.1.3 Managing and determining take in the Goulburn-Murray

In the Goulburn-Murray water resource plan area there are these forms of take:

- take from an aquifer (excluding basic rights)
- take from an aquifer under basic rights

These forms of take are prescribed as 'take from groundwater' under the Basin Plan. For this reason, the tables in this report refer to take from groundwater when providing the methods and volumes for sustainable diversion limit and permitted take to meet Basin Plan requirements.

Victoria uses its Water Register to account for all groundwater entitlements and groundwater use. This public register of all water-related entitlements in Victoria was designed and built to record water entitlements with integrity and provide crucial information for managing the state's water resources.

For the purposes of the Basin Plan requirements for groundwater management and trade, Victoria acknowledges that the state management unit, as defined by the Commonwealth

groundwater trade guidelines, is the Goulburn-Murray water resource plan area. This is made up of the Goulburn-Murray: Highlands SDL resource unit, the Goulburn-Murray: Sedimentary Plain SDL resource unit, the Goulburn-Murray: Shepparton Irrigation Region SDL resource unit and the Goulburn-Murray: deep SDL resource unit. Victoria manages the resource and licensing within Victoria's North and the Murray water resource plan area.

The groundwater management framework is applied by Victoria for accounting and reporting purposes and this does not align exactly with the four Goulburn-Murray groundwater SDL resource units specified in the Goulburn-Murray water resource plan area.

Work is progressing to enable the Victorian Water Register to generate the report on the volume of groundwater taken from each respective SDL resource unit in Victoria's North and Murray Water Resource Plan, including trade and carryover.

The Victorian Government plans to enable reporting at the scale of the water resource plan SDL resource units. This will help with the relevant MDBA trading rules where applicable and reporting on compliance with the Basin Plan SDL resource units for groundwater in the future.

4.1.3.1 Take from an aquifer (excluding basic rights)

Take from an aquifer is managed through Victoria's entitlement framework, except where it is under a basic right, and a water user must hold a take and use licence and a works licence to take water from an aquifer. The works licence regulates the construction, use, maintenance and alteration of the bore used to extract groundwater. The take and use licence is the water access right that authorises the maximum volume the user is permitted to take in a year. The take and use licence also prescribes the place at which groundwater may be taken and the time and rate.

These conditions protect other users and the aquifer by regulating how water is extracted by all users, to prevent third party impacts from extraction and to protect the resource and environment.

4.1.3.2 Take from an aquifer under basic rights

Basic rights are defined under the Basin Plan to include rights to take water for domestic and stock purposes and Traditional Owner rights. Basic rights are prescribed in section 8 and 8A of the Victorian Water Act.

Under section 8, water users have a right to take water free of charge from a bore for domestic and stock purposes under prescribed circumstances. In general terms, people or businesses can exercise that right if they own the land on which the bore is located. See **Chapter 7** for detail on basic rights.

Take under section 8 is generally not metered and the volume of take is unknown. Take under this right may be metered in circumstances where bores are used to take water for other purposes under an entitlement, in addition to water taken under section 8. In these cases, a meter may be attached to the works. However, the works only provide for take for domestic and stock rights, there is no requirement to install a meter to monitor volumes of take. Take under basic rights is relatively small because water taken under this right cannot be used for commercial purposes, including irrigation.

The right of Traditional Owners to take water under section 8A aligns with the requirements under section 8 regarding the circumstances in which the right to take can be exercised.

Traditional Owner rights to take water under section 8A are outlined in more detail at **Chapter 7**. At the time of producing this report there are no circumstances of Traditional Owner groups exercising this right in the Goulburn-Murray water resource plan area. However, this may change as a result of the implementation of the Aboriginal Water Policy outlined in *Water for Victoria*.

4.1.4 Methods

The methods for determining permitted take and actual take of groundwater in the Goulburn-Murray water resource plan area apply to the following forms of take in the following SDL resource units:

- Goulburn-Murray: Shepparton Irrigation Region
- Goulburn-Murray: Highlands
- Goulburn-Murray: Sedimentary Plain
- Goulburn-Murray: deep

Basin Plan s10.10(1) & s10.15(1)

Table 11: Methods for determining permitted take and actual take - groundwater

Form of take	Method		Best available information
	Permitted take 10.10(1) Basin Plan	Actual take 10.15(1) Basin Plan	
The methods apply to all groundwater SDL resource units in the Goulburn-Murray water resource plan area			
Take from groundwater (excluding basic rights)	For each SDL resource unit, the permitted take is equal to the SDL as prescribed in schedule 4 of the Basin Plan, minus the annual permitted take for take from groundwater under basic rights.	Determined using entitlement data for all forms of take except basic rights use, on the Victorian Water Register based on the location of licensed and registered bores in the water resource plan SDL reporting area. For unmetered bores less than 20ML, actual take is estimated to be equal to the total volume of the entitlement.	Permitted take for groundwater SDL resource units is determined by the sustainable diversion limit prescribed for the SDL resource unit. Actual take reflects take under entitlements in Victoria as this is how a user is authorised to take water in a given accounting period. Therefore, the water actually taken is equal to the water taken under entitlement for this form of take. The best available information in relation to entitlement use is the Victorian Water Register. This includes metered take under entitlements and estimates for unmetered bores. In Victoria bores greater than 20 ML are metered. For unmetered bores less than 20 ML, actual take is estimated to be equal to the total volume of the entitlement.
Take from groundwater under basic rights	Estimated based on the number of bores in the SDL resource unit less than 30 years old with a rate of 2 ML/year as at 30 June 2009.		This estimate is considered to be based on the best available information. Victoria's assessment of bores and reasonable domestic and stock use identified: • 2 ML/year as a reasonable volume for domestic and stock users and expected to be sufficient on average to allow for any uptake of Traditional Owner rights as permitted under basic rights • 2 ML/year allowance is for a typical size farm and may be adjusted to reflect the property size • bores older than 30 years are considered to be non-functional and are excluded from the estimation.

4.2 Matters accounted for in the permitted take method (10.12)

The matters outlined in section 10.12 of the Basin Plan are accounted for in the methods proposed for determining the maximum volume of water that the plan permits to be taken for consumptive use during a water accounting period (see **Table 12**). The alphabetical numbering corresponds to the paragraph numbering in section 10.12 of the Basin Plan.

Basin Plan s10.12(1)

Table 12: Matters relating to accounting for water (groundwater)

Section 10.12(1) Basin Plan		How the matters were accounted for by the methods requirements for determining permitted take
(a)	All forms of take from the SDL resource unit and all classes of water access right	All forms of take from the SDL resource units and all classes of water access rights are accounted for by the methods specified for the purposes of section 10.10(1) of the Basin Plan. A different method has been developed for each form of take being taken from groundwater (excluding basic rights) and from groundwater under basic rights, as detailed in **Part 4.1** of this report. The classes of water access right accounted for by the methods are: • bulk entitlements • take and use licences (take from groundwater) • section 8 and section 8A rights (take from groundwater under basic rights)
(b)	Water allocations that are determined in one water accounting period and used in another, including water allocations that are carried over from one water accounting period to the next, also referred to as carryover	Carryover of groundwater take is permitted in some groundwater management areas and is recorded in the Victorian Water Register. For groundwater, carryover is accounted for in the year carryover is accumulated. It may be used in the subsequent year (i.e. the actual take for that year). Carryover is accumulated when the actual take for an individual user is less than the licensed take in areas where carryover is allowed. It is limited to a percentage of the entitlement. This percentage is different in different areas and not all areas can have carryover. It cannot be carried over for more than one year. The carryover will always be less than the net take in a given year. Carryover does not affect the method for determining permitted take as permitted take is based on the SDL which is the long-term average sustainable take and carry over is based on a percentage of unused allocation for a licensed entitlement in the reporting period. Carryover is therefore part of the permitted take accounted for in the year carry over is accumulated.

Section 10.12(1) Basin Plan		How the matters were accounted for by the methods requirements for determining permitted take
(c)	For a surface water SDL resource unit, return flows must be taken into account in a way that is consistent with arrangements under the Murray–Darling Basin Agreement immediately before the beginning of the Basin Plan	This matter is not relevant for the Goulburn-Murray water resource plan area.
(d)	Trade of water access rights	Trade is allowed within the SDL resource units which does not affect annual permitted take. Where trade is allowed between the SDL resource units, it is only allowed where it will not exceed the annual permitted take and the requirements of Part 4 of Chapter 10 the Basin Plan. As this does not cause any net change in water availability in the SDL resource unit, accounting for trade in the annual permitted take method is not necessary. ***Between groundwater SDL resource units in the water resource plan area*** Trade of entitlements to take and use groundwater may occur in accordance with the circumstances specified in response to section 10.37 of the Basin Plan (see **Section 7.4.2.8** of Victoria's North and Murray Comprehensive Report). Groundwater is not held under an entitlement for the environment and therefore the requirement in section 10.12(3) is not relevant for the Goulburn-Murray water resource plan area. As permitted take is determined to be equal to the long-term average sustainable limit, trade does affect the method for determining permitted take. All trade is recorded in the Victorian Water Register and will be used to adjust the actual take if any such trade occurs.

Section 10.12(1) Basin Plan	How the matters were accounted for by the methods requirements for determining permitted take
	Groundwater to groundwater connected resources outside the water resource plan area Trade of entitlements to take and use groundwater may occur in accordance with the circumstances specified in response to section 10.38 of the Basin Plan (see **Section 7.4.2.9** of Victoria's North and Murray Comprehensive Report). Groundwater in the water resource plan area is connected to groundwater resources south of the water resource plan area primarily at the southern boundary of the Loddon Highlands water supply protection area which is based on the groundwater flow divide . This is not the same as the surface water flow divide, which is the same as the WRP boundary. Trade across this boundary is not being considered and there is no intention to adjust the permitted take in these circumstances. There are connected aquifers across the boundary with New South Wales in the Lower Murray Alluvium for which trade in future may occur however no mechanisms are in place to facilitate this at this time, and there is no intention to adjust the permitted take in these circumstances. ***Groundwater to surface water connected resources in the water resource plan area*** Trade of entitlements to take and use groundwater may occur in accordance with the circumstances specified in response to section 10.39 of the Basin Plan (see **Section 7.4.2.10** of Victoria's North and Murray Comprehensive Report). Currently, trade between groundwater and surface water SDL resource units only occurs in the Upper Ovens River water supply protection area and volumes of trade between these two SDL resource units is very unlikely to affect the actual take. There is no intention to alter the permitted take method for these cases. See response to 10.12(1)(e) below for further information.

Section 10.12(1) Basin Plan		How the matters were accounted for by the methods requirements for determining permitted take
(e)	Water resources which have a significant hydrological connection to the water resources of the SDL resource unit	***Groundwater to groundwater connected resources outside the water resource plan area*** Goulburn-Murray groundwater SDL resource units have limited connections to water resources outside the Basin Plan area which are predominantly south of the hydrological divide of the Great Dividing Range and is not considered to have a significant hydrological connection for accounting purposes. There is no intent to trade between these resources that would affect compliance with the SDL. The groundwater resources in the Goulburn-Murray: Sedimentary Plain SDL resource unit has a significant hydrological connection to the Ovens surface water SDL resource unit, however, the relatively small volumes extracted from groundwater will be accounted for as groundwater for SDL compliance purposes. The hydraulic connection with the Wimmera Mallee Sedimentary Plain and Highlands SDL resource units are not considered significant for accounting purposes as groundwater flows generally down groundwater catchments and the two WRP areas contain distinct groundwater catchments. For the purposes of groundwater take and there is no intent to trade between these resources that would affect compliance with the SDL of these SDL resource units. There may be significant hydrological connection with New South Wales groundwater resources under the Murray River between Yarrawonga and Echuca adjacent to the Katunga and Lower Campaspe water supply protection areas. Work with New South Wales will assess the degree of connection and if sufficiently connected, whether trade may be allowed and accounting for this for trade purposes and consequences for compliance with the SDL. ***Groundwater to surface water connected resources*** The groundwater resources in the Goulburn-Murray water resource plan area: The Goulburn-Murray: Sedimentary Plain SDL resource unit has a significant hydrological connection to the surface water SDL resource unit where the Calivil formation is outcropping or relatively shallow, particularly in the Upper Ovens River water supply protection area. However, the relatively small volumes extracted from groundwater will be accounted for as groundwater for SDL compliance purposes. There is no intention to account for groundwater take in the permitted take of surface water systems or vice versa.

Section 10.12(1) Basin Plan		How the matters were accounted for by the methods requirements for determining permitted take
		In the Goulburn-Murray: Shepparton Irrigation Region SDL resource unit, groundwater extraction is primarily to protect against saline groundwater discharge and manage salinisation, and efforts are made to minimise groundwater discharge, so while this SDL resource unit is significantly connected to surface water there is no intention to account for groundwater use in the permitted take method for its connected surface water systems. See **Section 4.4** of Victoria's North and Murray Comprehensive Report for further discussion on connectivity of groundwater resources.
(f)	Circumstances in which there is a change in the way water is taken or held under a water access right	This matter is not relevant to the Goulburn-Murray (groundwater) water resource plan area as there are no groundwater environmental entitlements and there are no proposed changes to the way groundwater is taken or held.
(g)	Changes over time in the extent to which water allocations in the unit are used. Note: Paragraph (g) includes what is commonly known as a growth-in-use strategy.	The SDL method for permitted take allows for growth as full utilisation of existing licences is well below the SDL and therefore growth in use is permitted up to this prescribed limit. If growth were to result in the SDL being exceeded, the related provisions in section 10.11(1) will ensure SDL compliance.
(h)	Water sourced from the Great Artesian Basin and released into a Basin water resource, by excluding that water	This matter is not relevant to the Goulburn-Murray water resource plan area as there is no water sourced from the Great Artesian Basin.
(i)	Water resources which are used to manage aquifer recharge	This matter is not relevant for the Goulburn-Murray water resource plan area. Currently there are no managed aquifer recharge schemes operating or proposed in the Goulburn-Murray water resource plan area.

4.3 Demonstration of method

Section 10.10(4) of the Basin Plan requires that Victoria's North and Murray Water Resource Plan set out a demonstration that the method relates to the sustainable diversion limit of each SDL resource unit in such a way that, if applied over a repeat of the historical climate conditions, it would result in meeting the SDL for the SDL resource unit, including as amended under section 23B of the Commonwealth Water Act.

The demonstration or explanation as to how this requirement has been met is outlined in **Table 13** for each method outlined in this report. **Table 11** relates to the methods for determining permitted take for groundwater forms of take.

As Victoria is required to run the method for permitted take on an annual basis, only the long-term average of permitted take can be compared to the SDL to demonstrate compliance with sustainable diversion limits over the life of the plan.

Table 13 identifies the same volumes for SDL and long-term average permitted take on the basis that the methods for calculating permitted take and sustainable diversion limit are identified and based on identical climate sequences, and therefore always provide the same result.

Basin Plan s10.10(4)

Table 13: SDL volume and permitted take volume (demonstration under section 10.10(4) Basin Plan)

Form of take	SDL (ML)	Long-term average permitted take (ML)
Goulburn-Murray: Shepparton Irrigation Region SDL resource unit		
Take from groundwater (excluding basic rights)	241,490	241,490
Take from groundwater under basic rights	2,610*	2,610
Goulburn-Murray: Highlands SDL resource unit		
Take from groundwater (excluding basic rights)	55,590	55,590
Take from groundwater under basic rights	13,110*	13,110
Goulburn-Murray: Sedimentary Plain SDL resource unit		
Take from groundwater (excluding basic rights)	211,454	211,454
Take from groundwater under basic rights	11,546*	11,546
Goulburn-Murray: deep SDL resource unit		
Take from groundwater (excluding basic rights)	20,000	20,000
Take from groundwater under basic rights	0	0

** basic rights estimate from original SDL estimates (2010)*

5. References

DELWP. (2019). *Hydrologic Models for Basin Plan Compliance in the Northern Victoria Water Resource Plan Area*.

HARC. (2016). *User Manual for SoilFlux Tools*. Melbourne: Department of Environment, Land, Water and Planning.

Jacobs. (2016). *SoilFlux User Manual*. Melbourne: Department of Environment. Land, Water and Planning.

Murray-Darling Basin Authority. (2018). *Sustainable Diversion Limit Reporting and Compliance Framework Summary*. Canberra: Murray-Darling Basin Authority.

Murray-Darling Basin Authority. (2019). *Source Murray Model - method for determining permitted take*. Canberra: Murray-Darling Basin Authority

RMCG. (2011). *Stock and Domestic Water Use Modelling Resource Manager's Handbook*.

SMEC. (2010). *Afforestation Risks to Water Resources in the Murray-Darling Basin*. Canberra: Murray-Darling Basin Authority.

6. Schedule 1

6.1 Sustainable diversion limit adjustment mechanism projects

The Murray-Darling Basin Ministerial Council endorsed the final package of environmental works and measures to be included in the sustainable diversion limit adjustment mechanism in June 2017.

The Murray-Darling Basin Authority has been progressively modelling the offsets from all projects from Victoria, New South Wales and South Australia.

Victoria has put forward 22 projects to achieve the Basin Plan's environmental targets without the need for further Commonwealth water buybacks. These projects will contribute significantly to meeting the requirements of the Basin Plan.

Victoria's 22 projects will deliver great outcomes for regional communities with real benefits for local waterways and wetlands along the Murray and its tributaries.

The package of 22 projects includes constraints and rules-based projects and an Enhanced Environmental Delivery Project. It also contains the completed Living Murray Projects already delivering results, including Chowilla Floodplain, Gunbower Forest, Hattah Lakes Environmental Flows, Koondrook-Perricoota Forest Flood Enhancement, Lindsay Island (Stage 1) Upper Lindsay Watercourse Enhancement and Mulcra Island Environmental Flows.

6.2 Environmental works and measures

Environmental works include channels, regulators and pumps that deliver water to priority, high-value sites to meet the needs of plants and animals such as fish, frogs, waterbirds and river red gum and black box woodlands.

Works provide a better outcome for areas of high environmental value, particularly during dry years. They directly deliver the water flows an ecosystem needs that often are not possible under river regulation.

Works can deliver and hold water in specifically targeted areas on the river floodplain that are usually only inundated where there are high flows. This means natural flood-dependent ecological processes can occur, even under regulated river conditions.

These projects aim to improve environmental outcomes at large Murray floodplain areas and key river red gum ecosystems. Water delivery through works improves forest, river and wetland habitats and provides conditions for successful feeding, breeding and migration of native fish, reptiles, birds, frogs and insects.

Environmental works projects include:

Belsar-Yungera Floodplain Management Project

This proposed supply measure will maintain and improve flora and fauna habitat values and provide periodic breeding opportunities for wetland species like fish, frogs and waterbirds. Managed flows will be able to be delivered to 2,370 ha of highly valued floodplain, representing one third of the total area.

The works can be operated flexibly to meet the water requirements of different vegetation localities, mimicking a broad range of River Murray flows of up to 170,000 ML per day (ML/d). By constructing three large regulators, a series of smaller supporting regulators, track raising to form levees and a pipeline to allow use of temporary pumps, this project will connect extensive

floodplain areas through tiered watering events. These works will make use of natural flow paths to increase the extent, frequency and duration of inundation from either Basin Plan flows or pumping during low-flow events.

Burra Creek Management Proposal

The proposed works will enable inundation of 407 ha. This represents 33 percent of the total forest area and almost all of the flood-dependent ecological communities found within the forest, and provides a greater extent of watering than is possible under Basin Plan flows. The works involve the construction of three large regulators, raising tracks to form levees and removing barriers to flow on the floodplain.

Gunbower National Park Floodplain Management Project

The project has been developed to enable the delivery of environmental water to the wetlands and forest of the Gunbower National Park. It will mimic a natural flood of up to 45,000 ML/d in the River Murray across 500 ha. This includes almost half of the permanent and temporary wetlands in the project area and 20 percent of river red gum with flood-dependent understorey seedlings and saplings. The package of works includes a pump station, regulator and creek enhancement works. The mid-forest works will consist of a 100 ML/d pump station located on the Murray and a number of regulators, as well as upgrades to infrastructure on Camerons Creek. This will provide water to around 500 ha of Gunbower National Park which currently cannot be watered by any other infrastructure.

Guttrum and Benwell State Forests Floodplain Environmental Works Project

The project will reinstate a more natural flooding regime for the Guttrum and Benwell Forests and addresses the reduced frequency and length of floods. The proposed works will water 1,200 ha by pump stations off the River Murray, including semi-permanent wetlands and 82 percent of the river red gum forest with flood-dependent understorey seedlings and saplings. The works will include two separate pump stations to deliver environmental water into Guttrum Forest, one pump station in Benwell Forest and containment works of regulators and levees in both forests to contain water on the floodplain. The works have been designed to meet the water requirements of the forest by mimicking a 26,000 ML/d flood event in the River Murray for Guttrum Forest and a 24,000 ML/d flood event for Benwell Forest.

Hattah Lakes North Floodplain Management Project

This project will complement the Living Murray initiative works at the Hattah Lakes Icon Site by boosting flooding across higher floodplain terraces. The proposed works will water an additional 1,130 ha of floodplain by constructing two new regulators, a causeway across an existing track and 1.7 km of levees along track alignments. The project will increase flexible environmental water management across the lakes.

Lindsay Island (Stage 2) Floodplain Management Project

The Lindsay Island Floodplain Project will inundate 5,152 ha of the floodplain. It will connect many parts of the floodplain through tiered watering events, including areas of unique fast-flowing aquatic habitat, through to sections of black box and lignum and onto the higher alluvial terraces. The proposed works will operate alongside the recently completed Living Murray works at this Lindsay State 1 site and Lock 7 to mimic flows of 40,000 to 120,000 ML/d.

The proposed works include two components:

- Primary: Berribee Regulator and fishway, five containment regulators and 2.6 kilometres of levees along track alignments
- Secondary: 13 regulators and associated work and 4.9 kilometres of levees along track alignments

Nyah Floodplain Management Project

The proposed works will water almost 500 ha of floodplain within Nyah Forest, replicating River Murray flows of up to 25,000 ML/d. They will influence over 53 percent of the total forest area and almost all of the flood-dependent plants and animals. The works consist of four regulators, three on the downstream end of Parnee Malloo Creek and one on the upstream end. Extra works to contain water within the forest include 1.7 km of low-level track raising, forming a levee at the downstream end of the forest.

Vinifera Floodplain Management Project

This project will water up to 350 ha of floodplain within Vinifera Forest. It represents 55 percent of the total 638 ha forest area and almost all of the flood-dependent plant species The proposed works involve constructing four regulators and raising 1.1 km of low-level track to control both flood and pumped flows into and out of Vinifera Creek. Water will be delivered to the site through a combination of natural inflows or temporary pumping when river flows are insufficient.

Wallpolla Island Floodplain Management Project

Wallpolla Island is part of the Living Murray Lindsay-Wallpolla Islands Icon Site and proposed works will complement existing Living Murray works at this site. This project will increase the frequency and length of floodplain inundation across 2,650 ha, significantly benefitting nationally important species, threatened vegetation, ecological values, carbon cycling and downstream water quality. This will benefit both Wallpolla Island and the broader Lower Murray region.

The proposed works include four major regulators, 22 smaller containment regulators and 4.5 km of levees or raised tracks. The works have been designed to complement weir pool manipulation activities at Locks 8 and 9 and connect areas of flowing aquatic habitat with sections of black box, lignum and higher alluvial terraces. This will enable watering at a landscape scale, mimicking flows of 30,000 to 120,000 ML/day.

6.3 Constraints Management Strategy

As well as the agreed 2,750 GL sustainable diversion limit, the Basin Plan allows for a potential further 450 GL of water to be recovered for the environment by 2024 by removing operational and physical constraints in the river system. The Commonwealth has agreed it will fund works required under its Constraints Management Strategy 2013 to 2024 provided that the works are socio-economically neutral and have no adverse third party impacts.

Victoria has been looking at opportunities to get better environmental outcomes by delivering environmental water more efficiently. This includes exploring opportunities to increase natural higher flows by putting measures in place that prevent and mitigate any potential impacts of higher flows on public and private land. Two constraints measures are included in Victoria's package of 22 projects that seeks to achieve the Basin Plan's environmental targets without the need for further Commonwealth water buybacks. These constraints measures are in their early development and involve ongoing community consultation.

Hume to Yarrawonga key focus area

Investigation of opportunities to address physical and policy constraints to the delivery of higher regulated flows of up to 40,000 ML/d from Hume Dam. Investigations will include the potential effects of higher flows on third parties and mitigation options to address unacceptable impacts, including easements and/or infrastructure, to allow the delivery of these flows to support improved river and wetland health outcomes. Landholder acceptance of potential works will be critical. This project must be considered in relation to the other southern connected Basin constraints projects.

New Goulburn key focus area

Investigation of opportunities to address in-channel constraints to the delivery of higher regulated flows of up to 20,000 ML per day at Shepparton. Allowing the delivery of flows to the top of the bank would improve river health outcomes. This work will be done with communities in a staged and bottom-up way to understand the risks, impacts and costs, and develop feasible and acceptable solutions to mitigate third party impacts.

Building on this work, further improvements to environmental water delivery will also be investigated in close consultation with landholders and communities. Landholder acceptance of potential works will be critical. This project must be considered in relation to the other southern connected Basin constraints projects.

6.4 Operational rule changes and system enhancements

Victoria is working with other Basin states on projects that involve changing the way river systems operate. These are known as Operational Rule Changes.

Five Operational Rule Change projects are part of Victoria's package of 22 projects to achieve the Basin Plan's environmental targets without the need for further Commonwealth water buybacks. These are joint projects with New South Wales.

The projects involve changes to river operation rules to improve flexibility and control over delivering environmental water to the River Murray. They achieve the environmental outcomes of the Basin Plan using less water to meet the rigorous statutory requirements for offsets under the sustainable diversion limit adjustment mechanism.

Barmah-Millewa Forest Environmental Water Allocation

Rule change to vary the rules associated with the water set aside by Victoria and New South Wales in the Barmah-Millewa Forest Environmental Watering Account to water the Barmah-Millewa Forest. The change proposes allowing the use of other environmental entitlements to target the environmental requirements specified in the Basin Plan. This measure proposes to not initiate or continue release from the Barmah-Millewa Forest Environmental Watering Account if a four-monthly flood has already occurred.

Flexible rates of fall in river levels downstream of Hume Dam

Rule change to allow releases from Hume Dam to be reduced more quickly when flows have not been elevated for an extended period beforehand. The water saved would be released at a different point in time or in a different flow pattern to provide additional environmental benefits. The extra flexibility improves Hume Dam operational efficiency.

Hume Dam airspace management and pre-release rules

Rule change to allow future environmental water releases in airspace management.

2011 Snowy Water Licence schedule 4 amendments to River Murray increased flow call out provisions

Amendments to Snowy Hydro licence in 2011 allow the water recovered by the River Murray Increased Flows to be held and called out. Previously the release of the water was at the discretion of Snowy Hydro and was generally at times suited to Snowy Hydro's commercial outcomes. The proposal intends to provide a way of controlling the timing of River Murray Increased Flows water releases from the Snowy Scheme, allowing more flexibility to achieve environmental outcomes targeted in the River Murray below Hume Dam.

6.5 Efficiency measures

Efficiency measures recover and provide more water for the environment by increasing the efficiency of consumptive water uses, like irrigation.

Victoria has carried out a series of water efficiency programs to meet its share of the 2,750 GL water recovery target. However the Basin Plan also allows for efficiency measures - usually called 'upwater' - to deliver a further 450 GL above that target for the environment. The Basin Plan requires that these 450 GL efficiency measures achieve neutral or improved socio-economic outcomes.

At Murray-Darling Basin Ministerial Council in December 2018, all governments agreed to socio-economic criteria which were adopted as the basis of the neutrality test for assessing efficiency measures projects. Ministers agreed that these criteria be applied to all efficiency measures projects that are part of the additional 450 GL proposed, prior to approval of projects. They agreed that each state establish a process to assess each project against the criteria to ensure their compliance. Projects will then be submitted to the Commonwealth.

At the December Ministerial Council meeting, the Commonwealth government also committed to fund state projects to contribute to the initial focus of recovering 62 GL of additional water through socio-economically neutral or positive projects to enable the full 605 GL Sustainable Diversion Limit Mechanism offset to be achieved.

This includes Victoria's Northern Water Infrastructure Prospectus which was submitted to the Commonwealth government in October 2018 for funding consideration. The prospectus meets Victoria's commitment to provide up to 9 GL of socio-economically neutral or positive projects to meet the initial water recovery priority of 62 GL.

Victoria has a number of existing projects that aim to improve water delivery. These processes involve upgrading or evolving components specific to each project, while minimising impacts to the environment and economy.

Modernising irrigation systems can involve:

- automating and upgrading channels to reduce the need to operate the system manually, while measuring water flows accurately and in real time
- removing redundant channels
- replacing open channels with pipelines to minimise water losses
- upgrading the accuracy of metered outlets that deliver water to farms
- lining and remodelling channels to minimise water lost during transport.

These works, combined with changes to the way systems operate, are improving service levels to irrigators and saving billions of litres of water.

There are a number of modernisation projects currently underway that aim to bring existing irrigation systems to current standards.

Goulburn-Murray Water Connections Project

The Connections Project is the largest irrigation modernisation project in Australia, ensuring a sustainable future for productive agriculture in northern Victoria and long-term water security for the Goulburn-Murray Irrigation District.

The $2 billion Victorian and Commonwealth Government-funded project is upgrading the irrigation delivery system to recover 429 GL of water savings to benefit irrigators, the environment and Melbourne retail water corporations. The project is a key part of Victoria's contribution to the Basin Plan in a way that minimises any socio-economic impacts.

When the project is completed, water users in the region will benefit from a modern delivery system providing increased productivity and greater water reliability.

Sunraysia Modernisation Project

The $120 million Sunraysia Modernisation Project has created a more efficient irrigation network with better water quality across the Mildura, Merbein and Red Cliffs irrigation districts.

It has:

- upgraded key pump stations across the three districts
- replaced approximately 24 kilometres of open channels with pipelines
- installed channel automation in the remaining 20 kilometres of open channels, including 19 regulating structures

The project was funded with $103 million from the Commonwealth Government and $17 million from the Victorian Government through Lower Murray Water's capital works budget. It was delivered by Lower Murray Water and officially opened in September 2016.

Benefits of the project include:

- greater reliability and water availability for more than 2,000 customers, with 365-day access to irrigation water through the ordering system
- improved water quality helping to reduce on-farm filtration costs
- greater operational flexibility to improve service delivery to irrigation customers
- seven GL in water savings transferred to the environment to bridge the gap under the Basin Plan

Appendix D Consultation Report

Appendix D Consultation Report

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1. Introduction

The Victorian Government consulted and worked with stakeholders, including the broader community and Traditional Owners, to develop the Water Resource Plan for Northern Victoria

1.1 About the Consultation Report

The Consultation Report outlines the consultation carried out for Victoria's North and Murray Water Resource Plan, including:

- consultation for the risk assessment
- stakeholder engagement before the release of the draft plan in January 2019
- Traditional Owner engagement throughout the development of the draft and final plan
- community consultation during the formal public submission period
- how feedback in submissions was incorporated into the final Victoria's North and Murray Water Resource Plan
- follow-up consultation before the final plan was given to the Murray–Darling Basin Authority.

The report includes some discussion about consultation carried out during 2015–16 for the development of *Water for Victoria*, specifically about the emerging Victorian Aboriginal Water Policy. This consultation is relevant as the Basin Plan requirements for water resource plans helped to drive development of the Victorian Aboriginal Water Policy that was finalised in October 2016.

1.2 Victoria's North and Murray Water Resource Plan

Victoria's North and Murray Water Resource Plan demonstrates how Victoria will meet the requirements identified in Chapter 10 of the Basin Plan for Victoria's north and Murray region. This is done by bringing together existing arrangements from bulk water and environmental entitlements, groundwater management plans, sustainable water strategies and other legal instruments under the Victorian Water Act. The Plan also outlines and builds on the Victorian Government's Aboriginal Water Policy.

As outlined in Chapter 2 of the Comprehensive Report, Victoria's North and Murray Water Resource Plan covers three water resource plan areas - Victorian Murray, Northern Victoria and Goulburn-Murray. These water resource plan areas include the Victorian river systems connected to the Murray, including the Mitta Mitta, Kiewa, Ovens, Goulburn, Broken, Campaspe and Loddon rivers, and groundwater in the northern Victoria area.

It features internationally and nationally significant floodplain wetlands such as Hattah Lakes, Walpolla, Mulcra and Lindsay Islands and Barmah National Park, and wetlands in the Ovens, Broken, Goulburn, Campaspe and Loddon catchments. It supports the Goulburn-Murray Irrigation District, and the Sunraysia Irrigation District, and areas that source water from the River Murray or its tributaries.

For more information on Victoria's North and Murray Water Resource Plan area refer to Chapter 2 of the Comprehensive Report.

Victoria's North and Murray Water Resource Plan was prepared by the Department of Environment, Land, Water and Planning (DELWP).

1.3 Stages of Development

Victoria's North and Murray Water Resource Plan has been developed over four years, reflecting the extensive research and engagement required to ensure it meets the requirements of the Basin Plan. Table 1 below outlines the key stages of delivery for Victoria's North and Murray Water Resource Plan.

Table 1: Victoria's North and Murray Water Resource Plan: Stages of Delivery

Stage	Actions
Risk Assessment 2015–16	Working group formed Advisory panel appointed Working group and advisory panel meetings held Consultation on the Risk Assessment with key stakeholders Preliminary risk assessment released to inform water resource plan Traditional Owner engagement commenced
Draft Water Resource Plan 2016–2019	Coordination working group formed Technical Advisory Group appointed Stakeholder briefings began Traditional Owner engagement and capacity-building continued Aboriginal Waterway Assessments expression of interest process and implementation began Stakeholder briefings continued
Consultation with MDBA on technical requirements of Basin Plan in respect of northern Victoria 2018 - 2019	Extensive liaison with the Murray-Darling Basin Authority regarding technical responses to Basin Plan requirements
Public consultation on draft water resource plan 2019	Draft released for public comment and submissions process Consideration of all 43 written submissions and feedback provided during public meetings and targeted stakeholder meetings in finalisation of the Water Resource Plan
Final water resource plan 2019	Submissions and public meeting feedback addressed Water Resource Plan finalised and submitted to the Murray-Darling Basin Authority

2. Victoria's North and Murray Water Resource Plan consultation approach

Victoria's water resource plans propose that our state's existing tools and instruments are the primary mechanism to deliver the Basin Plan requirements. Discussion and feedback in Victoria's north tested this approach.

Water and how it is allocated and managed touches the lives of every person, including:

- people who live in towns
- Traditional Owners who have a deep connection with the landscape and commitment to Country
- industries depending on water sources and their workers who depend on continuing employment
- people who fish, boat and swim on lakes and river systems
- farmers who rely on water for their livelihood and to produce food
- people who advocate for the environment.

When preparing the approach to consultation on Victoria's North and Murray Water Resource Plan, the extent of change required to Victoria's framework under the plan and the potential impact those changes would represent to stakeholders across the region was considered.

Recognising the critical role of water in the lives of people in the region, development of Victoria's North and Murray Water Resource Plan included targeted stakeholder engagement with people representing local government and agriculture, water and catchment managers, Traditional Owners, environmental groups, recreation users as well as broader community consultation.

This approach:

- sought to make sure target audiences understood the role of the Water Resource Plan, including the timing of development of the Victoria's North and Murray Water Resource Plan
- outlined changes being proposed under Victoria's North and Murray Water Resource Plan
- sought to understand how Basin Plan implementation impacted northern Victoria
- clarified the scope of the Water Resource Plan and what could be influenced through Water Resource Plan development.

Ultimately, as a result of these considerations, Victoria's North and Murray Water Resource Plan does not propose significant changes to Victoria's water entitlement and management frameworks.

"Victoria has been traditionally and still is a good water manager."

Loddon Valley GMW Water Services Committee meeting, Pyramid Hill

2.1 Consultation objectives

Consultation and engagement in northern Victoria was aimed at recognising and responding to the importance of water to the community.

Objectives of consultation included:

- providing opportunities for stakeholders to discuss and comment on key risks and themes
- making information available to the wider community to comment on areas of interest
- have water resource plans contribute to a better understanding of Victoria's water entitlement and management framework by providing clear descriptions of the state's instruments and how they relate to each other
- consistently explaining and applying the Victorian Government's policy position on water management in consultation and communication materials
- making sure stakeholders and community members received information in time to consider it and respond.

A challenge to meeting these objectives was the complexity of Victoria's water entitlement and management framework. This resulted in additional challenges such as the length of the document, which was necessary to meet Basin Plan requirements but could be prohibitive to the community being able to fully engage on the entirety of the document.

A further challenge to meeting the objectives was that Victoria's North and Murray Water Resource Plan did not provide the strategic direction expected by many in the community in the face of increasing pressures on irrigators to manage agricultural production under the Basin Plan, and many stakeholders had difficulty in separating out issues related to the implementation of Basin Plan as a whole and the narrow scope of Victoria's North and Murray Water Resource Plan.

In response to these challenges, the release of the draft Victoria's North and Murray Water Resource Plan was accompanied by:

- supporting materials that included a summary document and frequently asked questions and responses to help inform the public and clarify what the plan entailed
- public information sessions to provide an outline of what Victoria's North and Murray Water Resource Plan included and to offer the community an opportunity to ask questions about the document.

In addition, this Consultation Report proposes to highlight the concerns identified by the community during public consultation, including those that were not within the scope of what Victoria's North and Murray Water Resource Plan could address.

2.2 Forms of engagement

The consultation approach was developed to meet different stakeholder needs and can be broadly grouped into the following three categories.

2.2.1 Technical contributions and advice from delivery partners, Government and peak bodies

The first level of engagement involved consultation and collaboration with:

- key delivery partners of DELWP, which included relevant rural and urban water corporations, catchment management authorities and the Victorian Environmental Water Holder
- other sectors of the Victorian Government

- peak bodies including Murray Lower Darling Rivers Indigenous Nations (MLDRIN), the Victorian Farmers Federation (VFF), VicWater and the Goulburn Valley Environment Group
- the Commonwealth Government including the Murray–Darling Basin Authority and the Commonwealth Environmental Water Office.

Engagement with the aforementioned stakeholders supported the review of Victoria's water resource management framework and its application to Basin Plan requirements. It was important under this tier of engagement to collaborate with the identified stakeholders to:

- recognise and respond to change and risk in northern Victoria
- map water resource plan requirements across Victorian Government instruments and tools
- assess existing arrangements and determine whether and where change is required
- understand obligations and make sure they are met.

2.2.2 Testing outcomes and engaging with key stakeholders

Under this level of engagement, DELWP met with primary stakeholders to test proposed responses to Basin Plan requirements for water resource plans. The primary vehicle for undertaking this tier of engagement was the Technical Advisory Group established for the purposes of the project. The members of the Technical Advisory Group and the consultation undertaken with that Group is outlined in Part 5 of the Consultation Report.

Under this tier of engagement, it was important to:

- acknowledge current conditions and concerns
- build better understanding of different needs
- identify opportunities and gaps in Victoria's North and Murray Water Resource Plan
- comment on risks and responses
- adjust approaches to meet expectations.

2.2.3 Consulting with and informing the general public

This level of engagement was the basis for public consultation on Victoria's North and Murray Water Resource Plan. Public consultation was designed to provide information regarding the purpose of the Water Resource Plan and an opportunity for members of the community to contribute to the final approach and content.

Engaging with the community involved using a plain English approach, communicating the essence of complex water resource plans through a summary document, hosting public meetings across northern Victoria, sharing information via social media and the web to:

- give information on the purpose and content of Victoria's North and Murray Water Resource Plan and the relevance of the Basin Plan for Victoria's northern region
- explain the Victorian water entitlement and management framework
- demonstrate and maintain the Victorian Government's position on water management
- seek feedback from the community on areas of interest
- create forums for discussion and provide the opportunity for the general public to contribute.

2.3 Meeting the requirements of Basin Plan

2.3.1 Section 10.07(1)

Under section 10.07(1) of the Basin Plan, a water resource plan must contain a description of the consultation carried out. This requirement is satisfied by this Consultation Report, Appendix D to

Victoria's North and Murray Comprehensive Report, which describes the consultation that occurred to develop the material contained in Victoria's North and Murray Water Resource Plan before it was submitted to the MDBA for formal assessment and recommendation for accreditation.

Basin Plan 10.07(1)

The Consultation Report contained at Appendix D of Victoria's North and Murray Comprehensive Report describes the consultation in relation to Victoria's North and Murray Water Resource Plan that was undertaken before Victoria gave the Plan to the MDBA under section 63(1) of the Water Act 2007 (Cth).

2.3.2 Section 10.26(2)

Section 10.26(2) of the Basin Plan requires that a water resource plan be prepared having regard to the views of local communities, including bodies established by a Basin State, that express community views in relation to environmental watering.

The views of local communities identified during consultation on *Water for Victoria*, the Victorian Murray Long-Term Watering Plan, Northern Victoria Long-Term Watering Plan and during the development of Victoria's North and Murray Water Resource Plan were taken into account in preparation of this Plan and Comprehensive Report. How this requirement is satisfied is outlined by this report, which describes the consultation that occurred to develop the material contained in Victoria's North and Murray Water Resource Plan.

The consultation described in this report is in addition to the consultation that informed *Water for Victoria* and Victoria's Long-Term Watering Plans, which also informed the preparation of Victoria's North and Murray Water Resource Plan.

2.3.3 Section 10.52(2) and 10.53(1)

In responding to the requirements under Part 14 of Chapter 10 of the Basin Plan to identify the objectives and outcomes for water resource management of Traditional Owners in Victoria's North and Murray water resource plan area, matters identified in sections 10.52 and 10.53 are required to be considered.

Section 10.52 of the Basin Plan requires Victoria to have regard to the following, as determined through consultation with relevant Indigenous organisations, including the Murray Lower Darling Rivers Indigenous Nations.

- the social, spiritual and cultural values of Indigenous people that relate to the water resources of the water resource plan area (Indigenous values); and
- the social, spiritual and cultural uses of the water resources of the water resource plan area by Indigenous people (Indigenous uses)

as determined through consultation with relevant Indigenous organisations, including the Murray Lower Darling Rivers Indigenous Nations.

Section 10.53 of the Basin Plan requires regard to be had to the views of the views of relevant Indigenous organisations in relation to the following matters:

a. Native Title rights, Native Title claims and Indigenous Land Use Agreements provided for by the Native Title Act 1993 in relation to the water resources of the water resource plan area
b. registered Aboriginal heritage relating to the water resources of the water resource plan area
c. inclusion of Indigenous representation in the preparation and implementation of the plan

d. Indigenous social, cultural, spiritual and customary objectives, and strategies for achieving these objectives
e. encouragement of active and informed participation of Indigenous peoples
f. risks to Indigenous values and Indigenous uses arising from the use and management of the water resources of the water resource plan area.

In developing Victoria's North and Murray Water Resource Plan, relevant indigenous organisations was taken to include MLDRIN and peak bodies representing the views of Traditional Owner Nation Groups as identified in **Chapter 8** of the Comprehensive Report and in **Section 4** below. Where Traditional Owners were not represented by an established organisation, DELWP endeavoured to engage and consult on the matters outlined in sections 10.52 and 10.53 of the Basin Plan in a manner that provided that best opportunity for Traditional Owners to have their say.

To ensure that the matters in section 10.52 and 10.53 were considered, DELWP prepared a template that highlighted the key requirements of Basin Plan to inform discussions with Traditional Owners on the development of their respective objectives and outcomes for water resource management. Regardless of the requirements of Basin Plan, DELWP supported Traditional Owners in leading their own discussions. Therefore, the information provided about the matters listed in sections 10.52 and 10.53 of the Basin Plan may vary between Traditional Owner group.

While Basin Plan requires discussion and consideration of Native Title rights and claims and registered Aboriginal heritage relating to Victoria's North and Murray water resource plan area, this plan is not a tool for progressing land disputes or claims for recognition under Victorian or Commonwealth legislative arrangements. Therefore, as outlined in **Chapter 8** of the Comprehensive Report, Victoria's North and Murray Comprehensive Report only discusses registered claims and agreements. Outside of formal claims, DELWP has asked Traditional Owners to discuss their objectives and outcomes with respect to 'areas of interest'.

Risks to Indigenous values and uses of water were considered through Victoria's risk assessment process (see **Appendix B**). Traditional Owner representatives were included on the Advisory Panel to provide feedback on how:

- Traditional Owner benefits and uses of water were described in the risk assessment
- Threats and causes of risk were identified in respect of Traditional Owner benefits and uses of water
- risks to Traditional Owner uses and values of water were described in the Risk Assessment.

For more information on the Risk Assessment see **Chapter 5** of the Comprehensive Report and **Section 1.4**, **Section 2**, **Section 3.2.3** and **Section 3.3.3** of **Appendix B** for more detail on risks to Traditional Owner values and uses of water. The approach to engagement for each Traditional Owner group is outlined below at **Section 2**.

2.3.4 Section 10.54

A water resource plan must be prepared having regard to the views of Indigenous peoples with respect to cultural flows. Engagement in water resource management policy development provides a way for Traditional Owners to identify their existing and future needs for water and to develop pathways to support and improve their spiritual, cultural, environmental, social and economic conditions.

Victoria's North and Murray Water Resource Plan was prepared having regard to the views of Indigenous peoples with respect to cultural flows. Cultural flows were also discussed as part of the consultation for *Water for Victoria*. These conversations revealed that cultural flows mean

different things to different people and groups of Traditional Owners and, in some cases, the term 'cultural flows' is being used interchangeably with other terms, such as cultural outcomes from shared benefits.

Victoria is pursuing opportunities to further discuss cultural flows and understand the impact of these various views on water resource management. The pathways to achieving this will differ for each water resource (see also **Section 8.6** of the Comprehensive Report for discussion of cultural flows).

The mid-2018 release of the National Cultural Flows Research Project findings provides an opportunity to engage further with Traditional Owners to share knowledge and discuss the findings and desires to progress this work further. DELWP is looking at opportunities to use the findings from the National Cultural Flows Research Project in implementing water resource plans as well as broader implementation of Victoria's Aboriginal Water Policy.

Discussions with Traditional Owner groups during the development of Victoria's North and Murray Water Resource Plan have determined a clear interest in water entitlements and rights. DELWP provided information about water entitlements, the water market, how to access section 8A rights and specifics of Victoria's entitlement system. Further discussion and policy development is required to progress the expressed interest in water entitlements and rights.

While Victoria's North and Murray Water Resource Plan is not a vehicle for providing water entitlements, the Plan does not prevent this from happening in the future where water is available for purchase on the water market.

It is intended that the information provided and the capacity building that will continue beyond finalisation of Victoria's North and Murray Water Resource Plan will improve the ability of Traditional Owners to effectively engage in Victoria's water sector to secure water required to meet their objectives in future. Similarly, *Water for Victoria* and Victoria's water resource plans have improved understanding of Aboriginal values and uses of water to support Traditional Owner involvement in water resource management in future.

3. Development of Victoria's North and Murray Water Resource Plan

Victoria's North and Murray Draft Water Resource Plan was prepared for public comment with contributions from technical and key stakeholders and through consultation with a technical advisory group, a DELWP coordination working group, a water quality working group and an engagement program with Traditional Owner groups.

3.1 Preliminary Risk Assessment 2015–16

Under Basin Plan, all Basin States are required to undertake a risk assessment to inform the development of water resource plans. Victoria prepared a single risk assessment across all of Victoria's water resource plan areas in the Wimmera-Mallee and northern Victoria. The risk assessment report for Victoria's North and Murray water resource plan area is provided at **Appendix B**.

The development of the risk assessment was informed by an advisory panel and an internal DELWP coordination (working) group. The risk assessment advisory panel included internal and external members and was established to review and provide high-level advice on outcomes of the risk analysis. This process was the first stage of consultation on water resource plans for Victoria.

The DELWP internal working group was made up of leaders in policy areas within DELWP, with skills and responsibilities in surface water policy, interception (farm dams and forestry), climate change, groundwater, water quality and drought. It provided preliminary review and contributions to the data, methods and project outcomes.

Table 2: Risk Assessment Advisory Panel members

Organisation	Representative
DELWP	Chris McAuley (Chair)
DELWP	Amber Clark
DELWP	Adrian Spall
DELWP	Dr Grace Mitchell
Goulburn Broken Catchment Management Authority	Chris Norman
Goulburn-Murray Water	Graeme Hannan
GWMWater	Andrew Barton
Mallee Catchment Management Authority	Jenny Collins
Murray Lower Darling Rivers Indigenous Nations	Will Mooney
Murray Lower Darling Rivers Indigenous Nations	Darren Perry
North Central Catchment Management Authority	Brad Drust

Organisation	Representative
North East Catchment Management Authority	Catherine McInerney
Victorian Environmental Water Holder	Tori Perrin
Victorian Farmers Federation	Richard Anderson (observer)
VicWater	James Cleaver
Wimmera Catchment Management Authority	Greg Fletcher

Workshops were held for the advisory panel to provide high-level guidance and endorsement of the risk assessment process in workshop one and the risk assessment outcomes in workshop two. Minutes of both workshops were documented and circulated to all who attended.

Table 3: Advisory Panel workshop outcomes

Workshop	Actions
Workshop one 11 February 2016	Agreement and endorsement was sought from the advisory panel on: • the context of the risk assessment • the list of real, possible or perceived risks to be considered • an approach to assess the likelihood and consequence of each identified risk • any following work or processes for resolving identified issues.
Workshop two 15 April 2016	Issues discussed included: • the draft application of the risk assessment • the review, refinement (if necessary), and endorsement of the draft assessment of major risks to be addressed in each water resource plan - noting that further approval was required within DELWP before submission of the first draft to the MDBA for comment and release for stakeholder discussion • determining a pathway to resolve anomalies. Main statements endorsed by the advisory panel at the completion of Workshop two, subject to comments being addressed, were: • the risk-based approach was consistent with risk principles • documentation of the work was appropriate and adequately detailed the process • the scenarios were suitable for further consultation, with agreed clarifications • the revised risk assessment method was fit for purpose • the risk assessment outcomes were fit for purpose for consultation.

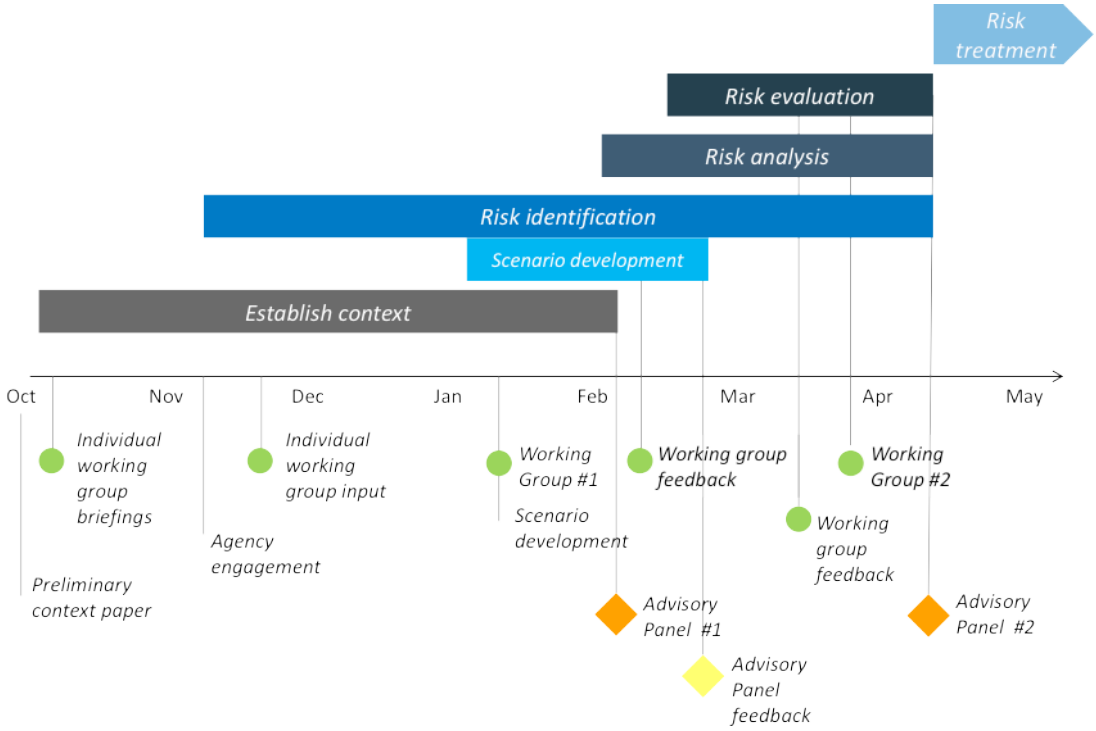


Figure 1: Chronology of Risk Assessment Advisory Panel and Working Group project engagement (below the line) and alignment with stages of the risk assessment (above the line) for 2016–17

3.2 Engagement on Victoria's North and Murray Water Resource Plan

3.2.1 Technical Advisory Group

A technical advisory group made up of key delivery partners and representative stakeholder groups was set up in September 2017 to inform and review content while the Water Resource Plan was developed. The group reflected community interests, highlighted water issues, took part in stakeholder and community consultation and steered the inclusion of wider stakeholder and community feedback into the final version.

The members of the Technical Advisory Group are provided in **Table 4** below.

It should be noted that the inclusion of Aboriginal members in the Technical Advisory Group did not indicate that those members were speaking for all Traditional Owners represented by their organisation or Nation they individually identify with. Members were sought for the Technical Advisory Group for their individual expertise across the range of stakeholders relevant to Victoria's North and Murray Water Resource Plan.

Technical Advisory Group membership was determined based on key stakeholders and delivery partners. Inclusion of Traditional Owner representation was reflective of the significant work program required to meet Traditional Owner engagement under Basin Plan. Given the ability to align Victoria's existing framework to Basin Plan requirements, it was not considered necessary to include additional representation from other stakeholder groups as it was not anticipated that Victoria's North and Murray Water Resource Plan would result in significant or meaningful changes to Victoria's water resource management.

During public consultation, however, some irrigators expressed frustration about being represented by entities and not having an independent voice. It was identified that water corporations, catchment management authorities and the Victorian Farmers Federation was not considered sufficient representation for irrigators in the process. This advice has been incorporated into the planning for future work.

Table 4: Members of the Technical Advisory Group

Organisation	Title	Name
Barapa Barapa Traditional Owner	Water for Country Board member	Dixon Patten
Coliban Water	Manager, Raw Water Supply	Steven Healy
Dja Dja Wurrung Clans Aboriginal Corporation	Program Manager	Nathan Wong
Goulburn-Murray Water	Head of Water Resources	Mark Bailey
Goulburn Valley Environment Group	President	John Pettigrew
Goulburn Valley Environment Group		Terry Court
Goulburn Valley Water	Manager, Planning, Strategy and Environment	Alan Tyson
Goulburn Broken CMA	Manager, Sustainable Irrigation	Carl Walters
Lower Murray Water	Entitlement Manager	Peter Ebner
Mallee CMA	Chief Executive	Jenny Collins
Murray Lower Darling Rivers Indigenous Nations	Executive Officer	Will Mooney
North Central CMA	Executive Manager, Program Delivery	Tim Shanahan
North East CMA	Environmental Water Resource Officer	Catherine McInerney
North East Water	Manager, Systems Optimisation	Jason Mullins
Tati Tati Wadi Wadi Nation	Traditional Owner	Brendan Kennedy
Victorian Environmental Water Holder	Acting Manager, Planning & Delivery	Caitlin Davis (delegate of Denis Flett)
Victorian Farmers Federation	Water Council, Chair	Richard Anderson

The Technical Advisory Group met throughout the drafting of Victoria's North and Murray Water Resource Plan between September 2017 and March 2019 to:

- review working documents, including the draft Victoria's North and Murray Comprehensive Report
- share its skills and expertise and represent local perspectives within the water resource plan area
- take part in and, at times, lead community and stakeholder consultation and give feedback on what issues would most likely interest stakeholders, and their preferred tools of engagement.

The group reconvened to guide the incorporation of feedback from public consultation into the final Victoria's North and Murray Water Resource Plan before it was submitted to the Murray-Darling Basin Authority. An outline of the meetings held is provided in **Table 5** below.

Table 5: Technical Advisory Group meetings

Meeting Date	Matters raised
12 September 2017	• Outline of Water Resource Plans and Victoria's approach. • Role of the Technical Advisory Group, terms of reference and timelines. • Lessons learnt from the Wimmera-Mallee Water Resource Plan • Discussion regarding table of contents • Accreditation requirements • Water Resource Plan key focus areas
6 December 2017	• Technical Advisory Group terms of reference approved • Presentation on Long-Term Water Resource Assessments and discussion on how they relate to Water Resource Plans • Outline of Traditional Owner consultation engagement • Five Aboriginal Water Assessments conducted • Meetings on Country continuing • Process for forming the Water Resource Plan, the role of the Technical Advisory Group, timelines • Compliance and enforcement regimes • Murray-Darling Basin Authority feedback on the Wimmera-Mallee Water Resource Plan Field visit: Reedy Lagoon, Gunbower with the Barapa Barapa Water for Country Steering Committee.
28 February 2018	• Update on the Wimmera-Mallee Water Resource Plan process • Discussion on the consultation approach for the Victoria's North and Murray Water Resource Plan • Next steps
21 May 2018	• Progress update • Update on the Sustainable Diversion Limit adjustment amendments • Next steps Field visit: Doctor's Swamp tour - Environmental watering in a heavily regulated system

Meeting Date	Matters raised
11 October 2018	• MDBA update • Traditional Owner engagement update • Confirmation of Water Resource Plan name change from Northern Victoria Water Resource Plan to Victoria's North and Murray Water Resource Plan • Presentation of the Tati Tati Wadi Wadi Aboriginal Waterway Assessment from Brendan Kennedy • Discussion on connectivity • CEWO update • Water quality presentation, State Environmental Protection Policy and water quality targets • Environmental watering update • Sustainable Diversion Limit update • Compliance compact steering committee and assessing Victoria's compliance risk
28 November 2018	• Traditional Owner engagement update • Water quality update • Sustainable Diversion Limit update • Comprehensive report feedback • Environmental watering • Public consultation plan • Wentworth Group Paper • Delivery of draft comprehensive report
27 March 2019	• Outcomes of public consultation and overview of proposed changes to Comprehensive Report • Update on Traditional Owner engagement • Overview of MDBA preliminary assessment of draft • Discussion of remaining MDBA concerns regarding permitted take in unregulated systems, environmental watering and groundwater trade.

3.2.2 DELWP coordination (working) group

To support development of Victoria's North and Murray Water Resource Plan, an internal co-ordination working group was established within DELWP. The group was made up of representatives from each policy area contributing to the development of the Comprehensive Report and review of the formal responses to Basin Plan requirements.

This group met monthly to discuss the following:

- updates on the progress of work contributing to the development of the Comprehensive Report
- updates on work being undertaken through Basin-wide working groups coordinated by the MDBA
- discussion of project milestones to ensure delivery of the project
- discussion of key issues being raised by the MDBA that influence the development of Victoria's North and Murray Water Resource Plan and accompanying Comprehensive Report
- feedback from the Technical Advisory Group
- provision of preliminary review and contributions to data, methods and project outcomes.

3.2.3 Working Group for Water Quality Management Plan

A working group was also established to comment on and assist in the preparation of the Water Quality Management Plan (**Appendix A**). See **Table 6**.

Table 6: Water Quality Management Plan working group members

Organisation	Representative	Position
Mallee CMA	Jenny Collins	Chief Executive
Lower Murray Water	Peter Ebner	Entitlement Manager
North Central CMA	Tim Shanahan	Executive Manager, Program Delivery
Goulburn Broken CMA	Megan McFarlane	Program Manager
Goulburn-Murray Water	Greg Smith	Manager Water Quality
North East CMA	Catherine McInerney	Environmental Water Resource Officer

3.2.4 Target stakeholder briefings

Targeted stakeholder briefings were held throughout the preparation of the Water Resource Plan, and during public consultation, including but not limited to meetings with:

- Committee for Greater Shepparton
- Murray River Group of Councils
- Shepparton Irrigation Region Program Implementation Committee
- Mallee CMA Aboriginal Reference Group
- Environment Victoria Strategy Advisory Committee (Lower Murray Water)
- Customer Services Advisory Committee (Lower Murray Water)
- Water Service Committees (Goulburn-Murray Water)
- Goulburn Murray Irrigation District (GMID) Water Leadership Forum

During the course of developing the draft Victoria's North and Murray Water Resource Plan, consultation at stakeholder forums included updating the working groups of the progress in developing the Plan and providing an outline of the proposed approach to plan development to comply with Basin Plan requirements.

The informative nature of engagement with stakeholder committees was aimed at understanding points of interest in Victoria's water resource plans for the relevant stakeholders and on the basis that no regulatory or policy changes were required to meet the requirements of Basin Plan. It is understood that this does not necessarily equate to a lack of desire for existing policies and strategies to be re-evaluated in light of the impacts of Basin Plan implementation. This is discussed further in the summary at **Section 5.3** of this Consultation Report.

Consultation with the customer service committees occurred following commencement of public consultation (discussed below in **Section 5**). DELWP received feedback during this process that engagement with water service committees should have commenced earlier and the views of the members of those committees should have been sought to inform the draft Victoria's North and Murray Water Resource Plan and accompanying Comprehensive Report.

"We are sick of being talked to. You are worrying about the environment, but you have not seen the impacts on the community... we'll have a real tragedy on our hands soon enough."

Public meeting, Bendigo

3.2.4.1 Continued Stakeholder engagement

While key stakeholders were not heavily consulted in the development of Victoria's North and Murray Water Resource Plan, they are involved in development of regulatory arrangements, policies and strategies under the Victorian Water Act. Community and key stakeholder engagement in the development Victoria's policies, strategies and operational arrangements is fundamental to ensuring Victoria's reputation of effective water resource management remains.

Included in the range of documents that are developed in consultation with key stakeholders are:

- long term water resource assessments
- sustainable water strategies
- bulk entitlement amendments and new ones
- regional catchment strategies
- regional waterway strategies
- statutory management plans
- long term watering plans required by Basin Plan
- seasonal watering proposals for environmental water
- environmental water management plans
- regulatory amendments, where relevant, such as changes to the Water Act or regulations under that Act.

Victoria's North and Murray Water Resource Plan is based the existing framework and the arrangements already in place under the Victorian Water Act. As the above documents are updated and reviewed, further engagement with key stakeholders and the community will occur.

3.3 Finalising Victoria's North and Murray Water Resource Plan

The draft Victoria's North and Murray Comprehensive Report was prepared based on feedback from delivery partners and key stakeholders through the Technical Advisory Group. Additionally, the Department engaged with the Murray-Darling Basin Authority to determine the best approach for responding to requirements detailed in Chapter 10 of the Basin Plan. The draft Victoria's North and Murray Comprehensive Report was released for public consultation on 23 January 2019 for eight weeks of consultation.

In response to the feedback received from the community during public consultation, amendments were made to the Comprehensive Report to reflect the issues raised relating to the implementation of Basin Plan in general, rather than specifically to the draft Water Resource Plan. No significant changes have been made to the formal components of Victoria's North and Murray Water Resource Plan because of feedback received from the community during the public consultation phase. Changes made to the formal components of the Plan are a result of continued negotiations with the Murray-Darling Basin Authority.

Key changes to the Comprehensive Report include:

- streamlining content to improve readability following public feedback as to the density and repetitive nature of the document, including changes to the groundwater discussion in **Chapter 4** which now covers connectivity matters previously addressed across multiple sections in the document
- additional information included in **Chapter 3** relating to northern Victoria, the importance of irrigation to regional communities, the importance of the GMID and provide some of the historical context that explains the origins of irrigation in Victoria
- Updates to **Chapter 5** to include more information about the changes in the assessment of inter-valley transfers and how it relates to the risks from *changes in the timing and volume of demand*. A case study highlighting risks to the Goulburn River was also included in the document in response to community feedback
- updates to the discussion of environmental watering requirements to better reflect Victoria's water management framework and how environmental watering is supported in response to Community feedback and comments from the Murray-Darling Basin Authority
- updates to **Chapter 8** in response to changes requested by Traditional Owner groups as they finalised their contributions
- updates to the discussion on groundwater trade to improve clarity about how sufficient hydraulic connectivity is assessed and the requirements of Basin Plan are met, largely to respond to MDBA concerns but also to address readability concerns raised by the community
- updates to **Chapter 9** and **Appendix C** of the Comprehensive Report in response to feedback from the Murray-Darling Basin Authority regarding methods for determining limits on take from a watercourse (excluding basic rights) and addressing requirements to manage growth in use under all forms of take
- clarification in the Risk Assessment Report at Appendix B as to how timber harvesting was considered

Changes made to the document in response to public feedback are also identified in response to key themes discussed in **Section 5.2** below where relevant.

4. Traditional Owner engagement

Engagement with Traditional Owners was a major focus during the development of Victoria's North and Murray Water Resource Plan. Knowledge and understanding of Traditional Owner water objectives and outcomes is a significant gap in Victoria's water management arrangements. Underpinning the engagement with Traditional Owners was Victoria's statewide Aboriginal Water Policy developed under *Water for Victoria*. DELWP sought to build on this policy initiative by engaging with Traditional Owners within Victoria's North and Murray water resource plan area to link Victoria's broader policy objectives with the requirements of Basin Plan.

The engagement approach DELWP has adopted responds to the needs, capacity and interests of each Traditional Owner group, while seeking to remain consistent with the principles and guidelines adopted by MLDRIN for the Basin Plan.

These include:

- Murray–Darling Basin Authority (MDBA) Part 14 Guidelines
- convention on Biological Diversity Akwé: Kon Guidelines
- United Nations Declaration on the Rights of Indigenous Peoples
- MDBA Position Statement 14A: Aboriginal objectives and outcomes:
  - a planned approach to properly engaging Traditional Owners (e.g. adequate time, appropriate venues and resources)
  - identification and involvement of appropriate Traditional Owners
  - Traditional Owners are properly notified of the opportunity to be involved in the water resource planning process (e.g. print, phone, electronic and personal media and town meetings)
  - clear information about water resource planning processes and content is provided to Traditional Owners
  - use of appropriate tools and mechanisms for recording and understanding Aboriginal objectives and outcomes.
- Murray–Darling Basin Authority Handbook for Practitioners.

4.1 Working towards identifying Aboriginal objectives and outcomes for water

During the development of Victoria's North and Murray Water Resource Plan the Government sought to engage local Traditional Owner groups in accordance with Basin Plan requirements.

The Murray–Darling Basin Plan requires that Basin States identify objectives and outcomes of water based on Aboriginal values and uses of water and have regard to the views of Aboriginal organisations as listed in sections 10.53 and 10.54 of the Basin Plan.

Victoria's North and Murray Water Resource Plan recognised that discussions to identify Aboriginal water objectives, and desired outcomes, required a collaborative approach tailored to meet the needs of individual Traditional Owner groups.

Engagement was mostly through meetings on Country and the provision of support to Traditional Owner groups where requested. This was to identify objectives and desired outcomes for water resources, support celebrating and sharing culture and traditional practices within

Traditional Owner groups, discuss economic development opportunities and build relationships and Traditional Owner organisational and community capacity.

Victoria's North and Murray Water Resource Plan identified Victoria's Aboriginal Water Policy announced in *Water for Victoria* as the framework to address the high and medium risks to Aboriginal water identified in the preliminary risk assessment (see **Appendix B**).

4.2 Traditional Owner groups in Victoria's North and Murray water resource plan area

Traditional Owner groups in Victoria's North and Murray water resource plan area include:

- Bangerang
- Barapa Barapa
- Dhudhuroa, Waywurru and Yaitmathang represented through Dhudhuroa Waywurru Nations Aboriginal Corporation
- Dja Dja Wurrung represented through Dja Dja Wurrung Clans Aboriginal Corporation.
- The Ngintait, Nyeri, Nyeri and Latji Latji Nations represented by the First Peoples of the Millewa-Mallee Aboriginal Corporation.
- Tati Tati
- Taungurung represented through the Taungurung Land and Waters (Aboriginal Corporation)
- Wadi Wadi
- Wamba Wemba
- Weki Weki
- Yorta Yorta represented through the Yorta Yorta Nations Aboriginal Corporation.

4.2.1 Link to Wimmera-Mallee water resource plan area

Several Traditional Owner groups have interests in both the Wimmera-Mallee and Victoria's North and Murray water resource plans, including Barapa Barapa, Dja Dja Wurrung, First Peoples of the Millewa-Mallee, Tati Tati, Wadi Wadi, Wamba Wemba and Weki Weki.

When water managers and policy makers are reviewing Traditional Owners' contributions, it is recommended they read the contributions in both the Wimmera-Mallee and Victoria's North and Murray Water Resource Plans to make sure they are considering all information on Traditional Owner values, uses, objectives and outcomes for water.

4.3 Traditional Owner engagement program

4.3.1 Engagement for Victoria's North and Murray Water Resource Plan

Engagement with Traditional Owners for water resource plans was based on these guiding principles:

- engagement on water resource plans is directed by the requirements of the Commonwealth Government Murray-Darling Basin Plan 2012 and supported by the Victorian Government's Aboriginal Water Policy
- the engagement approach is tailored to the needs of each Nation group, as advised by MLDRIN delegates wherever possible, and adhering to the key principles of inclusivity, self-determination and free, prior and informed consent
- DELWP takes responsibility for engaging with Traditional Owner groups within Victoria's share of the Basin and commits to building relationships between the state and Nations through face-to-face engagement on Country, supported by MLDRIN delegates, peak Traditional Owner organisations and delivery partners as required

- feedback and information sharing from Traditional Owner groups is, when permitted, communicated to DELWP water senior managers to support integration of Traditional Owner requirements in policy and planning
- DELWP will endeavour to provide a clear narrative to talk through the issues and use plain English to explain the complexities of water resource management
- cross governmental border issues are managed sensibly, with Traditional Owner groups to decide where and when they want the opportunity for joint consultation or involvement between states.

Using these principles as a basis for engagement, DELWP worked with Traditional Owner groups to:

- develop engagement plans relevant to each group in consultation with the nominated MLDRIN delegates or appropriate key contact
- support and fund Nation meetings to provide wider opportunity for Nation members to discuss the Nation's contribution to Victoria's water resource plans
- include, where possible, water senior management and key policy officers in Nation meetings to demonstrate commitment to continued engagement with Traditional Owners and to make sure experts in water resource management were part of the conversation and were starting to build relationships with Traditional Owners
- support and fund extra meetings required to finalise and approve contributions of Traditional Owner Nations for inclusion in Victoria's water resource plans
- capture Traditional Owners' views in water resource plans through contributions for each Nation. The contributions were largely structured around a template that outlines matters relevant to addressing the requirements of Part 14 of Chapter 10 of the Basin Plan.

Tools utilised to support Traditional Owner engagement included funding of Aboriginal Water Officers, Aboriginal Waterway Assessments, workshops, Nation meetings, community gatherings and support to MLDRIN. Further detail regarding the tools utilised by each Traditional Owner group is outlined in **Section 4.4** below and in **Chapter 8** of the Comprehensive Report.

4.3.2 Engagement with MLDRIN

A key requirement of Basin Plan and the Commonwealth Water Act is to engage with the Murray Lower Darling Rivers Indigenous Nations (MLDRIN) organisation to support Traditional Owner engagement. As identified above, MLDRIN have provided guidelines to support engagement by Basin states with Traditional Owners.

Additionally, DELWP has engaged extensively with MLDRIN while developing Victoria's North and Murray Water Resource Plan, including:

- inclusion of a MLDRIN representative on the Technical Advisory Group to support and guide development of Victoria's North and Murray Water Resource Plan (see **Section 3.2** above);
- entering into funding agreements to support MLDRIN's work on building capacity within Traditional Owner groups across Victoria and to support development of Victoria's North and Murray Water Resource Plan
- funding MLDRIN to undertake Aboriginal Waterway Assessments in Victoria's North and Murray water resource plan area to support development of Traditional Owner objectives and outcomes
- engaging with MLDRIN to discuss emerging issues arising from engagement and seek guidance on culturally sensitive issues
- consultation with MLDRIN on determining the most appropriate engagement strategy for meeting the requirements of Part 14 of the Basin Plan

- consultation with MLDRIN in the development and funding of Aboriginal Water Officer positions across Victoria's North and Murray water resource plan area.

4.3.3 Previous engagement for *Water for Victoria*

During 2016, DELWP met Traditional Owner groups about the formation of the *Water for Victoria* Aboriginal Water Policy. While this was not directly consultation about water resource plans, it had the relevant Basin Plan requirements in mind as the policy was being developed.

MLDRIN was engaged in the development of *Water for Victoria* and was a member of the Victorian Aboriginal Water Reference Group set up as part of the policy consultation.

DELWP's Rural Water Programs Team presented to MLDRIN's Board and full membership and provided updates on pilot projects that were informing the development of Victoria's Aboriginal Water Policy, and on DELWP's Aboriginal Inclusion Plan. DELWP had initial discussions with MLDRIN about establishing an Aboriginal Water Reference Group specially for water resource plans. In July 2016, Rural Water Programs proposed establishing an Aboriginal Working Group which would meet around six times a year.

Regular meetings were held with MLDRIN representatives and some presentations were given to the MLDRIN Board and delegates before the release of *Water for Victoria*, including but not limited to, meetings on 2 March, 13 April, 19–20 May, 5 July, 18 August and 2 October 2016. These covered subjects including involvement in the water resource plan risk assessment, approach to Traditional Owner engagement, Basin Plan requirements and development of the Aboriginal Water Policy. On 12 July 2016, DELWP presented to the Federation of Traditional Owners Natural Resource Management sub-committee on water resource plans and the development of *Water for Victoria*.

The release of *Water for Victoria* in October 2016 provided the opportunity to develop a statewide strategic advisory body to make sure Aboriginal water values and uses were incorporated into Victoria's water planning and management. Funding was secured to establish the body and a two-day community meeting resolved to establish the Water for Country Project Control Group. The release of *Water for Victoria* enabled conversations with Traditional Owners to be framed by the new policy, to address long-standing shortcomings in Victoria's water management arrangements and to help meet Basin Plan requirements for identifying Traditional Owner water objectives and outcomes.

4.4 Engagement with Traditional Owner groups

The discussion below summarises the engagement undertaken with each Traditional Owner group to support the development of Victoria's North and Murray Water Resource Plan. The full contribution from each group is included in **Chapter 8** of the Comprehensive Report.

The completion of this Consultation Report does not represent the end of discussions with Traditional Owners and various meetings to discuss implementation of Victoria's water resource plans are planned following the completion of Victoria's North and Murray Water Resource Plan. These meetings will not be documented here.

4.4.1 Bangerang

Traditional Owners identifying themselves as from the Bangerang Nation expressed an interest in engaging with Victoria regarding water resource plans in October 2018.

Water resource planning staff from Victoria and New South Wales were invited to the Aboriginal Waterways Assessment (AWA) in the Barmah Millewa Forest facilitated by MLDRIN and funded by New South Wales Parks and Wildlife in early November 2018. Water Resource Plans were discussed with the group and information booklets were provided to Traditional Owners.

DELWP met with Bangerang representatives, together with New South Wales Government representatives, in January 2019. The Bangerang people communicated it would like a joint consultation with Victoria and New South Wales Governments despite challenges meeting Victorian Government timeframes to finalise contributions by the end of February 2019.

Independent Aboriginal consultants, Strategic Small Business Solutions (SSBS), were contracted by New South Wales Government agency DOI Water to conduct the engagement. The consultants facilitated the January 2019 workshop and co-ordinated one-on-one interviews with several Traditional Owners. The consultants presented their consultation report back to the group in early April 2019 for feedback.

4.4.2 Barapa Barapa

DELWP began discussions with the Barapa Barapa Water for Country Steering Committee in 2017, presenting to the committee on 26 October that year and meeting on Country several times to discuss the project and future aspirations.

On 13 November 2018 a Barapa Barapa Nation meeting was held to consider a draft contribution for Water Resource Plan, where it was decided to also contribute to the Wimmera-Mallee Water Resource Plan. The Barapa Barapa people said they had concern for the whole system, not just Barapa Barapa Country. At that meeting, Barapa Barapa MLDRIN delegate Uncle Neville Whyman expressed the need for some changes to the contribution.

A shortened draft of the Barapa Barapa objectives and outcomes was sent to MLDRIN delegate Sharnie Hamilton on 4 January 2019 and was approved for inclusion in Victoria's Water Resource Plans. At subsequent meeting with Barapa Barapa representatives at Kerang in January 2019, the entire contribution was discussed and amended and approved it for inclusion in Victoria's North and Murray Water Resource Plan and final Wimmera-Mallee Water Resource Plan.

4.4.3 Dhudhuroa, Waywurru and Yaitmathang

There was a preliminary meeting between DELWP and the Chair and CEO of the Dhudhuroa Waywurru Nations Aboriginal Corporation in May 2018 to set out how to work together and what resourcing was required to facilitate engagement for the Water Resource Plan. A funding agreement was subsequently developed in June 2018 for the employment of an Aboriginal Water Officer and engagement activities to assist with work relating to the Water Resource Plan.

A three day on-Country camp took place in early October 2018, and as part of this DELWP ran a workshop on Water Resource Plans. Yaitmathang people were not present at the three-day camp. The Aboriginal Water Officers made contact through the Chair of the Yaitmathang Indigenous Lands Incorporated and co-ordinated for representatives to be interviewed in New South Wales.

At a follow up meeting with the Aboriginal Water Officers, it was agreed they would lead the development of a contribution for the Water Resource Plan, with DELWP staff to provide support and guidance as required.

An Aboriginal Waterways Assessment facilitated by MLDRIN was held in early February 2019. DELWP staff were invited and provided support during the week. A follow-up workshop was facilitated by MLDRIN on 16 March 2019 to promote inclusion of the findings in the final contribution as a case study.

A draft contribution for the Water Resource Plan was submitted in mid-December 2018. This draft however contained material that was not consistent with Victorian legislation and policy and therefore could not be included in the draft Victoria's North and Murray Water Resource Plan, which was released for public consultation in January 2019.

A meeting was held in Melbourne at the end of January 2019 between Elders, the Aboriginal Water Officers and DELWP to discuss the issues with the proposed content and attempt to agree a way that a contribution from the group could be included in the final Water Resource Plan.

A final contribution submitted on 18 March 2019 continued to contain material outside the scope of Victoria's North and Murray Water Resource Plan. It was subsequently agreed that DELWP could modify the contribution so that it could be included in Victoria's North and Murray Water Resource Plan. In lieu of the public consultation process, this version was circulated to all Traditional Owner groups in the water resource plan area for feedback over a one-week period in late March. No feedback was received.

This additional but necessary stage in the process meant that the contribution was not finalised in time to be included in **Chapter 8** of the Comprehensive Report. However, as noted in Chapter 8, the contribution is included as **Appendix F** to the Comprehensive Report.

4.4.4 Dja Dja Wurrung

Meetings between DELWP and Dja Dja Wurrung agreed that Dja Dja Wurrung's water aims were best met through an approach which enabled self-determination, using this structure:

- DELWP to fund Dja Dja Wurrung to conduct its engagement on water resource plans, keeping in close contact but not dictating methodology or approach
- DELWP to be available at Dja Dja Wurrung's request to provide technical, policy or facilitation support
- Dja Dja Wurrung to establish an advisory group for water within its corporation to enable continuity, capacity building, self-determination and transition to outcomes
- Dja Dja Wurrung to have a representative on the Northern Victoria Water Resource Plan Technical Advisory Group.

A funding agreement between Dja Dja Wurrung and DELWP for water resource plans was signed on 13 December 2017. This resulted in a comprehensive and considered contribution to Victoria's water resource plans that was directed and produced by Dja Dja Wurrung, with collaboration by DELWP as requested.

The approach was devised in response to the shortcomings of the Wimmera-Mallee Water Resource Plan engagement through 2016-2017, and Dja Dja Wurrung's contribution to the Wimmera-Mallee Water Resource Plan has also been amended to reflect the revised approach.

Formation of the Kapa Gatjin (Knowing Water) Advisory Group was a highlight of Dja Dja Wurrung's water engagement. The group has an agreed terms of reference and involves the facilitated participation of Dja Dja Wurrung members to talk firstly about aspirations for water resource plans, and water more generally now and for the future, including values and uses of water.

The Kapa Gatjin group first met 1 May 2018 at Tang Tang Swamp. Two further meetings of the Kapa Gatjin Advisory Group were scheduled for 2018, supported by the Dja Dja Wurrung water officer position.

According to Dja Dja Wurrung, Kapa Gatjin is not the first engagement point for the corporation. Any water-related issues are first to be communicated to the water policy officer, and/or the CEO of the corporation.

Dja Dja Wurrung Chief Executive Officer Rodney Carter is the MLDRIN delegate for Dja Dja Wurrung. The approach taken for the water resource plans contribution for Victoria is in full accordance with his requirements.

4.4.5 First Peoples of the Millewa–Mallee

DELWP met the Federation of Victorian Traditional Owners on 21 November 2017 and outlined a proposed presentation for a Board meeting of the First Peoples of the Millewa–Mallee Aboriginal Corporation. DELWP presented to the Board on water resource plans on 19 January 2018. At that meeting and at subsequent meetings of the First Peoples of the Millewa–Mallee Aboriginal Corporation (FPMMAC) Board, the FPMMAC Board endorsed DELWP and the Federation of Victorian Traditional Owner Corporations to provide support to the First Peoples of the Millewa-Mallee. This was to help produce outcomes for both a First Peoples of the Millewa- Mallee Country and Water Plan and contributions to the Victorian Government's water resource plans.

The First Peoples of the Millewa-Mallee's preferred engagement is initially through their Board. Where MLDRIN delegates were accessible and appointed, they were engaged directly to approve and help lead the Nation meetings.

A meeting was held on Country with MLDRIN Ngintait delegate Uncle Norm Wilson on sites of importance to Ngintait. DELWP funded the April 2018 Ngintait Aboriginal Waterways Assessment and attended the assessment for several days.

The engagement approach for the Water Resource Plans included two residential community gatherings in 2018, incorporating visits on Country to discuss water priorities and issues. Mallee Catchment Management Authority employees assisted by explaining the current water management regime and challenges, and DELWP staff explained water policy issues. Places visited over the two residential gatherings were within the lodged Registered Aboriginal Party boundaries for the First Peoples of the Millewa-Mallee, which have now been approved by the State of Victoria.

Following the two community gatherings, it was discussed with MLDRIN delegates and the First Peoples' Chair whether separate Nation meetings were the best approach to discuss and approve the objectives, desired outcomes and statements collated from the community gatherings. It was agreed that separate meetings would be held in November 2018 for Ngintait in Berri, Latji Latji in Mildura and Nyeri Nyeri in Mildura. The Nation meetings, facilitated and funded by DELWP, included handouts and were focussed on confirming the content each Nation wanted to see in their contribution.

Across the three separate meetings and associated discussions, there was strong consensus that the objectives, outcomes and statements reflected their own words from discussions on Country.

A draft contribution was prepared from the Nation meetings for the Wimmera-Mallee Water Resource Plan, and Victoria's North and Murray Water Resource Plan. The draft was presented at a special board teleconference, then approved a week later in December 2018. This contribution replaced the initial contribution in the original submission of the Wimmera-Mallee Water Resource Plan and is included in **Chapter 8** of the Comprehensive Report.

4.4.6 Tati Tati Wadi Wadi[1]

Tati Tati representatives have identified themselves as Tati Tati Wadi Wadi for the purposes of Victoria's North and Murray Water Resource Plan. It is acknowledged that there was a separate consultation for the Wadi Wadi Nation as represented in the Wimmera-Mallee Water Resource Plan.

1 A July meeting at Robinvale in 2018 concluded the people present wished to be identified as Tati Tati Wadi Wadi. In November 2018, the MLDRIN full gathering formally appointed delegates for the Wadi Wadi Nation, that were not part of the Tati Tati Wadi Wadi consultation. These delegates had, from September 2018 led consultation for their Nation.

DELWP started talking with Tati Tati in 2017, and a MLDRIN-facilitated Aboriginal Waterway Assessment was held from 11 to 13 July 2017. This was funded by DELWP, and a representative from DELWP's water resource plan team attended for several days.

Soon after the Aboriginal Waterway Assessment it was agreed there was need for engagement with a broad group to explain the water resource plan process, what it meant for Tati Tati Wadi Wadi and to develop a contribution from the group. DELWP subsequently held a series of meetings with the group.

Early in 2018, DELWP entered into a funding agreement to facilitate workshops on water objectives, hold an inclusive gathering open to all people identifying with the group, conduct planning meetings and provide support for sign off.

In May 2018, DELWP and Tati Tati Wadi Wadi had a series of conversations about Lake Tyrrell, its water management regime, its water source and whether Tati Tati Wadi Wadi wished to also make a contribution to the Wimmera-Mallee Water Resource Plan.

Meetings between DELWP and Tati Tati Wadi Wadi were held on Country. These included workshops in July and August 2017, meetings in March and April 2018, and culminating in a Nation meeting on 29 October 2018 attracting around 30 participants at Nyah. Participants workshopped the objectives, statements and supporting text, which had been prepared based on previous meetings, and approved the contribution for inclusion in both of Victoria's water resource plans.

4.4.7 Taungurung

Victoria's Water Resource Plan team and Taungurung Land and Waters Council met in August 2017 and again early in 2018 to outline the best approach for Taungurung to contribute to Victoria's North and Murray Water Resource Plan. It was agreed that consultation with Taungurung regarding water objectives, outcomes and other requirements as outlined in the Murray-Darling Basin Plan was best conducted by Taungurung, resourced through the employment of an Aboriginal Water Officer.

An Aboriginal Waterway Assessment facilitated by MLDRIN was held early October 2017. Staff from the Water Resource Plan team were invited and provided support during the week. Findings were to be included as a case study for the final Water Resource Plan.

A funding agreement for activities to meeting the Basin Plan requirements was developed and signed in June 2018, including for the employment of a Water Policy Officer who was recruited in July 2018.

It was agreed that the Taungurung Land and Waters Council would develop Taungurung's contribution for the Water Resource Plan with support from the Water Policy Officer. DELWP staff and Taungurung Land and Waters Council staff agreed to check in frequently and DELWP provide support and guidance as required. This occurred through face to face meetings, meetings on Country, email and phone.

A draft contribution for the Water Resource Plan was signed off by the Board and submitted to DELWP in mid-December 2018. The submission was confirmed by the CEO in February 2019 to be included in the final Northern Victoria Water Resource Plan.

Schedule 1 provides an outline of the consultation undertaken by the Taungurung Land and Waters Council (TLAWC), which has been provided for inclusion by TLAWC. It has not been edited by DELWP other than to align formatting style.

4.4.8 Wadi Wadi

MLDRIN delegates were contacted initially by DELWP in August/September 2018 to discuss an engagement plan. After several meetings it was agreed:

- to run a Nation meeting over two days in Swan Hill on 11 and 12 October 2018
- to cover fuel, accommodation and travel costs to support participation
- to coordinate mailouts, RSVPs and payment for attendance through First Nations Legal and Research Services who have contact details of all Wadi Wadi members
- to invite representatives from relevant organisations, including the executive officer of MLDRIN and environmental watering manager from the Mallee CMA
- to carry out joint consultation with New South Wales Department of Industry (DOI Water).

This was the first time that New South Wales and Victorian Governments had delivered a joint consultation for water resource plans and agreed to adopt New South Wales's approach to engagement. DOI Water contracted consultants, Strategic Small Business Solutions to conduct the engagement using the following process outlined below:

- phase 1: design and development – planning, development of consultation tools (question list and data use agreements) and participant identification (stakeholder list)
- phase 2: preparation - face-to-face interviews with Traditional Owners to share information, build relationships and guide planning of later workshops
- phase 3: consultation – inclusive workshops with the wider Wadi Wadi community to gather more contributions into the clauses of Part 14 on objectives and outcomes based on values and uses of water
- phase 4: analysis and review - data analysis and report writing, including face-to-face presentation of the draft report to Wadi Wadi Nation members who took part in face to face interviews.

An extract from the consultants final report is contained at **Schedule 2** to this Appendix and details the consultation process undertaken with the Wadi Wadi. Final sign off of the report from Strategic Small Business Solutions which formed the basis of the contribution in **Chapter 8** of the Comprehensive Report was provided by the 8 senior Traditional Owners who were involved in the one on one interviews.

The information in **Chapter 8** and **Appendix D** of the Comprehensive report is the report provided by the consultants with immaterial changes relating to grammar and spelling.

There are a group of Traditional Owners who identified themselves as Tati Tati Wadi Wadi. They had a separate consultation and contribution for the purposes of Victoria's North and Murray Water Resource Plan.

4.4.9 Wamba Wemba

MLDRIN delegates were contacted initially in August/September 2018 to discuss an engagement plan. It was suggested to involve another representative (referred to as Nation organiser) in planning the engagement because of his knowledge of the area.

After several meetings and phone conversations with each person the following was agreed:

- to run a Nation meeting so that the engagement approach is inclusive
- to run separate meetings for New South Wales and Victoria and allow Traditional Owners to decide which meeting they would like to attend
- to run the meeting over a two-day period starting at midday on the first day and finishing at midday on the second day. This will allow people to travel in the morning and afternoon

- on the first day, run a meeting at the Grain Shed in Swan Hill to share information and on the second day conduct a field trip to visit Lake Boga, Round Lake and Turtle Lagoon
- fuel, accommodation and travel costs to be covered by DELWP to support people's participation
- to invite representatives from relevant organisations, including MLDRIN, North Central CMA and Mallee CMA
- First Nations Legal and Research Service to coordinate a mailout of invitations and information as they have up-to-date lists of Wamba Wemba members.

The Nation meeting, held on 30 and 31 October 2018, was attended by nine Traditional Owners, with one MLDRIN delegate unavailable to attend as it was held mid-week and was difficult to take time off work. Several DELWP staff as well as representatives from the Mallee and North Central Catchment Management Authorities also attended.

At the meeting it was agreed DELWP would prepare a draft contribution on behalf of Wamba Wemba. The draft was reviewed by the Nation organiser and MLDRIN delegates before being distributed to the Wamba Barapa Working Group on 11 December 2018. There were no content amendment suggestions to the draft contribution.

A Working Group meeting was planned for 23 January 2019, which presented an opportunity for further discussion and feedback about the draft contribution. This meeting was cancelled due to sorry business.

A second Nation meeting was held on 7 March 2019 in Swan Hill. DELWP staff and a MLDRIN representative also attended the meeting. The purpose of the meeting was to review the draft contribution as a group and to make any revisions as agreed by the group. The revised version was reviewed by the Nation organiser and sent to the MLDRIN delegates before being distributed to the Wamba Barapa Working Group on 8 March 2019. There were no content amendment suggestions or objections to the report, so this version became the final contribution.

4.4.10 Weki Weki

MLDRIN delegates were contacted initially in October/November 2018 to discuss an engagement plan. It was suggested involving the Chair of the Weki Weki Aboriginal Corporation in planning the engagement.

After a meeting in Wodonga the following approach was agreed:

- run a Nation meeting so that the engagement approach is inclusive
- run the meeting at Tooleybuc, New South Wales, where there is easy access to a meeting room and accommodation
- run the meeting over an afternoon starting at midday and finishing at 5pm
- fuel, accommodation and travel costs to be covered by DELWP to support people's participation
- the Chair of the Weki Weki Aboriginal Corporation contacted Weki Weki members through email, facebook and phone/texts to inform them about the meeting and to register their details with DELWP
- First Nations Legal and Research Services were able to auspice the payments before and after the Nation meeting to ensure quick payment.

The first meeting was held on 15 December 2018 at the Tooleybuc Sporting Club and was attended by 16 Traditional Owners as well as DELWP staff. The purpose of the first meeting was to provide an overview of the water resource planning process and invite Traditional Owners'

contribution. This was the first meeting between the Weki Weki and a Government agency and its significance was noted.

By the end of the first meeting, Weki Weki members expressed interest in developing a contribution and agreed to include a 'placeholder' in the draft report for the Northern Victoria Water Resource Plan. They resolved to meet again in January to prepare a contribution for the final Water Resource Plan

The second meeting was held on 17 January 2019 at the Tooleybuc Sporting Club and was attended by 19 Traditional Owners, DELWP staff and a New South Wales representative from DOI Water, as requested by Weki Weki members. The New South Wales representative outlined the New South Wales process for Traditional Owner engagement and observed the meeting. The meeting was led by the Elders and there was an informal discussion about values and uses, objectives and outcomes, cultural flows and areas of interest. During the meeting, it was agreed that DELWP would develop a draft contribution based on the conversation and distribute it by email before the next meeting in February 2019.

The third meeting was held on 22 February 2019 at the Robinvale Golf Club. Positive feedback was received regarding the draft. The minutes of the meeting and the draft contribution were circulated to Weki Weki meeting attendees for any final comments, and as no further feedback was received, the final contribution was signed off by the Chair and Director of the Weki Weki Aboriginal Corporation as well as the MLDRIN delegates.

4.4.11 Yorta Yorta

There was a preliminary meeting with DELWP, Goulburn Broken CMA and the acting CEO of Yorta Yorta Nations Aboriginal Corporation (YYNAC) in November 2017. The purpose was to set out how to work together and what resourcing was required to facilitate the engagement for Water Resource Plans. The Acting CEO expressed an interest in recruiting for an Aboriginal Water Officer position.

A funding agreement was developed and signed by DELWP and YYNAC in January 2018 for the employment of an Aboriginal Water Officer to assist with activities related to meeting the Basin Plan requirements.

DELWP met with the CEO of YYNAC (who is also one of the MLDRIN delegates) in early 2018 where it was agreed to undertake an Aboriginal Waterways Assessment. A funding agreement was prepared and signed by MLDRIN in June 2018 to facilitate the AWA with Yorta Yorta.

At a follow up meeting in October 2018, the CEO highlighted that the Water Resource Plan was an opportunity to work towards an all of Country Plan and requested that the funding for the AWA be used to facilitate a community gathering instead. A variation of the funding agreement was developed in December 2018 to support this request.

It was agreed that the Aboriginal Water Officer would lead Yorta Yorta's contribution for the Water Resource Plan. DELWP staff and the Water Policy Officer checked in regularly and DELWP provided support and direction as required.

A draft contribution for the Water Resource Plan was signed off by the acting CEO and submitted to DELWP in mid-December 2018. The Aboriginal Water Officer presented the draft report to the Council of Elders in February 2019 and invited their feedback. The final contribution was signed off by the CEO in March 2019 and submitted to be included in the Northern Victoria Water Resource Plan.

5. Community consultation

In January 2019, following three years of preliminary work, discussion and engagement with key stakeholders, Victoria released the draft Victoria's North and Murray Water Resource Plan for public comment. The public consultation process with targeted and open consultation sessions helped stakeholders and communities to better understand Victoria's implementation of the Basin Plan. It provided a vehicle for interested parties to have their voice heard through a formal, recorded and publicly accessible response.

The public consultation ran from 23 January to 18 March 2019 and included:

- public meetings
- targeted stakeholder briefings
- presentations at existing stakeholder forums
- online consultation through engagevic.gov.au and accompanying submissions process
- continued engagement with Country with Traditional Owner groups
- direct contact with stakeholders by email.

5.1 Public consultation

Engage Victoria is the Victorian Government's Online Consultation platform. Through this platform the community can readily obtain information and documentation relevant to the public consultation in addition to having an online forum to share their ideas and opinions and provide feedback on the content.

DELWP engaged with the community through Engage Victoria in addition to:

- publishing advertisements in local newspapers regarding the commencement of public consultation and the time and location of public meetings
- emailing key stakeholders with the announcement of the release of the draft Victoria's North and Murray Water Resource Plan Comprehensive Report for public consultation and relevant public meetings
- announcing public consultation and public meetings through social media, particularly Facebook of the regional DELWP offices
- utilising delivery partner communication channels to advise water corporation and catchment management authority customers of the public consultation and the time and location of public meetings
- utilising communication networks of the Technical Advisory Group

Feedback from public consultation indicated that DELWP needs to review its processes for advertising community engagement. It is recognised that improvements can be made in the process to ensure that communication with community is undertaken in a way that aligns with how community obtain information.

In addition, concerns were raised across all the public meetings and via written feedback as to the six-week duration of public consultation. This feedback resulted in three additional public meetings being held and a two-week extension to the consultation process.

"I don't think you get how much stress the irrigation community is under..... I talk to people on the phone who are nearly in tears because they can't pay their water bills. There is nothing in the [water resource] Plan that gives us a sense of optimism. We understand that there are things that are necessarily out of your control but we want some security..... Murray-Darling Basin Plan hasn't really delivered what it was promised to....."

Loddon Valley GMW Water Services Committee

DELWP arranged eight public meetings across six locations at the beginning of February 2019. Following feedback from the community an additional three sessions were added to the schedule. In addition, public meetings were extended in duration to allow more time for discussion following public feedback about the length of the sessions. **Table 7** provides a list of public meetings held during the public consultation period.

The public meetings were supplemented by presentations at key stakeholder meetings in addition to attendance at Goulburn-Murray Water - Water Services Committee meetings. It was noted at the these committee meetings that earlier engagement with the committees would have been welcomed by committee members. Committee members communicated a desire to work with Government on policy, noting they had local and on-the-ground knowledge that should be fundamental to policy development.

Table 7: Public consultation meetings

Date	Meetings
4 February 2019	Bendigo 6-7PM Welcome to Country: Dja Dja Wurrung
	Mildura 12-1PM and 6-7PM Welcome to Country: Latji Latji
	Yea 12-1PM Welcome to Country: Taungurung
12 February 2019	Wangaratta 12-130PM Welcome to Country: Yorta Yorta
13 February 2019	Shepparton 12-130PM and 6-730PM Welcome to Country: Yorta Yorta
14 February 2019	Kerang 12-130PM and 6-730PM Welcome to Country: Barapa Barapa
25 February 2019	Yea 12-2PM Welcome to Country: Taungurung
27 February 2019	Shepparton 12-2PM Welcome to Country: Yorta Yorta

5.2 Key themes from key stakeholders and the community

During the public consultation period DELWP heard a consistent story from the community regarding the implementation of Basin Plan. Notably a significant proportion of the issues raised cannot be addressed through the implementation of Victoria's North and Murray Water Resource Plan. The feedback is, however, relevant to determining DELWPs position in discussions with Basin states and the Commonwealth in the continued implementation of Basin Plan. It has also been translated to existing work programs for the implementation of Basin Plan or *Water for Victoria* actions.

The key themes identified by the community included:

- the impact Basin Plan implementation is having on farming communities and concerns about the additional 450GL water recovery
- the lack of recognition of consumptive users, most importantly not recognising irrigators as part of the environment
- the importance of water security to support continued food production for Victorians and the impacts of high water prices
- confidence in the environmental outcomes expected by Basin Plan, noting the Menindee fish deaths and deterioration of river banks as an example of adverse outcomes for the environment despite significant water recovery for the environment.

There was strong feedback about a lack of confidence in the Basin Plan and the ability of the Commonwealth to regulate Basin States effectively and deliver on environmental benefits.

5.2.11.1 Impacts of implementing Basin Plan

During public consultation members of the community raised concerns regarding implementation of Basin Plan. A common theme across all meetings held was an expectation that Victoria's North and Murray Water Resource Plan would be a strategic water management plan for northern Victoria and a Government response to Basin Plan more generally. The public consultation meetings were an important tool for outlining the purpose and scope of water resource plans and the role of water resource plans within the Basin Plan framework.

> "This is destroying Basin communities. It's not about the water market, not about SDL adjustments..... the irrigation community is being destroyed. We are just seeing the destruction of our communities across the southern connected basin. This wouldn't be so bad if we were getting good environmental outcomes."
>
> **Public meeting, Kerang**

Community concern regarding Basin Plan implementation can by summarised as relating to:

- socio-economic interests and the impending additional 450GL recovery
- deliverability and constraints management
- lack of climate change considerations
- concerns that the quality of the waterways are not improving, noting the recent fish deaths
- lack of Government taking responsibility for bad decision making
- concern about Australia sustaining a viable food bowl.

There was also some discussion about seeing the Darling and the Murray Rivers being discussed as separate systems so that responses can be developed that are specific and more suitable to those systems. How DELWP considered the Basin and its tributaries was a common theme from the community. This underpins some of the doubts the community has regarding how the Basin Plan was developed including that without proper consideration of the system, there is difficulty in assessing the treatments for and deterioration in the Basin.

"Maps presented shows root and branch, doesn't focus in on the local creeks and areas. Many around Stanley are as dry as they have been for 50 years... The health of the system depends on the arteries as well as the main flows."

Public meeting, Wangaratta

Socio-economic impacts of recovering water under Basin Plan

The socio-economic impacts felt by regional communities from ongoing water recovery is significant. It was clear there is growing angst in regional communities regarding the continued viability of irrigation in northern Victoria under Basin Plan. This was particularly linked to concerns regarding the additional 450GL recovery for the environment from the consumptive pool and recent announcement by the Commonwealth Labor Party that the cap on buy-backs would be lifted.

"What we have been seeing under delivery of Basin Plan is that a lot of the gains for the environment are at the expense of irrigators."

Central Goulburn GMW Water Services Committee

Following the announcements from the Commonwealth on buy backs and concerns about how an additional 450GL could be recovered from the consumptive pool, irrigators across northern Victoria were calling for a commitment under Victoria's North and Murray Water Resource Plan that water will not be recovered from the consumptive pool if there is an impact. The decline in the dairy industry across northern Victoria was a clear example for community members of the impact water recovery has had on regional Victoria. The community is looking for a clear policy or strategy from Victoria to respond to changes in its agricultural industry.

"We are not looking after the customer in all of this."

Public meeting, Kerang

The community also identified that there was a lack of clarity about where the water recovery is coming from and where the remaining water will come from including how Victoria's share compares to the other Basin states. There were concerns raised about what would happen to Victorian communities if targets were not met in other Basin states.

"Unless things change the Goulburn irrigation district is dead and gone."

Public meeting, Yea

Deliverability and constraints

When discussing the environmental benefits touted by the Basin Plan, members of the community raised significant concerns that Commonwealth and State Governments would be able to deliver on those environmental objectives.

Concerns were raised in meetings across northern Victoria regarding the Government's ability to meet its environmental watering requirements with the water it already has, without having an impact on rivers and catchments or affecting delivery of irrigation entitlement. The ongoing condition of waterways in the Basin is a significant concern for community, noting the Menindee fish deaths as a clear example of what is happening under Basin Plan.

Inter-valley transfer risks were specifically raised. Discussion at public meetings identified how those risks had been identified in Victoria's Risk Assessment (see **Appendix B**) and the outcomes of that risk assessment. It was discussed with community the change in the risk assessment since 2016 and the increased risk inter valley transfers now pose to Victoria. Concerns were raised in reference to the impacts on Victorian waterways due to high flows for the Goulburn River in particular. Because of public feedback, additional information has been included in **Chapter 5** of the Comprehensive Report to explain the changes in the risk assessment and to highlight the risks and impacts on the Goulburn River.

The community also queried the progress made on lifting constraints in the system. Particular interest was shown in the Barmah Choke and the role of New South Wales. The ability to lift delivery constraints without flooding private land was also raised, particularly in Yea. It has been Victoria's position for some time that flooding on private land would not occur without prior consent of the land owner. It was requested that Victoria's North and Murray Water Resource Plan secure this position and also identify the risks to Basin Plan delivery that this position raises.

Lack of recognition of climate change

A common theme across northern Victoria was the impact of climate change on water availability and whether the modelling underpinning sustainable diversion limits should be revisited to assess the impacts of climate change. Discussion on whether this would mean an increase or decrease on recovery of water for the environment is not clear.

It was clear from discussions with the community that there are concerns about the impact of climate change on regional communities and how this was considered as a risk under the Plan.

> "We are all aware of high-profile politicians saying that climate change doesn't exist. The implications for the Basin will be horrendous. It will get worse not better. It's frightening."
>
> **Public meeting, Mildura**

The community is seeing long-term decline in flows and there are growing concerns that assumptions are based on historical flows that are no longer being experienced by irrigators.

DELWP outlined for the community how climate change was considered in the Risk Assessment (see **Appendix B**) and what strategies are identified to address climate change risks in Victoria.

Government not seen to be taking responsibility

The community raised concern about the ability to effectively manage water resources in the Basin when Victoria is so dependent on other Basin States. Particularly, how the northern Basin

is being managed and how New South Wales and Queensland can be held accountable including, compliance and site-specific issues at Menindee.

"We are sick of being talked to. You are worrying about the environment, but you have not seen the impacts on the community..... we'll have a real tragedy on our hands soon enough..... Menindee has been so badly managed, it's a joke – the MDBA has failed. Watering the Gunbower forest 3 out of 5 years is just disgusting, the ground is so soft the trees are collapsing. We have always had droughts; the fish haven't died before."

Public meeting, Bendigo

The community is seeking honesty from Government as to the reasons for adverse impacts resulting from water resource management decisions. There was dissatisfaction in how the Menindee Lakes fish deaths was handled by the Commonwealth and New South Wales Governments. The messaging around the cause of the fish deaths in Menindee Lakes heightened concerns in the Victorian community that the northern Basin will not be appropriately managed.

Following recent inquiries into New South Wales and Basin Plan implementation, communities expressed growing concern that New South Wales and Queensland will not be held accountable to Basin Plan requirements and to meeting Basin Plan outcomes.

Given the interdependencies between the northern and southern Basin, Victorian communities are concerned that Victoria is not prepared for the impacts if Queensland and New South Wales fail to deliver on Basin Plan requirements.

5.2.11.2 Not recognising the irrigation community

It was apparent to the community that Basin Plan and consequently Victoria's North and Murray Water Resource Plan had a strong focus on the environment. There was concern raised that irrigators were not represented in Basin Plan implementation to the same extent as the environment.

"Irrigators were not represented the same as environment."

Rochester-Campaspe GMW Water Services Committee

DELWP noted that there was a focus under water resource plans as to how Victoria manages entitlements to meet environmental watering requirements. Furthermore, DELWP took on feedback from the community about how **Chapter 3** of the Comprehensive Report could be improved to include more details about the history of the area and irrigated agriculture. DELWP made changes to the Comprehensive Report in response to this feedback.

The community provided feedback to DELWP in respect of its engagement strategy. Criticism was provided on the way in which DELWP engaged with the irrigation community in developing Victoria's North and Murray Water Resource Plan. There was a strong preference to be included from the ground up in policy development. DELWP's reasons to limit engagement with irrigators in the early stages of developing the plan stemmed from basing the Plan on Victoria's existing regulatory arrangements and therefore a perceived lack of impact on the irrigation community.

It is recognised that the impacts on regional communities are far reaching and water resource plans do not provide a sufficient vehicle to highlight these impacts. This Consultation Report is an opportunity to highlight and recognise the concerns of regional communities in northern Victoria.

"The issue I have is that Basin Plan is about water for the environment and river health - we are part of the environment, our district is part of the environment. The impacts are going at 100 miles an hour. You tell us there is going to be this and going to be that, but the urgency is not there"

Public meeting, Kerang

In addition to concerns about involvement in development of the Plan, how irrigation is identified and depicted under Basin Plan and in the Comprehensive Report is of concern to some community members. There is a growing belief that irrigators are being identified as the enemies of the environment. A strong theme during consultation was that the positive environmental impacts of irrigation should be included in policy and operational decision making. There were numerous examples of how irrigation of land contributed to environmental benefits through creation of habitat for native animals and the "micro-economies farms sustain".

"Irrigators are not interested in destroying our environment so our farm benefits. We want them both to survive."

Loddon Valley GMW Water Services Committee, Pyramid Hill

The irrigation community also sought clarification about the importance of the food bowl and food production in northern Victoria. There is a growing sentiment that if things don't improve soon, irrigation communities will fail in the near future. Irrigators are seeking a commitment from the Victorian Government as to how the agricultural industry will be protected alongside meeting environmental outcomes under Basin Plan.

"We are all looking for outcomes but irrigators are seeing the worst of the outcomes."

Public meeting, Yea

5.2.11.3 Water security and the price of water

There are growing concerns about the continued viability of agriculture in northern Victoria due to the significant volumes of water recovered from the consumptive pool, the high prices of water and a decrease in water security across the system.

"Let's put some confidence back in the industry. Let's lower the price of water so that its more affordable and we can water our land."

Public meeting, Kerang

There was a call for the Victorian Government to work on the issues that are facing Victorian irrigators before committing to further recovery under Basin Plan. There were a number of issues raised relating to the price of water, these included:

- concerns that the ability of non-water users (speculators) to trade in the market was interfering with the market and artificially increasing price
- concern that New South Wales irrigators entering the market is driving up the price of water.
- concerns that water management tools such as allocations, carryover and spillable accounts look after water investors more than end users of water
- concerns about the movement of water downstream and out of the GMID.

DELWP has undertaken to come and speak to the community about these issues and provide more information about how the water management tools benefit all uses and impact on the market.

"If water is going to be $500 per ML then the water needs to be available when I want it. ...Understand that GMW needs to deliver for all customers, if this isn't fixed than the customers aren't going to be there."

Public meeting, Kerang

Security in water allocations is also an increasing concern for the community. The perception is that the way in which water is allocated and the ability to have water delivered across the system is impacting on water security. Coupled with the price of water, irrigators are questioning the value of investing in growing crops or increasing herds on their land.

"The reality in Victoria is water in Eildon can only be used down to a third then there is recharge. It means we can have agriculture set up with some confidence in Victoria because of water security. The added thing is that production in agriculture builds the jobs in rural communities - this is at threat. $8bn of GDP comes out of the GMID and that is being put in jeopardy. ..... We seem to be throwing our water security away which is causing such angst."

Public meeting, Yea

The impact of transmission losses on the reliability of water was also discussed. High prices and reduced security is impacting on investment decisions.

It was noted that there is low allocation on the Broken River. In Wangaratta it was identified that water users do not value water from the Broken system anymore. It was identified low allocations at the beginning of the water accounting period impacts on the ability to plan their season. Concerns were raised about the continued viability of the Broken River system.

"Not enough water to supply water to those on system... the Broken is broken"

Public meeting, Wangaratta

Community concerns also centred around how the Victorian Government is responding to the difficulties being faced by regional communities. It is felt that there is too much focus on the Murray and not enough on the rivers and creeks feeding into the Murray. This unbalanced focus is perceived to be causing adverse impacts and unbalanced outcomes across the system.

"One concern for our area is that as a result of all this water being returned to the environment is that it has caused the price of water to go up for all the customers represented by the committee. In that context we receive flyers back from the local catchment management authority as people are going bust and can't continue farming they are receiving updates on the benefits to birdlife or fish in the area when they are trying to keep their head above water."

Torrumbarry GMW Water Services Committee

Irrigators in the community acknowledged the significant amount of work that has gone into improving systems but consider the stability of the region has been decreased since the introduction of Basin Plan. Many expressed concerns about the continued viability of regional communities as key agricultural industry is leaving northern Victoria. There was a significant amount of discussion regarding the closure of dairy farms across the region during the public consultation period. Irrigators warned of more to come if things aren't improved.

"Stability of this area is key at a certain point the investment we have made in the area won't be worth it..... We have been losing water for 12 years. Nothing has been done to mitigate the impact on our community. We are on a fine line. If something isn't done soon we might lose this irrigation community. If we don't do something soon we won't be able to use the water we do have."

Loddon Valley GMW Water Services Committee

"If dairy fails we all fail"

Loddon Valley GMW Water Services Committee

5.2.11.4 Confidence in environmental watering and Basin Plan outcomes

Across northern Victoria the community raised concern regarding the use and management of environmental water in the system. Of the issues raised by the community the concerns can be summarised as follows:

- the measure by which environmental flows in the Murray and connected rivers in the system were being determined, particularly noting that the regional communities were not seeing variance in flows that would otherwise be expected
- how decisions about environmental priorities and environmental watering priorities were determined and how the community could be involved in the planning and decision making
- concern regarding the use and management of environmental water in the system, noting that communities are seeing larger quantities of water being delivered and that these increased flows may be having an adverse impact on the bed and banks of the system
- confidence in achieving downstream environmental benefits that justify the impacts being felt by Victorian regional communities
- a desire for more transparency in the trade of environmental water to the consumptive pool.

Concerns were also raised that there was a view in the community that irrigators were getting a better deal that the environment. There was concern that despite the reports outlining that water needs to be recovered for the environment it was not translating into community views where support for protecting the environment through increased flows was not widely supported.

"I've had 40 years experience in Barmah and Barmah has been watered at the wrong time of the year with Moira grass plains overtaken with rush and red gums."

Public meeting, Shepparton

Concern about environmental impacts from high flows

The community identified the environmental impacts current system operation was having on the environment and the ability for the system to meet environmental delivery needs.

"The amount of environmental water that needs to be delivered down the system - how do you manage getting the water down the river? ..... Environmental flows going down Goulburn is causing erosion, this can't continue. .... Speaking to people who live along the Murray they note that there are trees falling into the river so there are erosion issues there as well. The volumes of environmental water that you are talking about and the challenge to push it down the river - Barmah Choke is an example of this issue but of course erosion is also an issue."

Public meeting, Kerang

Delivery constraints are an issue for the environment and irrigators alike. The Basin States and the Commonwealth have recognised the risks to delivering on Basin Plan associated with resolution of constraints issues. DELWP is currently working with the Commonwealth to finalise a business case and secure funding for a constraints offset project for the Goulburn River. As was noted in the Productivity Commission report, progress on the constraints issue needs a transparent work program and Victoria has been leading the discussion to ensure there is transparency in the process.

"constraints management is a risk to Goulburn and should be explicitly listed in the water resource plan.... high flows through Goulburn, impact on environmental flows, water trading inter valley, ... the amount of water pushed through is providing huge environmental impacts and affect ability to deliver environmental flows at the optimum time"

Public meeting, Shepparton

A clear concern from the community was the impact of increased flows in the system and the increased risks of damage to the bed and banks and reduction in water quality. Amendments have been made to the Risk Assessment at **Appendix B** to the Comprehensive Report to reflect new information regarding how changes to the timing and volume of demand is impacting on Victoria's ability to meet environmental watering objectives. How this was done has been described at **Chapter 5.7** of the Comprehensive Report which now provides an explanation of the risks and a case study outlining how these risks are affecting the Goulburn River in response to community feedback.

Measuring environmental outcomes

In addition to the concerns raised by the community about how we are going to use the water recovered for the environment and linked to the concerns about how the Victorian and Commonwealth Environmental Water Holder will make decisions on the delivery and use of water for the environment, questions were raised about measuring outcomes.

"There are a lot of interest groups around that area and obviously watching environmental watering and wondering what the outcome is and who assesses that and who measures that."

Torrumbarry GMW Water Services Committee

Under Basin Plan Victoria is required to report on an asset scale as to how it is meeting environmental watering outcomes. The Murray-Darling Basin Authority is required to report on how environmental watering across the Basin meets the targets that are set out in Schedule 7 of the Basin Plan.

In addition to Basin Plan reporting requirements Victoria undertakes a monitoring and evaluation program to determine the effectiveness of environmental watering. More recently DELWP prepared a Basin Plan Report Card to identify how water for the environment was delivered and used to meet Basin Plan requirements. The report card can be found at **https://www.water.vic.gov.au/reportcard**.

Feedback that the Water Resource Plan should include how the VEWH set environmental watering priorities and how these decisions consider the overlaps between consumptive and environmental deliveries. **Chapter 12** of the Comprehensive Report outlines how environmental watering priorities are determined in Victoria and how this aligns with Basin Plan. Changes have been made to **Chapter 12** to clarify the role of catchment management authorities and the Victorian Environmental Water Holder in the setting of environmental objectives and meeting environmental watering requirements. **Appendix E** to the Comprehensive Report provides an outline of priority environmental assets and how that aligns with Victoria's environmental water management plans which can be found at **https://www.water.vic.gov.au/waterways-and-catchments/rivers-estuaries-and-waterways/environmental-water/environmental-water-management-plans**.

5.2.11.5 Other issues

In addition to the above key themes, discussion with community and at key stakeholder forums included questions on the following matters:

- the role of MLDRIN in the assessment of water resource plans and DELWPs approach to engagement with MLDRIN
- questions about the submission and accreditation process more generally
- how DELWP was engaging with Traditional Owners
- discussions about Victoria's framework and how various tools under the Victorian Water Act operate and will interact with Victoria's North and Murray Water Resource Plan
- discussions about specific content of the plan, including how various risks were identified and articulated in the risk assessment including:
  - impacts of implementation of Basin Plan
  - risk relating to land use change and more specifically plantations and clearfell logging
- discussions about the use of fossil fuel and the environmental impact of pumping water around the system compared to the use of gravity fed systems
- Discussions about recreational water under Basin Plan and support of recreational water going forward in Victoria
- Bushfire impacts on catchments
- Impacts of any changes made to the allocation framework in New South Wales (or other States) and the risks this might have on Victoria, such as on incoming flows or trade

In the discussions around clearfell logging, including through written submissions, the impacts on water yield was identified. Community feedback identified that clear fell logging causes about 30 percent decrease in catchment yield. Concerns were raised as to why land users who manage plantations and use clear fell logging practices are not required to pay for water in the same way as irrigators, for example. As an example, community feedback identified clear fell logging in the Goulburn catchment upstream from Snobs Creek hatchery. Concerns were also raised about the water quality impacts of logging, particularly the increases in sediment.

"The effects of logging are diabolical and is an abuse of the environment. There is a compounding loss year on year and there is an urgent need to mitigate climate change. Who has the authority to tell VicForests to stop?"

Public meeting, Yea

While communities provided feedback on areas of the Water Resource Plan to improve, they also acknowledged the strengths of the Victorian water management system. There was a high degree of support of Victoria's position on Basin matters including the 450 GL recovery, development of the socio-economic criteria, and support shown for regional communities. Communities were confident that Victoria's compliance regime is effective and that in many ways, Victoria has been leading Basin Plan implementation. There was recognition and acceptance that Victoria's existing water management system did not require major change to meet our obligations under the Basin Plan.

Schedule 1 – Consultation summary provided by Taungurung Land & Waters Council

The information provided by the Taungurung Land & Waters Council below has not been modified other than to change formatting to follow the style of DELWP documents.

Consultation undertaken by the Taungurung Land & Waters Council (TLAWC)

Background

The Northern Victoria Water Resources Plan (NWRP) comprises the full extent of Taungurung country. Taungurung Land & Waters Council (TLAWC) was recently funded by DELWP to develop its response to the NWRP, making our water goals and aspirations more detailed and explicit.

The work prepared, agreed and submitted by Taungurung Land & Waters Council (TLAWC), in a process agreed between the corporation and Victorian Government, enabled Taungurung to prepare its response to Victoria's water resource plans, supported by Government when requested. By managing the consultation process and the decision-making, TLAWC secured its self-determination and autonomy.

Taungurung have strong cultural, spiritual and economic connections to their land, water, and resources (Country). As custodians of their Country, Taungurung have managed their land and waters sustainably over thousands of generations. We are now immersed in the process of gathering and protecting our values and the customary uses of water and increasing our participation in water management within the region. The process is an ongoing effort supported by DELWP and other Government agencies. It is essential that it continuously contributes to the Northern Water Resource Plan in the future.

Consultation process

Invitation

Taungurung Land & Waters Council (TLAWC) made an open invitation to all members to participate in the two consultation meetings. We were looking for a consensus about our goals and aspirations, but at the same time, we aimed for the consultation process to be genuinely representative, gathering all different positions and thoughts about Country and the water management in the region.

Table 1: Attendants

First consultation meeting	Second consultation meeting
Michelle Monk	Michelle Monk
Troy Wilkinson	Troy Wilkinson
Ashley Wilkinson	Ashley Wilkinson

First consultation meeting	Second consultation meeting
Patricia Smith (Aunty Patsy and Board member)	Patricia Smith (Aunty Patsy and Board member)
Matthew Shanks (Board member)	Matthew Shanks (Board member)
Brad Letman (RSA negotiation group)	Brad Letman (RSA negotiation group)
Shane Monk	Shane Monk
Corrie Leathman	Corrie Leathman
Ronald Leathman	Ronald Leathman
	Annette Sax

**Bernadette Franklin (Aunty Bernadette) and Angela Ten Buuren were unable to attend to meetings but they participated in the elaboration and review of the final NWRP response. Also, they are members of the Baan Ganalina and were part of the consultation by providing feedback and comments to the process and the development of the response.*

***Matthew Shanks and Patricia Smith (Aunty Patsy) have been nominated as the new Taungurung's MLDRIN delegates. Official recognition of this nomination is pending due to internal process and procedures.*

Process phases

Table 2: Process phases

Process phase	Timing
Coordination meetings with DELWP representative to plan and receive information about the requirements of the consultation process and the proposed format of the NWRP response	(September 2018)
Gathering and review of different sources of information, such as; *Taungurung Buk Dadbagi* (Country Plan) and the final report of the Aboriginal Waterways Assessment 2017	October 2018
Organization and open invitation of Taungurung members to participate in the process	October 2018
Preparation of a draft document and workshop agenda	October 2018
First consultation meeting: review and comment on the draft document, receive input from attendants. Formal creation of the water knowledge holder group *Baan Ganalina*	8 November 2018
Permanent communications and collaboration with the *Baan Ganalina*	November 2018
Second consultation meeting: review and approval of the final version of the NWRP response	28 November 2018
Submission of the final version of NWRP response to DELWP	6 December 2018
Approval of the response and resubmission of NWRP response after observations were solved	14 December 2018

Outcomes

Taungurung's NWRP response was developed following the principles of true self-determination.

TLAWC has developed the principles and the preferred means of engagement. On July 2018, as part of the Aboriginal Water Grants Program funded through the water resource plan project by DELWP, TLAWC employed a Water Policy Officer to continue the collection of Taungurung values and uses of water, increase our participation in water management, build capacity within the corporation and contribute to the development of Taungurung water rights. TLAWC requests that the Water Policy Officer must be considered as the first contact for all waterways matters.

TLAWC has created the *Baan Ganalina* (Guardians of water), a water knowledge holder group which will support and advise the Water Policy Officer, assist in project development and implementation and plan and conduct cultural activities on waterways. It would be the role of the Water Policy Officer to inform the Water Knowledge Holder Group and prepare consultation processes if required for any future policy development, evaluation or endorsement.

TLAWC has started the process to update the *Taungurung Buk Dadbagi* and develop a Water Chapter.

Final thoughts

TLAWC expects that the State Government, its departments and agencies will willingly contribute to the progress of the objectives and aspirations about water management which are now explicit and systematized in the NWRP.

Taungurung feel confident that in adhering to the developed principles of engagement we can contribute to water management in the region in partnership with DELWP and other state agencies to achieve our water aspirations and objectives in line with the principles of self-determination.

As custodians of Traditional Ecological Knowledge, we request the protection of the intellectual property of the information shared in the NWRP, to ensure cultural and environmental knowledge is protected and managed according to the principles of true self-determination. All intellectual property rights of water knowledge and practices are vested upon TLAWC, who hold the right to keep the cultural and environmental knowledge confidential. The use or reference of this information for purposes other than informing the NWRP requires free, prior and informed consent obtained through appropriate consultation with Taungurung.

Finally, Taungurung acknowledge and praise the effort and commitment that DELWP representative has shown to initiate, promote, improve and expand the engagement with Traditional Owners. TLAWC recognizes that even though the input from Traditional Owners has been limited during recent years due to capacity and resourcing issues, DELWP is committed to working with us for a more meaningful contribution to the water management in Victoria.

Schedule 2 – Extract from Wadi Wadi Consultation Report

The content of the consultation report for Wadi Wadi engagement has not been altered other than to change formatting to follow the style of DELWP documents.

Extract from the Strategic Small Business Solutions consultant report

Scope

Independent Aboriginal consultants, Strategic Small Business Solutions (SSBS), were contracted by DOI Water to conduct the engagement to provide a sense of independence, and to safeguard cultural knowledge. The consultants were given this brief before the consultation process.

First Nations stakeholder consultants will:

- work with New South Wales' DOI Water and Victoria's DELWP and the Wadi Wadi Nation, which crosses the border of Victoria and New South Wales
- identify the importance of water to the Wadi Wadi Nation and seek information about the values placed on water and the Nation's vision for the future in water sharing and management. They will work in a culturally appropriate manner with the appointed Wadi Wadi delegate(s) to meet with identified Traditional Owners of the Wadi Wadi Nation and gain informed and agreed consent, using the data use agreements provided by DOI Water.
- conduct face-to-face interviews with identified Wadi Wadi Nation Traditional Owners after obtaining written consent
- seek Traditional Owner support for the planned workshops on water resource plans and encourage active engagement and participation
- make sure SSBS support the workshop by promoting discussion around key issues and creating a comfortable atmosphere conducive to open and direct feedback from participants
- prepare an extensive consultation report for DOI Water and DELWP that provides authentic data gained with consent from Wadi Wadi Nation members about their values and objectives for water resource planning in their Nation
- provide the report to interviewees and seek approval of report content during return face-to-face visits
- present the final report to DOI Water and DELWP for publication.

Methodology

The methodology for this consultation is based on a Nation by Nation approach developed by Strategic Small Business Solutions on "principles for culturally appropriate Nation-based consultation". These principles are supported by a commitment to the practice of Indigenous data sovereignty and the use of qualitative research practices, including participant-centred research and generic thematic analysis.

Principles for culturally appropriate Nation-based consultation

Strategic Small Business Solutions rely on their proven approach to culturally appropriate consultation. While this is the first time we have taken part in the new method of Nation-based consultation, our approach as shown here has proven to be culturally appropriate and successful.

Strategic Small Business Solutions propose the following community consultation methodology for culturally appropriate First Nations stakeholder engagement:

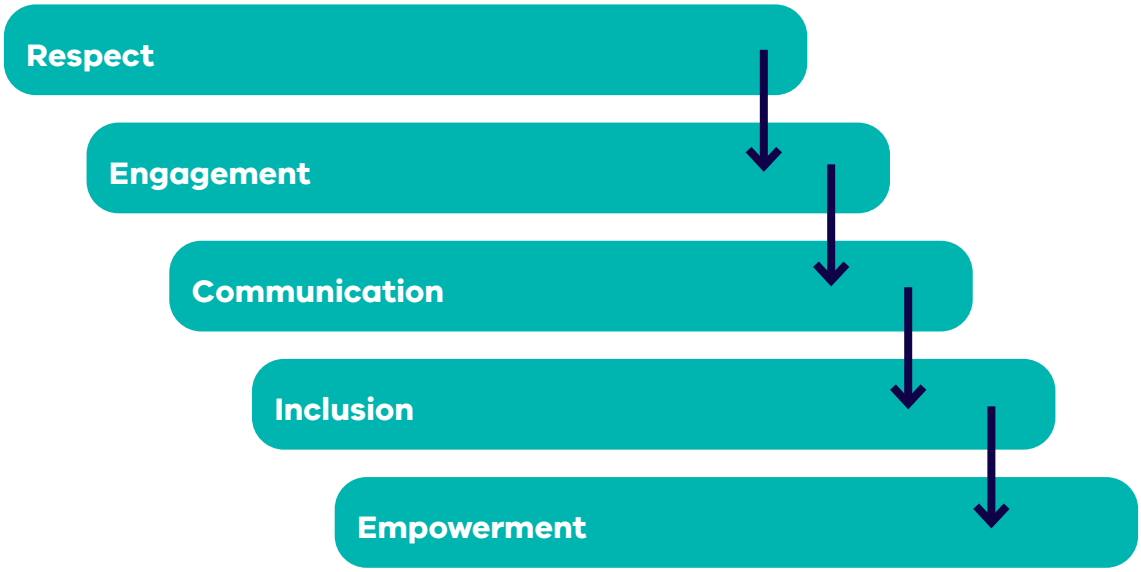


Figure 1: Proposed community consultation methodology of Strategic Small Business Solutions

Nation-based approach

The consultation methodology enables First Nations people to continue their traditional roles as custodians. A Nation-based approach, encouraged by the MDBA, Northern Basin Aboriginal Nations and MLDRIN, sustains the presence of individual Nations and allows them to contribute to water resource plans within the context of their cultural boundaries. With this approach, First Nations can assist government to make better decisions in water planning.

Governance structures of First Nations are complex and in their infancy in engaging with Government. The engagement approach taken was guided by the MDBA, Northern Basin Aboriginal Nations and MLDRIN and considered accepted cultural protocols. It relied heavily on the Wadi Wadi Nation organisers. MDBA states that 'the term 'Traditional Owners' is used to refer to those with recognised cultural authority to speak for Country' and guides states to identify appropriate Traditional Owners for consultation. The use of the Nation organiser as a guide relied on widely accepted cultural protocol and lore which determines that only internal representatives have the cultural authority to speak on a Nation's internal governance structures, guide consultative processes and identify senior Traditional Owners.

Indigenous data sovereignty

Part of a culturally appropriate consultation framework acknowledges the rights of First Nations people over their own knowledge. The contract signed between Strategic Small Business Solutions and DOI Water included this definition of First Nations Cultural Knowledge:

'Accumulated knowledge which encompasses spiritual relationships, relationships with the natural environment and the sustainable use of natural resources, and relationships between people, which are reflected in language, narratives, social organisation, values, beliefs, and cultural laws and customs'

Consultants are required to identify any First Nations cultural knowledge gathered during the consultation. This can only be used for specific purposes in the accreditation of water resource plans. Wadi Wadi participants read through data use agreements which made them aware of the purpose of the research and the use of their knowledge, and signed consent forms, giving them options for the recording and storage of their individual data.

Research methods

Our research methodology is aligned with the principles of Culturally Appropriate Nation-based consultation and the MDBA Part 14 Guidelines. Ethical considerations include the de-identification of data, the explanation of the purpose and scope and participant consent. These aligned with general considerations in the guidelines:

- prior, informed consent of the affected Indigenous and local communities
- ownership, protection and control of traditional knowledge
- the need for transparency.

New South Wales DOI Water supplied the data use agreements. The data use agreements are a sign to First Nations people that they and their knowledge are being treated with respect. The research process was expected to be directed by participants, with Traditional Owner face-to-face interviews shaping the research design. This two-pronged approach was recommended by the MDBA.

Data was collected from eight Wadi Wadi Nation-identified Traditional Owners during face-to-face interviews in the Traditional Owners' chosen location. A two-day workshop was conducted and further data was collected from just under 50 participants in a pressure-free environment.

Carefully considered questions and prompts developed by the consultants encouraged open, narrative responses, in line with the principle of flexibility and MDBA guidelines to 'use appropriate tools and mechanisms for recording and understanding Aboriginal objectives and outcomes.' A qualitative data analysis of both interview and workshop data was used to 'provide a fair-minded representation of information and knowledge gained through the consultation process,' as guided by the MDBA.

Consultation process

The Consultation Process followed four phases.

- phase 1: design and development – planning, development of consultation tools (question list and data use agreements) and participant identification (stakeholder list)
- phase 2: preparation - face-to-face interviews with Traditional Owners to share information, build relationships and guide planning of later workshops
- phase 3: consultation – inclusive workshops with the wider Wadi Wadi community to gather more contributions into the clauses of Part 14 on objectives and outcomes based on values and uses of water
- phase 4: analysis and review - data analysis and report writing, including face-to-face presentation of the draft report to Wadi Wadi Nation members who took part in face to face interviews.

The MDBA Part 14 guidelines advise 'a planned approach to properly engaging Traditional Owners, including identification and involvement of appropriate Traditional Owners' (phase 1). They suggest that for genuine engagement in water resource planning, Traditional Owners be consulted for two specific purposes of information sharing/relationship building meetings (phase 2) and inclusive workshops (phase 3).

Phase 1: design and development

Phase 1 included development of a stakeholder list, a data use agreement and a question list for the face-to-face interviews.

Stakeholder list

The stakeholder list was a key document required in the early stages of the consultation. It guided Strategic Small Business Solutions and DOI Water to engage participants for interviews and workshops according to a priority of traditional Nation-based governance. Other regional stakeholders who don't operate on a Nation-based model were also included.

The list clearly classified stakeholders into these different governance types, to overcome previous reliance on a few key stakeholders at the expense of others:

- Traditional Owners: groups or individuals under Nation-based governance
- external governance: those with non-traditional governance structures imposed from outside the Wadi Wadi Nation
- historically connected: those from other Nations who live on Wadi Wadi Country.

The Nation Organisers, with their cultural authority and internal knowledge of Wadi Wadi Nation governance, were essential to developing the stakeholder list in this Nation-based approach.

They provided Strategic Small Business Solutions with a list of Traditional Owners to make sure of inclusive representation of Wadi Wadi family groups and communities who do not always correspond to towns from a Western geographical perspective. These Traditional Owners are not necessarily associated with established lead agencies in the Aboriginal sector, but are recognised from grassroots governance structures as true cultural leaders by the Wadi Wadi community.

The stakeholder list was treated as a living document, with names being added throughout the consultation. All individuals on the list consented to share their details, either through the Nation organiser or Strategic Small Business Solutions. The list will be kept with DOI Water Aboriginal staff. As guided by the MDBA, 'better practice would expand and update available knowledge and understanding about the relevant stakeholder groups that are linked with the Basin water resources in an area'.

The Nation organisers were integral to the consultation. Freely-given consent and a culturally appropriate introduction to the identified Wadi Wadi Nation Traditional Owners was essential to the success of the interviews, comfort level of the interviewees and gathering of highly useful data. Strategic Small Business Solutions believe the consultation process would not have been achieved productively without the Nation organisers' contribution to the consultation project.

Data use agreements

Data use agreements allowed the Wadi Wadi Nation people, as a Nation and as individuals, to play a part in managing and controlling information they gave throughout the consultation.

Two different agreements were created for face-to-face interviews and workshops. These defined and explained:

- the purpose and scope of the consultation
- identity protection measures where data was de-identified and personal details stored securely
- data storage procedures, giving options for choice by participants
- data use where First Nations' cultural knowledge was limited to use for water resource plan development and accreditation, water planning and internal education.

Strategic Small Business Solutions concluded that once the data use agreements for the face-to-face interviews had been carefully explained and reviewed with participants, there was no room for doubt in participants' minds about the integrity, safety, ownership and use of the data once it had been shared freely with the consultants.

At first some participants appeared daunted by the data use agreements. However, they all agreed to sign them once they clearly understood that the signed agreements would protect their shared knowledge, and this relieved any anxiety.

The MDBA guidelines acknowledge that 'it is an ongoing challenge for Aboriginal organisations to engage multiple and repeated times with governments for a range of purposes.'

The reasons why we have data use agreements are:

- to safeguard First Nation' cultural knowledge
- that data gathered can only be used for the water resource plans, with participants consulted again for future water planning or approached to release the knowledge.

Question list

Strategic Small Business Solutions developed a question list in consultation with DOI Water. This was used for the face-to-face interviews to encourage conversation, shape interviews and ensure comprehensive coverage of information.

The list was useful as a guide, but was not always needed as interviews adopted a flexible, participant-controlled approach, and were often structured in a free-flow narrative style.

Phase Two – preparation

As the knowledge holders and heads of family groups within the contemporary cultural framework, senior Traditional Owners were invited to take part in interviews to share information, build relationships and shape the consultation by gathering feedback to guide the wider community workshops. Strategic Small Business Solutions did a series of face-to-face interviews with Traditional Owners in October 2018

Face-to-face interview participant data

In total eight Traditional Owners were interviewed in phase two. The first interview was terminated after it was agreed by all meeting with the Traditional Owner in her home that she was far too unwell to trouble her on that day. Aunty was terribly disappointed to be unable to participate as she expressed that the issue of water sharing was extremely important to her and her family and people.

There was an even gender spread as shown in Table 1. It is important to note that good representation for culturally appropriate consultation is measured not by numbers, but by inclusiveness of family groups and communities. In total, these Traditional Owners represented seven different family groups, more than 5,000 different people and spoke for a broad range of communities and different areas of Wadi Wadi Nation Country. The Nation organisers were included as participants. Consultants travelled more than 1,200 kilometres across the Wadi Wadi Nation and beyond to different locations.

Table 3: Participant Data: Traditional Owner face-to-face interviews

Date	M/F	Governance	Families Represented*	Location
12/10/2018	F	Grassroots	Davies/Wise-Sabina	Koondrook
13/10/20181012018	M	Grassroots	Kennedy	Robinvale
06/11/2018	F	Grassroots	Kennedy	Robinvale
13/10/2018	F	Grassroots	Kennedy/Baxter	Robinvale
13/10/2018	F	Grassroots	Ingram	Swan Hill
13/10/2018	M	Grassroots	Jackson	Balranald
14/10/2018	M	Grassroots	Firebrace	Echuca/Moama
14/10/2018	M	Grassroots	Firebrace/Morrison	Echuca/Moama
14/10/2018	F	Grassroots	Firebrace/Kennedy	Echuca/Moama

**Family groups represented do not necessarily correspond with surnames of participants.*

Face-to-face interview participant identification process

Traditional Owners from these groups were invited to be participants, always with guidance from the Nation organisers:

- grassroots Traditional Owners on the stakeholder list, as provided by the Nation organiser
- further suggestions from interview participants, while on the ground
- Native Title applicants on the stakeholder list, as provided by Native Title Services.

Best practice culturally appropriate consultation dictates that the Nation organiser arrange with the Traditional Owner/s a time and location of their choice to meet the consultants Strategic Small Business Solutions. If the Traditional Owner/Owner's were then comfortable, an interview was done once consent was confirmed via data use agreements. SSBS did find, as previously experienced, that in line with culturally appropriate consultation a need to be flexible around booked appointment times and travel plans made with individual Traditional Owners is required along with an ability to adapt quickly to changed circumstances and move forward.

Face-to-face interview process

So that the process could be as culturally appropriate as possible, Traditional Owners were encouraged to choose how they would like the interview conducted, including:

- choice of venues, including own homes, motels, cafes and community venues
- food brought to their home or in a cafe
- options for sharing feedback such as question and answer, walks on Country or photo documentaries
- recording options such as voice recording, note-taking, or both
- on Country trips.

Interviewees were given an information package that included the data use agreement, a consent form, the list of questions and a water resource plan information booklet/workshop notes. Nation organisers introduced all those present to the Traditional Owner/s, including an Aboriginal cultural officer from DOI Water who was at all but two of the interviews. Strategic Small Business Solutions asked Traditional Owner/s how they would prefer to be addressed,

thanked the Traditional Owner/s for their time, allowing us to talk to them on Country and paid their respects to Traditional Owner/s and Elders past, present and emerging. All present yarned comfortably and the data use agreement was then provided and explained to the Traditional Owner/s who freely gave their consent to share knowledge in all cases was freely given. The consultants asked questions with the TO's sharing their knowledge where and when able about Water Sharing and Planning, in their home, in a café, at Nation Organisers and Consultants accommodation and in one case on Country on the riverbank which included a much enjoyed and appreciated visit to the "family camp" which is where the Traditional Owner and his family had lived until 1965 when they were compelled to move into the town.

The consultants asked questions and the Traditional Owner/s shared their knowledge where and when they could about water sharing and planning. This took place in their home, in a café, at Nation Organisers' and consultants' accommodation, and in one case on Country on the riverbank, with a much enjoyed and appreciated visit to the 'family camp' where the Traditional Owner and his family had lived until 1965 when they were compelled to move into the town.

The 'family camp' visit was a rare opportunity to gather information about how significant the water/land connection is to First Nations people, and the time and spiritual journey taken for them to have recreated their 'family camp' is not to be taken lightly (see photos).

Over the course of the face to face interviews journey, it was evident that the more the Traditional Owner/s shared their stories, the more they wanted to, with the consultants receiving phone calls from Traditional Owner/s after the interviews with more knowledge the Traditional Owner/s wished to share. The Nation Organisers did a tremendous job of encouraging attendance at the workshop to be held the week after the Traditional Owner interviews. The interviews appeared to cement the relationships forged between the Nation Organisers, Traditional Owner/s and the consultants. Strategic Small Business Solutions concluded that the face-to-face interviews are integral to effective workshop attendance and participation, and the importance and valuable contributions of the Nation Organisers cannot be overstated.

Face-to-face interviews feedback

The feedback from the Traditional Owners in these interviews will provide a good basis for the workshops and for the overall structure of the findings in this Consultation Report. From these interviews, the following themes, were drawn out to guide the workshop discussions.

These themes from the interviews were drawn out to guide the workshop discussions:

- water represents 'Life'
- grave concerns over present care of all waterways
- 'special' memories and spiritual and physical cultural connections to the waterways for living and ancestral First Nations people
- accessibility to the waterways
- First Nations management of the waterways
- a firm belief that there are First Nations solutions to present water issues
- financial assistance required to repair damaged waterways.

The Basin Plan, Chapter 10, Part 14 requires that the views of First Nations people on the values and uses of water and a range of other issues including cultural flows, protection of First Nations water values and uses, identified heritage and identification of risks arising from the use and management of water resources are identified for inclusion in the water resource plans. It also requires that First Nations are given the opportunity to actively take part in identifying their own objectives and outcomes.

The feedback gathered in the face-to-face interviews allowed for extensive analysis. The recurring themes that were identified provided the basis for drawing the Wadi Wadi Nation Workshop questions to First Nations participants by aligning to culturally appropriate protocols.

As the Wad Wadi Nation consultation for Water Resource Planning is a collaborative project between New South Wales DOI Water and Victoria's the Wadi Wadi workshops location and venue had been arranged with DELWP under the guidance of the Nation organisers to align with culturally appropriate consultation protocols.

All Traditional Owners we spoke with supported the chosen workshop location and venues.

Phase 3 – consultation

Workshop participant data

A two-day Wadi Wadi workshop was held in Swan Hill Victoria on Thursday 11th and Friday 12th October, 2018. As per MDBA guidelines, this workshop put forward the opportunity for the Wadi Wadi Traditional Owners, along with other Wadi Wadi members to have their voices heard on the values and objectives of water resource planning within their Nations boundaries.

There was a total of 28 participants who signed the attendance sheet including Wadi Wadi members of all ages. There were an estimated 15-20 First Nations people in attendance who signed the attendance sheet. Of the 28 signed in as attending the workshop, 16 signed the workshop participation agreements.

Workshop logistics

As previously mentioned, the workshop logistics in this instance were organised by DELWP and the Nation organisers prior to the collaborative agreement between New South Wales DOI Water and Victoria's DELWP and the engagement of the consultants (SSBS).

The amount of people attending the workshop was more than anticipated based on prior workshop attendance, however less than had indicated attendance to the Nation organisers and DELWP. It is noted that travel costs, at a per kilometre allowance for travel over 100km's to attend and meal costs and accommodation costs were covered by DELWP.

The lunch on the day of the first workshop, followed by afternoon tea and a BBQ dinner were warmly received. The second day breakfast, morning tea and lunch were provided prior to closing the meeting.

This cost covering arrangement may have influenced the larger turnout than anticipated, based on prior workshop attendance, amount of Wadi Wadi Nation members who could travel to Swan Hill based on affordability and a wish to have their voices heard.

Workshop process: day one

All workshop participants and facilitators including consultants, DOI staff, DELWP staff and other organisational representatives met at the riverfront in Swan Hill on the banks of the Murray River as deemed most culturally appropriate by the Nation organisers and Wadi Wadi participants.

Figure 2: Smoking Ceremony – Swan Hill

Image credit: Andrew McMahon, SSBS

- a smoking ceremony was performed and Welcome to Country followed
- all workshop participants and facilitators then travelled to workshop venue, the Grain Shed
- workshops lasted between four to five hours according to the following structure:
  - lunch
  - introductions and acknowledgment of Traditional Owner's and Elders past, present and emerging, thanks for participants time and allowing the workshops on Country.
  - overview of the two-day workshop
  - water planning information session (DOI Water) and (DELWP)
  - data use agreement and consent (SSBS)
  - workshop 1
  - close meeting

All workshop participants and facilitators returned to Swan Hill riverbank for a BBQ.

Workshop process day two

Participants and facilitators met at the Grain Shed for the commencement of the workshop:

- re-cap of previous day
- MILDRIN presentation
- morning tea
- workshop 2
- lunch
- adjourn to Swan Hill riverbank
- close meeting

Data use agreement

SSBS found that the workshop participant agreements were met with a degree of trepidation and mistrust. We conclude that due to the large volume of attendees seated at round tables with other family members, there were mixed views regarding signing any documents perceived to be for the Government and this promoted discussion about the agreement itself.

In comparison, the face to face interview data use agreements were signed without hesitation. Further clarification was sought in some instances and as previously mentioned 16 participants chose to sign the agreement. Other participants were willing to share knowledge whilst choosing not to sign an agreement. SSBS conclude that more time to address large numbers of workshop participants on an individual or small group basis would be helpful to allaying any concerns about the data use agreements.

Feedback Sessions

Figure 3: Workshop Participants – Swan Hill

Image credit: Andrew McMahon, SSBS

Some factors to consider in the feedback sessions:

- keep it simple
- use 3-4 questions
- use prompts to encourage discussion
- use examples to start conversations use photos, and
- use large colour maps.

Phase 4: analysis and review

Analysis

Qualitative data analysis was used to identify recurring themes in the face to face interviews and the workshop participation feedback. Data was gathered in a formal, yet comfortable forum with house rules applied beforehand so that all felt free to express their views directly and when required forcibly, however always in a civilised and polite and respectful manner. Participants clearly felt comfortable to ask questions of Government representatives and pushback respectfully when the answer was unsatisfactory to them or required further clarification. From this direct approach, honest data was gathered for analysis and is presented in Chapter 11 of the Comprehensive Report.

Review

All face to face interviewees were asked how they would prefer to review the draft report. All wished to be contacted again to review the report on a face to face basis. Those with access to email will be emailed a draft copy before the visit to ensure time has been allowed for a satisfactory review of their input, that the report is culturally appropriate and to request any amendments they deem necessary be addressed.

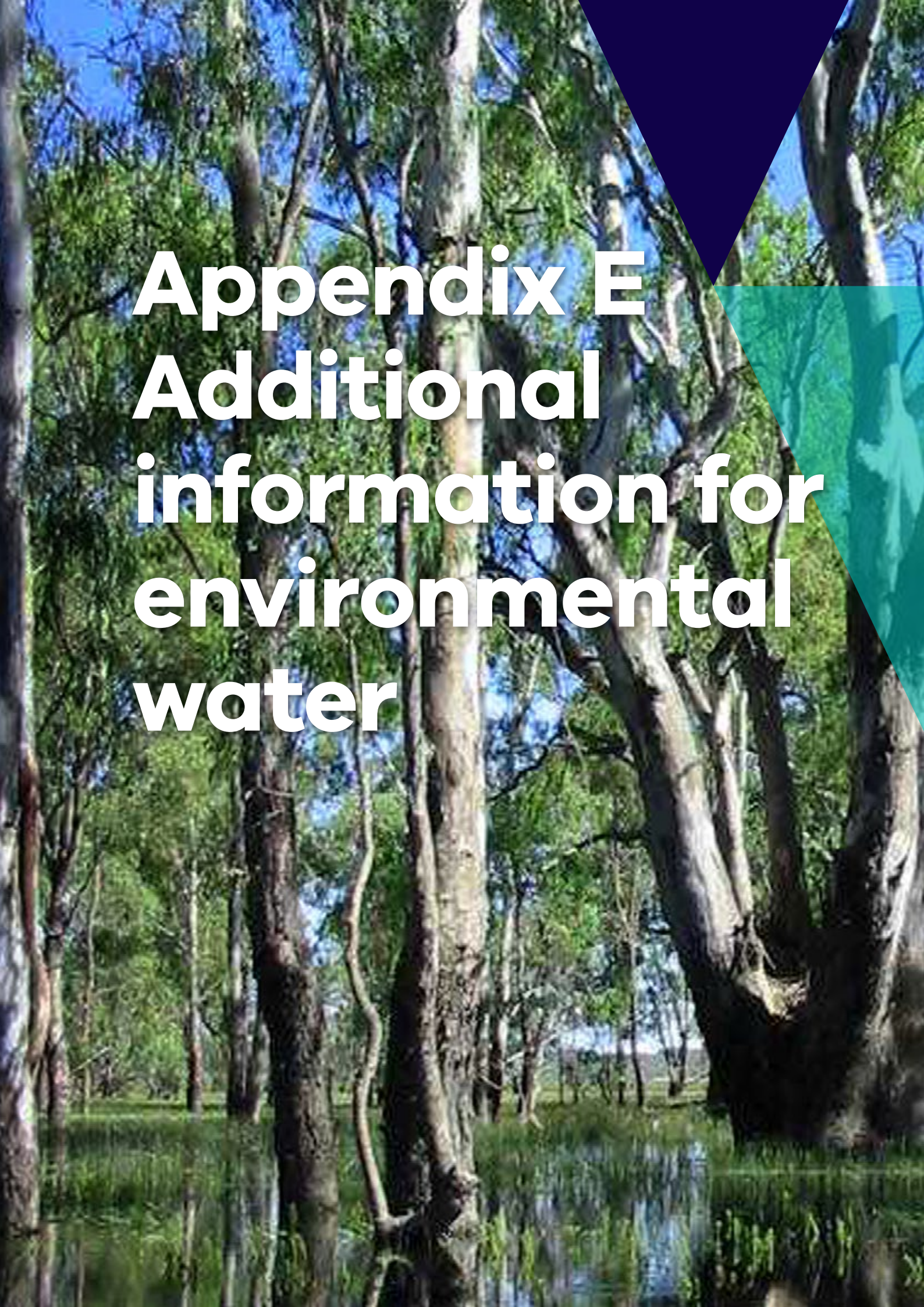
Recommendations for future consultation process

The following recommendations are made for future culturally appropriate Nation-based consultation rounds in the water resource plan development process:

- the Nation organisers in the Wadi Wadi Nation were crucial to the success of the consultation. Their combined input and guidance proved invaluable and determined accessibility to First Nation Traditional Owners. SSBS recommend the Nation organisers be engaged as early as possible in the process to begin identification of Traditional Owners and to determine the Traditional Owner's views on participating in the interview process
- the importance of the Nation organiser (delegate) cannot be understated and that MILDRIN/ NBAN play a more active role in determining the active status of the delegate prior to recommending the delegate to the Department. This may avoid a pressure situation on the delegate when contacted by consultants or the Department if they do not wish to be involved in the process.
- the project timeframes are reviewed to be more in line with more flexible culturally appropriate timelines, therefore allowing for availability for face to face interviews and travel arrangements to workshops.
- the DOI review the DELWP model for funding for workshop participants who are required to travel to attend workshops.

Figure 4: female MLDRIN delegates with a Traditional Owner

Image credit: Andrew McMahon, SSBS



Appendix E Additional information for environmental water

Appendix E
Additional information for environmental water

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Planned environmental water in the Northern Victoria and Victorian Murray water resource plan areas

Three categories of planned environmental water (PEW) have been identified for the Northern Victoria and Victorian Murray water resource plan areas.

Table 1 describes the three different types of planned environmental water, and Table 2 outlines the rules and associated arrangements which apply in the Northern Victoria water resource plan area to the planned environmental water. There is no planned environmental water in the Victorian Murray water resource plan area.

Table 1: Planned environmental water in the Northern Victoria water resource plan area

Instrument that secures PEW	Environmental Commitment under Commonwealth Water Act PEW definition
PEW 1 Bulk Entitlement (Broken System-Goulburn-Murray Water) Conversion Order 2004 Clause 12 and Schedule 4 and 5	Clause 12 provides for the minimum and maximum environmental flow. Schedule 4 sets out the operational arrangements and operational tolerances for meeting the minimum and maximum environmental flows. Schedule 5 sets out the method to calculate the natural flows. **Committed or preserved:** Clause 12 commits water from the Broken system to maintain the specified environmental minimum flows. **For environmental purposes:** Water that is committed by setting environmental minimum flows is committed for environmental purposes. Although the entitlement does not specify the precise nature of these purposes, it is reasonable to consider that the water is committed for the purposes of achieving environmental outcomes for the Environmental Water Reserve (protecting or conserving ecosystem function, biodiversity, water quality, and/or water resource health). **Cannot, to the extent to which it is committed or preserved, be taken or used for any other purpose:** Compliance with the environmental minimum flows is measured in a way that accounts for any losses resulting from the exercise of, for example, section 8 rights for domestic and stock use, and ensures that the volume of water committed for environmental purposes is met.

Instrument that secures PEW	Environmental Commitment under Commonwealth Water Act PEW definition
PEW 2 Bulk Entitlement (Ovens System – Goulburn-Murray Water) Order 2004 Clause 12 and Schedule 4 and 5	Clause 12 provides for the minimum and maximum environmental flow. Schedule 4 sets out the operational arrangements and operational tolerances for meeting the minimum and maximum environmental flows. **Committed or preserved:** Clause 12.1 commits water from Lake Buffalo and Lake William Hovell to maintain the specified environmental minimum flows. **For environmental purposes:** Water that is committed by setting environmental minimum flows is committed for environmental purposes. Although the entitlement does not specify the precise nature of these purposes, it is reasonable to consider that the water is committed for the purposes of achieving environmental outcomes for the Environmental Water Reserve (protecting or conserving ecosystem function, biodiversity, water quality, and/or water resource health). **Cannot, to the extent to which it is committed or preserved, be taken or used for any other purpose:** Compliance with the environmental minimum flows is measured in a way that accounts for any losses resulting from the exercise of section 8 rights for domestic and stock use, and ensures that the volume of water committed for environmental purposes is met.

Instrument that secures PEW	Environmental Commitment under Commonwealth Water Act PEW definition
PEW 3 Upper Ovens River water supply protection area water management plan (2011) Prescriptions 3, 4, 5, 6 and 7	Part 8.3 of the Management Plan identifies environmental flow requirements. Table 8 identifies the Ovens River environmental objectives under various summer low flow scenarios. Table 9 identifies the ban flow trigger for summer low flow environmental objectives, at the compliance point of Myrtleford. Table 11 outlines the water sharing regime, and management flow rate triggers for restrictions at the compliance point of Myrtleford. Prescriptions 3, 4, 5, 6 and 7 apply to the taking of surface water or groundwater under an all-year licence for groundwater and surface water. **Committed or preserved:** The Management Plan preserves this water by setting a minimum environmental flow of 1 ML/day, as measured at Myrtleford (refer Prescription 3) or equal or less than 2 ML/day at other compliance points (refer Prescription 4). The volume preserved is that necessary to achieve this flow objective. **For environmental purposes:** This water is expressly preserved for achieving environmental outcomes, namely wetting the bottom of the river channel, maintaining pool depth, watering aquatic plants and providing critical macroinvertebrate habitat. **Cannot, to the extent to which it is committed or preserved, be taken or used for any other purpose:** The restrictions set by the Management Plan ensure this water cannot be taken or used for any other purpose. The compliance point is at the bottom of the system, so any extraction of water under section 8 rights is accounted for in setting the restrictions.

Table 2: Rules and associated arrangements which apply to PEW in the Northern Victoria water resource plan area

Provision	Extract	Relevant PEW
Water Act 1989 (Vic)		
s 4A(1)(b)(i)	(1) The environmental water reserve comprises water that is set aside for the environment- (b) through the operation of- (i) conditions on any bulk entitlement …	PEW 1, PEW 2
s 4A(1)(b)(ii)	(1) The environmental water reserve comprises water that is set aside for the environment- (b) through the operation of- … (ii) any management plan under this Act;	PEW 3
s 4B	1. The environmental water reserve objective is the objective that the environmental water reserve be maintained so as to preserve the environmental values and health of water ecosystems, including their biodiversity, ecological functioning and quality of water and the other uses that depend on environmental condition. 2. In this Act a reference to the environmental water reserve objective is a reference to the objective set out in subsection (1).	All
s 7(4)	(4) Despite anything to the contrary in this or any other Act— (a) a right to water must not be conferred on another person by or under this or any other Act; and (b) a licence for the taking or use of water must not be issued by or under this or any other Act; and (c) an approval must not be given for works or activities that affect the use, flow or control of water under this or any other Act- unless regard is had to the need to maintain the environmental water reserve in accordance with the environmental water reserve objective.	All
s 22(2)(ac)	(2) The water resources assessment program must provide for the collection, collation, analysis and publication of information about-… (ac) the environmental water reserve;	All

Provision	Extract	Relevant PEW
s 22L(a)	A long-term water resources assessment must identify whether or not either or both of the following has occurred- (a) there has been any decline in the long-term availability of surface water or groundwater and whether the decline has fallen disproportionately on the environmental water reserve or on the allocation of water for consumptive purposes;	All
s 22P(a), (c)	If, in the opinion of the Minister, a long-term water resources assessment has identified- (a) a decline in the long-term availability of surface water or groundwater which has a disproportionate effect on the environmental water reserve or on the allocation of water for consumptive purposes;... the Minister must cause a review to be undertaken to determine the action that is required to be taken- (c) to restore the balance between the environmental water reserve and the allocation of water for consumptive purposes;... having regard to any relevant social, economic and environmental matters.	All
s 33E	(1) A person must not take water from- (a) a waterway (including the River Murray); or (b) an aquifer; or (c) a spring or soak; or (d) a dam (to the extent that it is not rainwater supplied to the dam from the roof of a building or water supplied to the dam from a waterway or a bore)— in a declared water system unless that person is authorised to do so under a water share. Penalty: For a first offence, 60 penalty units or imprisonment for 6 months; For a second or subsequent offence, 120 penalty units or imprisonment for 12 months. (2) Subsection (1) does not apply to— (a) water taken from a spring, soak or dam for domestic and stock use; or (b) water taken under any other authorisation to do so by or under this or any other Act.	PEW 1, PEW 2
s 33I(2)(c)	(2) The Minister must not issue a share under this Division if the Minister is of the opinion that— ... (c) the issue of the share would be in conflict with any relevant bulk entitlement.	PEW 1, PEW 2

Provision	Extract	Relevant PEW
s 33J(2)(g)	(2) The Minister, in issuing a water share and in making a determination under section 33G(b) or (c) in respect of a water share to which subsection (1) does not apply, must consider-... (g) any adverse effect the issue of the share or the determination (as the case requires) is likely to have on the maintenance of the environmental water reserve in accordance with the environmental water reserve objective;	PEW 1, PEW 2
s 40(1)(d)(iv)	(1) In considering an application under section 36(1), the Minister must have regard to the following matters-... (d) any adverse effect that the allocation or use of water under the entitlement is likely to have on-... (iv) the maintenance of the environmental water reserve in accordance with the environmental water reserve objective;	PEW 1, PEW 2
s 42(2)	(2) The Minister must not approve an application under subsection (1)(c) unless he or she considers that the allocation of water under the entitlement is not likely to have any significant impact in terms of the matters required to be considered and given effect to under section 40.	PEW 1, PEW 2
s 45(3)(d)	(3) In making an amendment under subsection (1), the Minister must be of the opinion that the amendment is necessary-... (d) to make any other amendment to the entitlement that does not impact on another person's entitlement to water and does not adversely affect the environmental water reserve.	PEW 1, PEW 2
s 46C(2)(a)(ii)	(2) The Minister, in deciding whether or not to approve an assignment under subsection (1), must have regard to- (a) any adverse effect that the assignment is likely to have on- ... (ii) on the maintenance of the environmental water reserve in accordance with the environmental water reserve objective;	PEW 1, PEW 2
s 46E(3)(a)(i)	(3) The Minister- (a) must not approve the transfer if he or she is of the opinion that- (i) transfer is likely to have an adverse effect on the maintenance of the environmental water reserve in accordance with the environmental water reserve objective;	PEW 1, PEW 2
s 47CA(2)	(2) In considering an application under section 47C, the Minister must have regard to any matter referred to in section 40(1)(a) to (o).	PEW 1, PEW 2

Provision	Extract	Relevant PEW
s 47D(1)(d)	(1) If- (a) an entitlement to take water has been converted, whether before or after the commencement of section 11 of the Water (Further Amendment) Act 1995, in accordance with section 47; and (b) the entitlement is in respect of water in a storage which on 1 January 1995 was owned by the Rural Water Corporation; and (c) there is water in the storage that is not allocated to the converted entitlement; and (d) the Minister has determined that the flow of water out of the storage is adequate having regard to the need to maintain the environmental water reserve in accordance with the environmental water reserve objective- the Minister may, by notice published in the Government Gazette, declare that an amount of water is unallocated water.	All
s 53(1)(b)	(1) In considering an application under section 51, the Minister must have regard to the following matters- ... (b) the matters mentioned in paragraphs (b) to (m) of section 40(1);	All
s 55(2B)(b)	(2B) Subject to section 51A, the Minister must refuse an application under section 51 if, in the Minister's opinion- ... (b) the allocation under the licence is likely to have an adverse effect on maintaining the environmental water reserve in accordance with the environmental water reserve objective.	All
s 62(6)(a)	(6) If an application is made- (a) the Minister, if he or she is of the opinion that the transfer is likely to have an adverse effect on the maintenance of the environmental water reserve in accordance with the environmental water reserve objective must refuse to approve the transfer;	All

Provision	Extract	Relevant PEW
s 63	(1) A person must not take or use water from- (a) a waterway (including the River Murray); or (b) a bore- in a non-declared water system unless authorised to do so by or under this or any other Act. Penalty: For a first offence, 60 penalty units or imprisonment for 6 months. For a subsequent offence, 120 penalty units or imprisonment for 12 months. (1A) A person must not take or use- (a) water from a spring or soak; or (b) water from a dam (to the extent that it is not rainwater supplied to the dam from the roof of a building or water supplied to the dam from a waterway or a bore- for a use other than domestic and stock use, unless authorised to do so by or under this Act or any other Act. Penalty: For a first offence, 60 penalty units or imprisonment for 6 months. For a subsequent offence, 120 penalty units or imprisonment for 12 months. (2) A person who is guilty of an offence under subsection (1) or (1A) that is of a continuing nature is liable, in addition to the penalty set out at the foot of that subsection, to a further penalty of not more than 5 penalty units for each day during which the offence continues (up to a maximum of 20 additional penalty units- (a) after service of a notice of contravention on the person under section 151; or (b) if no notice of contravention is served, after conviction.	PEW 1, PEW 2
s 64H(3)(a)	(3) If an application under subsection (1) is made- (a) the Authority, if the Authority is of the opinion that approval of the use of the works is likely to have an adverse effect on the maintenance of the environmental water reserve in accordance with the environmental water reserve objective, must refuse to approve the use of the works;	All
s 64GB(4)(a)	(4) An Authority must not make a determination under this section until the Authority has assessed the amount of water available in the system to be taken and the amount reserved for the environment- (a) in any case where a bulk entitlement applies to the system, by applying the rules specified for the purposes of any such determination in any Order granting the bulk entitlement;	PEW 1, PEW 2

Provision	Extract	Relevant PEW
s 64GB(4)(b)	(4) An Authority must not make a determination under this section until the Authority has assessed the amount of water available in the system to be taken and the amount reserved for the environment- … (b) in the case where a bulk entitlement does not apply to the system, by applying the rules specified for the purposes of any such determination in the management plan, approved under section 32A, applying to the system.	PEW 3
s 68(ba)	In considering an application under section 67, the Minister must- … (ba) have regard to the matters mentioned in paragraphs (b) to (n) of section 40(1) ;;…	All
s 74(6)(a)	(6) If an application for approval is made under subsection (3)- (a) the Minister, if the Minister is of the opinion that- (i) approval of the transfer is likely to have an adverse effect on the maintenance of the environmental water reserve in accordance with the environmental water reserve objective; or (ii) it is necessary to refuse to approve the transfer in order to preserve the environmental water reserve in accordance with the environmental water reserve objective- must refuse to approve the transfer;	All
s 124(8)	(8) In deciding whether to make an agreement to supply water, an Authority must have regard to the matters specified in section 40(1)(b) to (m), with any necessary modifications, and to any other matter that the Authority thinks fit to have regard to.	All

Provision	Extract	Relevant PEW
s 151	(1) An Authority may, by notice in writing to a person who contravenes- (a) this Act, the regulations or the Authority's by-laws; or (b) a requirement made by the Authority under this Act; or (c) a condition of a licence issued under this Act; or (d) a prescription of an approved management plan for a water supply protection area- require that person, or the owner of any property in relation to which the contravention occurs, to take any action specified in the notice within the time (being not less than 2 days) that is specified in the notice or any longer time allowed by the Authority, to remedy the contravention. (2) A person on whom a notice of contravention is served must make sure that the notice is complied with within the time specified, or any longer time allowed by the Authority. Penalty: 20 penalty units. (3) If a notice of contravention is not complied with within the time specified or any longer time allowed by the Authority, the Authority may- (a) carry out any works and take any other action it decides is necessary to remedy the contravention, and recover its reasonable costs from the person on whom the notice was served; and (b) remove or disconnect any service to the property in relation to which the contravention occurs, and recover its reasonable costs from the person on whom the notice was served; and (c) apply to a court for an injunction restraining the person on whom the notice was served from contravening the notice.	All
s 189(2)	(2) In performing its functions under this Act, an Authority that has a waterway management district must have regard to the need to maintain the environmental water reserve in accordance with the environmental water reserve objective.	All

Provision	Extract	Relevant PEW
s 289	(1) A person must not, without the consent of the Authority or without any other lawful authority- (a) take, use or divert water- (i) that is under the control and management of an Authority; or (ii) that is supplied by an Authority for the use of another person; or (b) interfere with the flow of water in any waterway, aquifer or works under the control and management of an Authority. Penalty: For a first offence, 60 penalty units or imprisonment for 6 months. For a subsequent offence, 120 penalty units or imprisonment for 12 months.	All
Bulk Entitlement (Broken System – Goulburn-Murray Water) Conversion Order 2004		
cl 11.1	In order to supply the entitlements set out in clause 8 subject to the limits specified under clause 7, and after meeting the environmental minimum flow requirements specified in clause 12, the Authority may take: (a) all the natural inflows into Lake Nillahcootie; and (b) * * * * * (c) all the natural inflows and regulated flows in the system waterway and the creek system.	PEW 1

Provision	Extract	Relevant PEW
cl 12.1	The Authority, subject to clauses 6 and 13, and sub-clause 18.1 and the daily operational arrangements and tolerances specified in Schedule 4 to this Order, must maintain the following minimum environmental flows in: (a) Broken River upstream of Casey's Weir - (i) in the Broken River between Lake Nillahcootie and Broken Weir, during the months of June to November inclusive, the lower of 30 ML per day or natural flow generated in all of the catchment upstream of Back Creek Junction as calculated using the procedure specified in Schedule 5 to this Order, measured at Back Creek Junction; and (ii) in the Broken River between Broken Weir and Casey's Weir, during the months of December to May inclusive, the lower of 22 ML per day or natural flow generated in all of the catchment upstream of Casey's Weir as calculated using the procedure specified in Schedule 5 to this Order, measured at Broken Weir; (b) * * * * * (c) Broken River downstream of Casey's Weir - in the Broken River between Casey's Weir and the Goulburn River confluence, during the months of December to May inclusive, the lower of 25 ML per day or natural flow generated in the Broken River catchment upstream of Gowangardie Weir as calculated using the procedure specified in Schedule 5 to this Order, measured at Gowangardie Weir.	PEW 1
cl 12.2	The Storage Operator will maintain accounts of the environmental minimum flow commitments specified in sub-clause 12.1.	PEW 1
cl 12.4	Minimum or maximum environmental flows, as specified in sub-clauses 12.1 and12.3 respectively, may be temporarily modified upon agreement between the Authority and the environmental water manager, when both parties deem this to be necessary. The Authority and environmental water manager must agree and specify: (a) the purpose of the modification; (b) the reduction or increase to be applied; (c) the period of time the modification will apply, including the trigger to revert back to minimum environmental flows as specified in sub-clause 12.1 or maximum environmental flows as specified in sub-clause 12.3, as applicable; (d) what monitoring will occur to ascertain the environmental effects of this action; and (e) what mitigation is required as part of this action, including the potential for the Authority to record the volume of any agreed reduction in minimum environmental flow releases and make this volume available to the environmental water manager on request for release in consultation with the Authority.	PEW 1

Provision	Extract	Relevant PEW
cl 13.1	The Authority, the Storage Operator and any person appointed or nominated by the Minister to manage environmental flows (the parties), must endeavour to agree on operational arrangements for the supply of water from the Broken system to provide supplies to the primary entitlement holders and meet the environmental minimum flow obligations.	PEW 1
cl 18.1(f)	The Authority jointly with the Storage Operator must propose to the Minister, and implement within 12 months of the date of this Order coming into operation, a program to manage the environmental effects of the works under its control, that allow water to be taken from the system waterway, including: (f) the proposed timing, extent and duration of any temporary changes to the provision of environmental minimum and maximum flows to allow for essential maintenance of the outlet works.	PEW 1
cl 19.1(d)	The Authority, and the Storage Operator where appropriate, must propose to the Minister, and implement within 12 months of the date of this Order a metering program to demonstrate compliance with this bulk entitlement with respect to: (d) the minimum environmental flows.	PEW 1
cl 20.1(g)	The Authority, jointly with the Storage Operator where appropriate, may be required to report to the Minister or to a person nominated by the Minister on all or any of the following: (g) the calculation of flows to demonstrate compliance in meeting the environmental minimum and maximum flows specified under clause 12;	PEW 1
Sch 4	[Not extracted]	PEW 1
Sch 5	[Not extracted]	PEW 1
Bulk entitlement (Ovens System – Goulburn-Murray Water) Conversion Order 2004		
cl 11.1	In order to supply the entitlements set out in clause 8, and after meeting the environmental minimum flow requirements specified in clause 12, the Authority may take: (a) all the inflows into Lake Buffalo; and (b) all the inflows into Lake William Hovell; and (c) all the other inflows to the system waterway	PEW 2

Provision	Extract	Relevant PEW
cl 12.1	Subject to clauses 12.2 and 16.1, the Authority must provide water from Lake Buffalo and Lake William Hovell, to maintain the following environmental minimum flows: (a) in the King River between Lake William Hovell and Cheshunt: (i) during the months of November to May inclusive, the lower of 20 ML per day or the natural flow generated in all of the catchment upstream of Cheshunt as calculated using the procedure and measured at the compliance stream gauging stations specified in Schedule 5 to this Order, and (ii) during the months of June to October inclusive, the lower of 30 ML per day or the natural flow generated in all of the catchment upstream of Cheshunt as calculated using the procedure and measured at the compliance stream gauging stations specified in Schedule 5 to this Order; (b) in the King River between Cheshunt and the Ovens River confluence (i) during the months of November to May inclusive, the lower of 40 ML per day or the natural flow generated in all of the King River catchment as calculated using the procedure and measured at the compliance stream gauging stations specified in Schedule 5 to this Order, and (ii) during the months of June to October inclusive, the lower of 20 ML per day or the natural flow generated in all of the King River catchment as calculated using the procedure and measured at the compliance stream gauging stations specified in Schedule 5 to this Order; (c) in the Buffalo River between Lake Buffalo and the Ovens River confluence during the months of November to May inclusive, the lower of 60 ML per day or the natural flow generated in all of the Buffalo River catchment as calculated using the procedure and measured at the compliance stream gauging stations specified in Schedule 5 to this Order; (d) in the Ovens River between the Buffalo River confluence and the King River confluence during the months of November to May inclusive, the lower of 154 ML per day or the natural flow generated in all of the Ovens River catchment as calculated using the procedure and measured at the compliance stream gauging stations specified in Schedule 5 to this Order; (e) in the Ovens River downstream of King River confluence (i) during the months of November to May inclusive, the lower of 140 ML per day or the natural flow generated in all of the Ovens River catchment as calculated using the procedure and measured at the compliance stream gauging stations specified in Schedule 5 to this Order, and (ii) during the months of June to October inclusive, the lower of 50 ML per day or the natural flow generated in all of the Ovens River catchment as calculated using the procedure and measured at the compliance stream gauging stations specified in Schedule 5 to this Order.	PEW 2

Provision	Extract	Relevant PEW
cl 12.2-12.4	12.2 In any year when Lake Buffalo ceases to spill before the end of November under operational arrangements agreed under clause 13, the Authority may request the Minister to review the environmental minimum flow specified under sub-clause 12.1(e)(i) for that year. 12.3 Any request under sub-clause 12.2 must set out: (a) the reasons for any review of the environmental minimum flow; and (b) the results of an assessment of the likely effect of that review on the environment. 12.4 The Minister may: (a) not agree to the request sought under sub-clause 12.2; or (b) agree to a review sought under sub-clause 12.2 and may require the Authority to provide further information to assist in carrying out the review; or (c) agree to alternative flow arrangements following the review carried out under sub-clause 12.4(b).	PEW 2
cl 12.5	The Storage Operator will maintain accounts of the environmental minimum flow commitments specified in sub-clause 12.1.	PEW 2
cl 13.1	The Authority, the Storage Operator and any person appointed or nominated by the Minister to manage environmental flows (the parties), must endeavour to agree on operational arrangements for the supply of water from the Ovens system to provide supplies to the primary entitlement holders and meet the environmental minimum flow obligations.	PEW 2
cl 17.1(f)	The Authority jointly with the Storage Operator must propose to the Minister, within 12 months of the date of this Order coming into operation, a program to manage the environmental effects of the works under its control, that allow water to be taken from the system waterway, including: (f) the proposed timing, extent and duration of any temporary changes to the provision of environmental minimum flows to allow for essential maintenance of the outlet works.	PEW 2
cl 18.1(d)	The Authority, and the Storage Operator where appropriate, must propose to the Minister within 12 months of the date of this Order a metering program to demonstrate compliance with this bulk entitlement with respect to: ... (d) the environmental minimum flows.	PEW 2
cl 19.1(g)	The Authority, jointly with the Storage Operator where appropriate, may be required to report to the Minister or to a person nominated by the Minister on all or any of the following: (g) the calculation of flows to demonstrate compliance in meeting the environmental minimum flows specified under clause 12;	PEW 2

Provision	Extract	Relevant PEW
Sch 4	[Not extracted]	PEW 2
Sch 5	[Not extracted]	PEW 2
Upper Ovens River water supply protection area water management plan		
Prescription 2	Prescriptions 3, 4, 5, 6 and 7 apply to the taking of surface water or groundwater under an all-year licence in Management Zone 1 while a Restriction Stage is in effect unless- (a) the licence is for domestic and stock use; or (b) licence is subject to a condition that a portion of the water taken and used is to be returned to the water system; or (c) the special transitional arrangements in Prescriptions 12 to 16 apply	PEW 3
Prescription 5	During a Restriction Stage, a licence holder is authorised to take water only at the times and at the rates specified by the Corporation.	PEW 3
Prescription 6 (and table in Prescription 3)	During Restriction Stage 2, 3, or 4 a licence holder is authorised to take only the corresponding percentage share of entitlement specified in Column 2 of Prescription 3.	PEW 3
Prescription 7 (and table in Prescriptions 3 and 4)	If a Restriction Stage 5 is declared - (a) under Prescription 3, a licence holder must not take any water during the Restriction Stage; or (b) under Prescription 4, in respect of a tributary, a licence holder must not take any water from that tributary during the Restriction Stage.	PEW 3
Prescription 12	As provided in Prescription 2(c), Prescriptions 13 to 16 apply to the percentage share of entitlement the holder of a groundwater licence in Management Zone 1 is authorised to take while Restriction Stage 4 or 5 declared by the Corporation under Prescription 3 is in effect.	PEW 3
Prescription 13	The holder of a groundwater licence in Management Zone 1 is authorised to take only the percentage share of entitlement specified in Column 2 of the table in Prescription 3 that corresponds to - (a) Restriction Stage 3, if Restriction Stage 4 or 5 is declared between 1 July 2012 and 30 June 2014, inclusive; or (b) Restriction Stage 4, if Restriction Stage 5 is declared between 1 July 2014 and 30 June 2015, inclusive.	PEW 3

Provision	Extract	Relevant PEW
Prescription 14	The holder of a groundwater licence in Management Zone 1 who uses water to irrigate an approved permanent planting is authorised to take only the percentage share of entitlement specified in Column 2 of the table in Prescription 3 that corresponds to- (a) Restriction Stage 3, if Restriction Stage 4 or 5 is declared between 1 July 2012 and 30 June 2019, inclusive; or (b) Restriction Stage 4, if Restriction Stage 5 is declared 1 July 2019 and 30 June 2020, inclusive.	PEW 3

Held Environmental Water

Table 3: Held environmental water in the Victorian Murray and Northern Victoria water resource plan areas as at 30 June 2015
(source: Victorian Water Register as at 2 April including water shares planned to issue to the CEWO as the final tranche of water savings from the GMW Connections Project on 30 April 2019.)

System	Entitlement	Volume (ML)	Class	Holder
Broken	CEWH water shares	534	High	CEWH
		4	Low	
Campaspe	Environmental Entitlement (Campaspe River – Living Murray Initiative) 2007 [3]	126	High	VEWH
		5,048	Low [4]	
	Campaspe River Environmental Entitlement 2013	20,652	High	VEWH
		2,966	Low	
	CEWH water shares	6,594	High [5]	CEWH
		395	Low	
Goulburn	Goulburn River Environmental Entitlement 2010	8,851	High	VEWH
		3,140	Low	
	Environmental Entitlement (Goulburn System – Living Murray) 2007 [3]	39,625	High	VEWH
		156,980	Low [4]	
	Environmental Entitlement (Goulburn System – NVIRP Stage 1) 2012	N/A [6]	Provisional	VEWH
	Bulk Entitlement (Goulburn System – Snowy Environmental Reserve) Order 2004 [7]	30,252	High	VEWH
		8,156	Low	
	Water Shares – Snowy River Environmental Reserve [7]	8,321	High	VEWH
		17,852	Low	
	Silver and Wallaby Creeks Environmental Entitlement 2006	N/A	Passing flow only	VEWH
	CEWH water shares [8]	317,453	High	CEWH
		42,467	Low	
	The Living Murray - water shares	5,559	High	MDBA

System	Entitlement	Volume (ML)	Class	Holder
Loddon	Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005	10,970	High	VEWH
		2,024	Low [3 & 4]	
		N/A	Passing flow only	
	Environmental Entitlement (Birch Creek – Bullarook System) 2009	100	Provisional [9]	VEWH
	Water Shares – Snowy River Environmental Reserve [7]	470	High	VEWH
	CEWH water shares	3,356	High	CEWH
		527	Low	
Murray	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999	29,782	High	VEWH
		3,894	Low	
		40,000	Provisional [10]	
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – River Murray Increased Flows	NA	Provisional [11]	VEWH
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Barmah-Millewa Forest Environmental Water Allocation	50,000	Provisional [12]	VEWH
		25,000	Provisional [12]	
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Living Murray [3]	9,589	High	VEWH
		101,850	Low [4]	
		34,300	Provisional [9]	
	Environmental Entitlement (River Murray – NVIRP Stage 1) 2012 [13]	N/A	Provisional	VEWH
	Bulk Entitlement (River Murray – Snowy Environmental Reserve) Conversion Order 2004 [7]	29,794	High	VEWH

System	Entitlement	Volume (ML)	Class	Holder
	Water shares – Snowy Environmental Reserve [7]	14,671	High	VEWH
		6,423	Low	
	CEWH water shares [8]	362,307	High	CEWH
		35,413	Low	
	The Living Murray - water shares	12,267	High	MDBA
Ovens	CEWH water shares	123	High	CEWH

1. *The Living Murray entitlements are held by the VEWH in trust for the MDBA*
2. *Valley cap rules apply which restrict use according to the rules in the entitlement*
3. *Includes 30 ML of entitlement in the Coliban Water system. This entitlement was obtained as part of the Murray-Darling Basin Small Block Irrigators Exit Grant Package. It is not possible to trade this entitlement out of the Coliban system for use in the wider Campaspe system or for use in the connecting River Murray*
4. *This entitlement provides the VEWH with a total annual allocation of water equal to one-third of the phase 3 Goulburn water savings achieved in the previous year under the GMW Connections Project Stage 1.*
5. *Snowy entitlements provide the water holder with entitlement which is transferred to the Snowy Scheme. This reduces the volume of water the Snowy Scheme is required to release each year by the volume of entitlement.*
6. *This includes the water shares planned to issue to the Commonwealth as the final tranche of water savings from the GMW Connections Project Stage 2 on 30 April 2019.*
7. *Allocation against this entitlement is made subject to rules specified in the entitlement.*
8. *Unregulated entitlement made available when the River Murray is unregulated*
9. *Rules in the Bulk Entitlement (River Murray - Flora and Fauna) Order 1999 describe access rights for RMIF*
10. *Rules in the Bulk Entitlement (River Murray - Flora and Fauna) Order 1999 allow 40,000 ML of this entitlement to be borrowed to support high-reliability entitlements. 10,000 ML must be made available for low-level watering at Barmah Forest.*
11. *This entitlement provides the VEWH with a total annual allocation of water equal to one-third of the phase 3 Murray water savings achieved in the previous year under the GMW Connections Project Stage 1.*

Priority environmental assets

This table lists all the priority environmental assets in the Victorian Murray and Northern Victoria water resource plan areas.

Table 4: Priority environmental assets of the Victorian Murray water resource plan area

Catchment Management Authority responsible for watering	Priority environmental asset	Surface water WRP area	Surface water SDL resource unit
GBCMA	Barmah Forest	Victorian Murray	SS2
GBCMA	Black Swamp	Victorian Murray	SS2
GBCMA	Broken and Nine Mile Creeks	Victorian Murray	SS2
GBCMA	Kinnairds Wetland	Victorian Murray	SS2
MCMA	Belsar and Yungera Islands	Victorian Murray	SS2
MCMA	Bottle Bend	Victorian Murray	SS2
MCMA	Bumbang Island	Victorian Murray	SS2
MCMA	Burra Creek[1]	Victorian Murray	SS2
MCMA	Cardross Lakes	Victorian Murray	SS2
MCMA	Carina Bend	Victorian Murray	SS2
MCMA	Cokum Bushland Reserve[2]	Victorian Murray	SS2
MCMA	Considines[2]	Victorian Murray	SS2
MCMA	Hattah Lakes[1]	Victorian Murray	SS2
MCMA	Heywoods Lake	Victorian Murray	SS2
MCMA	Johnstons and Chaffey Bend	Victorian Murray	SS2
MCMA	Karadoc (Inlet Creek)	Victorian Murray	SS2
MCMA	Kings Billabong	Victorian Murray	SS2
MCMA	Koorlong Lakes	Victorian Murray	SS2
MCMA	Lake Hawthorn	Victorian Murray	SS2
MCMA	Lindsay, Wallpolla, Mulcra Islands[1]	Victorian Murray	SS2
MCMA	Margooya Lagoon	Victorian Murray	SS2
MCMA	Merbein Common	Victorian Murray	SS2
MCMA	River Murray – Lock 15	Victorian Murray	SS2
MCMA	River Murray – Lock 6-10	Victorian Murray	SS2
MCMA	Murrumbidgee Junction	Victorian Murray	SS2

Catchment Management Authority responsible for watering	Priority environmental asset	Surface water WRP area	Surface water SDL resource unit
MCMA	Nyah	Victorian Murray	SS2
MCMA	Piambie	Victorian Murray	SS2
MCMA	Pound Bend	Victorian Murray	SS2
MCMA	Poyner[2]	Victorian Murray	SS2
MCMA	Psyche Bend Lagoon	Victorian Murray	SS2
MCMA	Sandilong Creek	Victorian Murray	SS2
MCMA	Spence's Bend	Victorian Murray	SS2
MCMA	Tata Creek	Victorian Murray	SS2
MCMA	Vinifera	Victorian Murray	SS2
MCMA	Walshes Bend	Victorian Murray	SS2
MCMA	Wemen-Liparoo	Victorian Murray	SS2
MCMA	Woorlong wetland	Victorian Murray	SS2
GBCMA	Benwell Forest[1]	Victorian Murray	SS2
NCCMA	Gunbower Creek	Victorian Murray	SS2
NCCMA	Gunbower Forest	Victorian Murray	SS2
NCCMA	Gunbower National Park	Victorian Murray	SS2
NCCMA	Guttrum Forrest[1]	Victorian Murray	SS2
NCCMA	Hird Swamp	Victorian Murray	SS2
NCCMA	Johnson Swamp	Victorian Murray	SS2
NCCMA	Lake Cullen	Victorian Murray	SS2
NCCMA	Lake Elizabeth	Victorian Murray	SS2
NCCMA	Lake Murphy	Victorian Murray	SS2
NCCMA	Loddon River (lower)	Victorian Murray	SS2
NCCMA	McDonalds Swamp	Victorian Murray	SS2
NCCMA	Pig Swamp	Victorian Murray	SS2
NCCMA	Richardson's Lagoon	Victorian Murray	SS2
NCCMA	Wirra-Lo Wetlands Complex	Victorian Murray	SS2
NECMA	Murray floodplain between Lake Hume and Lake Mulwala	Victorian Murray	SS2

1. *These sites are part of Victoria's Basin Plan Sustainable Diversion Limit supply project environmental works*
2. *These sites are part of the 51 Wimmera-Mallee wetlands, but receive their water from the River Murray via supply system #5.*
3. *Note on Table 3 – Golf Course Lake, Lake Wandella, Kiewa River, and Mitta Mitta River, listed in the Victorian Murray long-term watering plan, are not considered priority environmental assets for the purposes of Basin Plan as they cannot receive held environmental water. This will be updated in future iterations of the long-term watering plan.*

Table 5: Priority environmental assets of the Northern Victoria water resource plan area.

Catchment Management Authority responsible for watering	Priority environmental asset	Surface water WRP area	Surface water SDL resource unit
GBCMA	Broken River	Northern Victoria	SS5
GBCMA	Doctors Swamp	Northern Victoria	SS6
GBCMA	Gaynor Swamp	Northern Victoria	SS6
GBCMA	Goulburn River	Northern Victoria	SS6
GBCMA	Moodies Swamp	Northern Victoria	SS5
GBCMA	Reedy Swamp	Northern Victoria	SS6
NCCMA	Birch's (Bullarook) Creek	Northern Victoria	SS8
NCCMA	Campaspe River	Northern Victoria	SS7
NCCMA	Coliban River	Northern Victoria	SS7
NCCMA	Lake Boort	Northern Victoria	SS8
NCCMA	Lake Leaghur	Northern Victoria	SS8
NCCMA	Lake Yando	Northern Victoria	SS8
NCCMA	Loddon River (Middle and Upper)	Northern Victoria	SS8
NCCMA	Meran Lakes complex (Lake Meran and Little Lake Meran)	Northern Victoria	SS8
NCCMA	Pyramid Creek[1]	Northern Victoria	SS8
NCCMA	Round Lake[1]	Northern Victoria	SS8
NCCMA	Serpentine Creek[1]	Northern Victoria	SS8
NCCMA	Tullaroop Creek[1]	Northern Victoria	SS8
NCCMA	Twelve Mile Creek[1]	Northern Victoria	SS8
NECMA	Buffalo River	Northern Victoria	SS4

Catchment Management Authority responsible for watering	Priority environmental asset	Surface water WRP area	Surface water SDL resource unit
NECMA	King River	Northern Victoria	SS4
NECMA	Ovens River	Northern Victoria	SS4

1. *These sites have been added to the priority environmental asset list since the long-term watering plan was published.*
2. *The Upper Ovens River receives PEW therefore can be considered a PEA, it was omitted because it was not identified in the LTWPs as when these were being prepared in 2015 (when PEW was still in negotiation, therefore it was not included in the assessment of PEAs at that time. It has not been included in the table above as it does not have an EWMP and has until now not been considered a PEA. This will be reviewed when LTWPs are updated.*

Priority Ecosystem Functions

Ecosystem functions are the fundamental physical, chemical and biological processes that support environmental assets. The table below outlines the priority ecosystem function as defined in the long-term watering plans for Northern Victoria and Victorian Murray water resource plan areas.

Table 6: Priority ecosystem functions in the Victorian Murray and Northern Victoria water resource plan areas

Water Resource Plan Area	Ecosystem Function	Schedule 9 criteria	Function characteristics
Victorian Murray water resource plan area	Lateral hydrological connectivity (between floodplains, anabranches and wetlands)	2	Supports the transportation and dilution of nutrients, organic matter and sediment
		4	Provides connections across floodplains, adjacent wetlands and billabongs (lateral connections)
	Water quality (that allows for ecosystem processes)	1	Supports the creation and maintenance of vital habitats and populations
		2	Supports the dilution of carbon and nutrients from the floodplain to the river system

Water Resource Plan Area	Ecosystem Function	Schedule 9 criteria	Function characteristics
Northern Victoria water resource plan area	Longitudinal hydrological connectivity (between river reaches and the River Murray)	2	Supports the transportation and dilution of nutrients, organic matter and sediment
		3	Provides connections along a watercourse (longitudinal connections)
	Water quality (that allows for ecosystem processes)	1	Supports the creation and maintenance of vital habitats
		2	Supports the transportation and dilution of nutrients, organic matter and sediment
	Geomorphic habitat	1	Supports the creation and maintenance of vital habitats

Groundwater-dependent ecosystems

The figures in these maps show the groundwater-dependent features in the Victorian Murray and Northern Victoria water resource plan areas and the confidence level that there is a groundwater connection of the priority environmental assets. These tables describe the groundwater-dependent ecosystems in each SDL resource unit in the Victorian Murray and Northern Victoria water resource plan areas. These are sourced from the Groundwater Logic report (2018) commissioned by DELWP to outline which priority environmental assets in the Victorian Murray and Northern Victoria water resource plan areas are groundwater dependent.

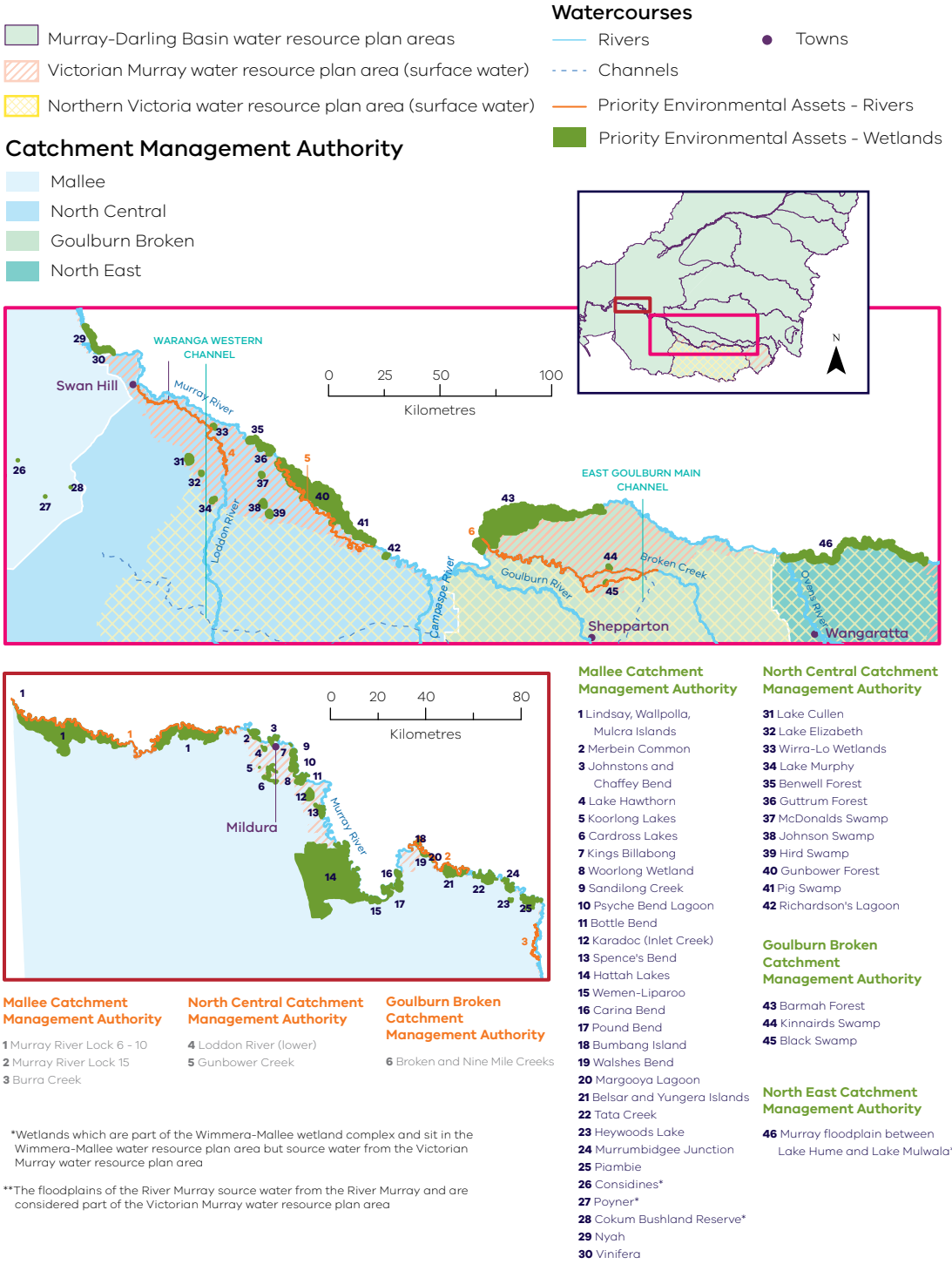
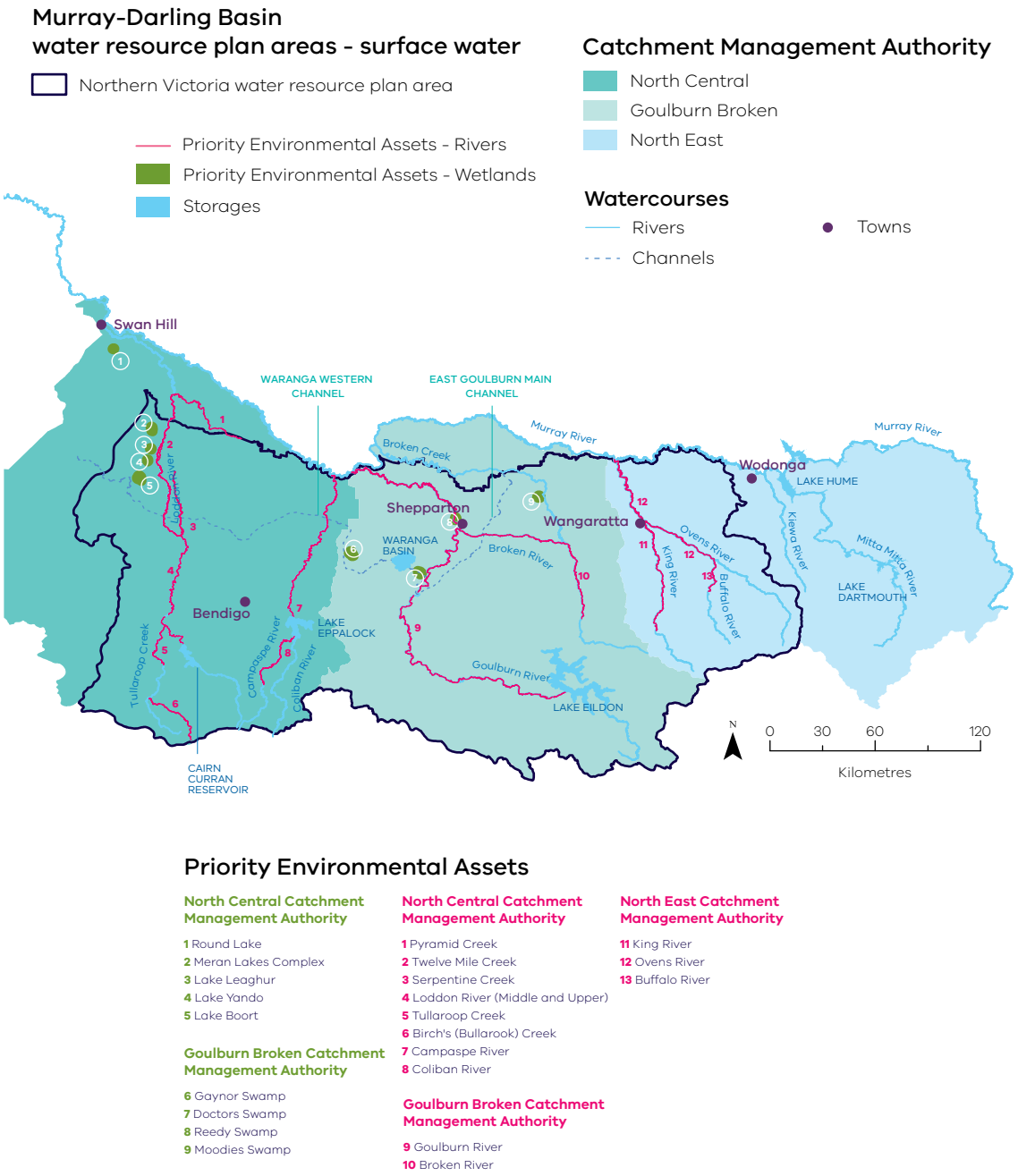


Figure 1: Map of river priority environmental assets and groundwater-dependence confidence



Priority Environmental Assets

North Central Catchment Management Authority

1 Round Lake
2 Meran Lakes Complex
3 Lake Leaghur
4 Lake Yando
5 Lake Boort

Goulburn Broken Catchment Management Authority

6 Gaynor Swamp
7 Doctors Swamp
8 Reedy Swamp
9 Moodies Swamp

North Central Catchment Management Authority

1 Pyramid Creek
2 Twelve Mile Creek
3 Serpentine Creek
4 Loddon River (Middle and Upper)
5 Tullaroop Creek
6 Birch's (Bullarook) Creek
7 Campaspe River
8 Coliban River

Goulburn Broken Catchment Management Authority

9 Goulburn River
10 Broken River

North East Catchment Management Authority

11 King River
12 Ovens River
13 Buffalo River

Figure 2: Map of wetland priority environmental assets and groundwater-dependence confidence

Table 7: Priority environmental asset groundwater dependencies - rivers in the Northern Victoria water resource plan area

PEA name	PEA reach	Index of Stream Condition Basin-Reach	Surface water SDL resource unit	Groundwater-dependent features (confidence)	Reference in **Figure 1** above
Birch's (Bullarook) Creek	Birch Creek R21	44378	SS8	H	31
Broken River	Broken and Nine Mile R22	44652	SS5	H	16
	Broken River R2	43135	SS5	H	54
	Broken River R3	43163	SS5	Non-GDE	55
	Broken River R4	43194	SS5	H	56
	Broken River R4	43194	SS5	L	57
Campaspe River	Campaspe River R1	43106	SS2	H	32
	Campaspe River R2	43137	SS7	H	33
	Campaspe River R3	43165	SS7	Non-GDE	34
	Campaspe River R4	43196	SS7	Non-GDE	35
	Campaspe River R5	43226	SS7	M	36
Coliban River	Coliban River R18	43252	SS7	M	37
	Coliban River R19	43617	SS7	M	38

PEA name	PEA reach	Index of Stream Condition Basin-Reach	Surface water SDL resource unit	Groundwater-dependent features (confidence)	Reference in **Figure 1** above
Goulburn River	Goulburn River R1	43105	SS6	H	39
	Goulburn River R2	43136	SS6	H	40
	Goulburn River R3	43164	SS6	Non-GDE	41
	Goulburn River R4	43195	SS6	H	42
	Goulburn River R5	43225	SS6	H	43
	Goulburn River R6	43256	SS6	H	44
	Goulburn River R7	43286	SS6	H	45
	Goulburn River R8	43317	SS6	H	46
	Goulburn River R9	43348	SS6	L	47
	Goulburn River R10	43378	SS6	H	48
	Goulburn River R11	43409	SS6	M	49
	Goulburn River R12	43439	SS6	H	50
	Goulburn River R13	41395	SS6	H	51
	Goulburn River R14	41760	SS6	H	52
Loddon River (upper)	Loddon River upper R6	43258	SS8	Non-GDE	26
	Loddon River upper R7	43288	SS8	H	27
	Loddon River upper R8	43319	SS8	M	28
	Loddon River upper R18	43282	SS8	M	28

PEA name	PEA reach	Index of Stream Condition Basin-Reach	Surface water SDL resource unit	Groundwater-dependent features (confidence)	Reference in **Figure 1** above
Loddon River (middle)	Loddon River middle R2	43138	SS8	Non-GDE	21
	Loddon River middle R4	43197	SS8	H	22
	Loddon River middle R5	43227	SS8	H	23
Ovens River (including Buffalo River)	Buffalo River R33	15401	SS4	H	68
Ovens River (including King River)	King River R21	44256	SS4	M	62
	King River R22	44621	SS4	M	63
	King River R23	44986	SS4	M	64
	King River R24	45352	SS4	M	65
Ovens River	Ovens River lower R1	43103	SS4	H	58
	Ovens River lower R2	43134	SS4	H	59
	Ovens River lower R3	43162	SS4	L	60
	Ovens River lower R3	43162	SS4	H	60
	Ovens River lower R4	43193	SS4	H	66
	Ovens River lower R4	43193	SS4	L	66
	Twelve Mile Creek	NA	SS4	Non-GDE	NA

Table 8: Groundwater dependencies - wetlands in the Northern Victoria water resource plan area

PEA Name	Index of Wetland Condition ID	Surface water SDL resource unit	Groundwater-dependent features (confidence)
Moodies Swamp	67053	SS5	M

NB - Wetlands that are identified as either being not groundwater-dependent or as low confidence in groundwater-dependency were excluded from the tables.

Table 9: Priority environmental asset groundwater dependencies - rivers in the Victorian Murray water resource plan area

PEA name	PEA reach	Index of Stream Condition Basin-Reach	Surface water SDL resource unit	Groundwater-dependent features (confidence)	Reference in **Figure 1**
Gunbower Creek	Gunbower Creek R38	14062	SS2	M	12
	Gunbower Creek R39	14427	SS2	M	13
River Murray - Lock 6-10	River Murray Lock 6 - 10 R13	14-13	SS2	M	5
	River Murray Lock 6 - 10 R14	14-14	SS2	M	4
	River Murray Lock 6 - 10 R15	14-15	SS2	M	3
	River Murray Lock 6 - 10 R16	14-16	SS2	M	2
	River Murray Lock 6 - 10 R17	14-17	SS2	M	1
River Murray - Lock 15	River Murray US of Lock 15 R6	43265	SS2	M	7
	River Murray US of Lock 15 R7	43295	SS2	M	6
Tullah Creek	Tullah Creek R36	13241	SS2	L	14
Broken and Nine Mile Creeks	Broken and Nine Mile R24	45383	SS5	Non-GDE	20
	Broken and Nine Mile R28	46844	SS5	M	19
	Broken and Nine Mile R30	11049	SS5	M	18
	Broken and Nine Mile R23	45017	SS5	L	17
	Broken and Nine Mile R21	44287	SS5	H	15
Loddon River (lower)	Loddon River lower R1	43107	SS8	L	9
	Loddon River lower R2	43138	SS8	Non-GDE	10
	Loddon River lower R50	18445	SS8	Non-GDE	8

Table 10: Priority environmental asset groundwater dependencies - wetlands in the Victorian Murray water resource plan area

PEA Name	Index of Wetland Condition ID	Surface water SDL resource unit source	Groundwater-dependent features (confidence)
Barmah Forest	60702	SS2	M
	60706	SS2	M
	63903	SS2	M
	63971	SS2	M
Belsar and Yungera Islands	12218	SS2	H
	12220	SS2	M
	12221	SS2	H
Cardross Lakes	11461	SS2	H
Gunbower Forest	45248	SS2	M
	45249	SS2	M
	45239	SS2	H
	45250	SS2	M
	45251	SS2	M
	45252	SS2	M
	45270	SS2	M
Hattah Lakes	11155	SS2	M
	11186	SS2	M
Hird Swamp	45231	SS2	H
Johnson Swamp	45222	SS2	H
Kings Billabong	11355	SS2	M
	11367	SS2	H
	11371	SS2	M
	11373	SS2	H
	11374	SS2	H
	11374	SS2	H

PEA Name	Index of Wetland Condition ID	Surface water SDL resource unit source	Groundwater-dependent features (confidence)
Lindsay, Wallpolla, Mulcra Islands	10001	SS2	M
	10626	SS2	M
	10156	SS2	H
	10159	SS2	M
	10164	SS2	H
	10176	SS2	M
	10179	SS2	M
	10180	SS2	H
	10181	SS2	M
	10183	SS2	M
	10186	SS2	M
	10187	SS2	H
	10188	SS2	H
	10189	SS2	M
	10191	SS2	H
	10195	SS2	M
	10197	SS2	H
	10199	SS2	M
	10207	SS2	M
	10208	SS2	M
	10209	SS2	M
	10212	SS2	M
	10213	SS2	H
	10219	SS2	H
	10220	SS2	H
	10228	SS2	H
	10234	SS2	H
	10235	SS2	H
	10242	SS2	H
	10245	SS2	H

PEA Name	Index of Wetland Condition ID	Surface water SDL resource unit source	Groundwater-dependent features (confidence)
	10555	SS2	H
	10561	SS2	H
	10562	SS2	M
	10563	SS2	M
	10565	SS2	H
	10594	SS2	M
	10613	SS2	M
	10619	SS2	H
	10620	SS2	H
	10622	SS2	H
	10625	SS2	H
Murray floodplain between Lake Hume and Lake Mulwala	75156	SS2	M
	75373	SS4	M
	75373	SS4	M
	75373	SS4	M
	75373	SS4	M
	75373	SS4	M
	75373	SS4	M
	75373	SS4	M
	75195	SS2	M
	75363	SS2	M
	75363	SS2	M
	75157	SS4	M
	75157	SS4	M
	75157	SS4	M
	75157	SS4	M
	75157	SS4	M
	75158	SS4	M
	75158	SS4	M
	75174	SS4	H
	75174	SS4	H

PEA Name	Index of Wetland Condition ID	Surface water SDL resource unit source	Groundwater-dependent features (confidence)
	75174	SS4	H
	75174	SS4	H
	75174	SS4	H
	75191	SS4	H
	75197	SS4	H
	75159	SS4	M
	75159	SS4	M
	75164	SS4	H
	75165	SS4	H
	75173	SS4	M
	75176	SS4	H
	75178	SS4	H
	75178	SS4	H
	75180	SS4	M
	75181	SS4	M
	75183	SS4	M
	75184	SS4	M
	75188	SS4	M
	75192	SS4	M
	75192	SS4	M
	75193	SS4	M
	75193	SS4	M
	75196	SS4	M
	75196	SS4	M
	75198	SS4	M
	75198	SS4	M
	75200	SS4	M
	75200	SS4	M
	75205	SS4	M
	75205	SS4	M

PEA Name	Index of Wetland Condition ID	Surface water SDL resource unit source	Groundwater-dependent features (confidence)
	75208	SS4	M
	75174	SS4	H
Nyah	12502	SS2	H
Vinifera	12508	SS2	M
Psyche Bend Lagoon	11354	SS2	M
Tata Creek	12789	SS9	M
	12790	SS2	M
Wirra-Lo Wetlands Complex	43210	SS2	M
	43214	SS2	M

1. *NB - Wetlands that are identified as being either not groundwater-dependent, or low confidence in groundwater-dependency, were excluded from the tables.*

Basin Plan and long-term watering plan objectives

This table outlines the Basin Plan objectives, long-term watering plan objectives and which assets support these objectives.

Table 11: Northern Victoria water resource plan area

Theme	Basin Plan objective	Long-term watering plan objective	Assets
Fish	Ensure that water dependent ecosystems are resilient to climate change and other risks and threats	Improve abundance of large-bodied native fish	Birch's Creek, Campaspe River, Loddon River (mid, upper), Goulburn River, Broken River, Ovens River
		Improve abundance of small-bodied native fish in rivers	Birch's Creek, Coliban River, Loddon River (mid, upper), Broken River, Ovens River, Goulburn River
	Protect and restore water-dependent ecosystems	Improve habitat for native fish	Birch's Creek, Coliban River, Loddon River (upper), Goulburn River, Ovens River
		Maintain species richness of native fish	Birch's Creek, Coliban River
	Protect and restore the ecosystem functions of water-dependent ecosystems	Improve movement of native fish	Campaspe River, Loddon River (mid, upper), Goulburn River, Broken River, Ovens River
Waterbirds	Ensure that water-dependent ecosystems are resilient to climate change and other risks and threats	Improve breeding opportunities for waterbirds	Doctors Swamp, Moodies Swamp, Lake Leaghur, Lake Yando
	Protect and restore water-dependent ecosystems	Improve habitat for waterbirds	Reedy Swamp, Meran Lakes complex (Lake Meran and Little Lake Meran), Lake Yando

Theme	Basin Plan objective	Long-term watering plan objective	Assets
Vegetation	Protect and restore water-dependent ecosystems	Maintain the condition of aquatic vegetation in wetlands	Lake Boort, Moodies Swamp, Lake Leaghur, Lake Yando, Meran Lakes complex (Lake Meran and Little Lake Meran)
		Maintain the extent of river red gum dominated ecological vegetation classes	Lake Boort, Coliban River, Loddon River (mid, upper)
		Maintain the condition of river red gum dominated ecological vegetation classes	Campaspe River, Loddon River (upper), Lake Leaghur, Lake Yando
		Maintain the extent of black box dominated ecological vegetation classes	Lake Boort, Loddon River (mid)
	Protect and restore the ecosystem functions of water-dependent ecosystems	Maintain the condition of in-channel aquatic vegetation	Broken River, Coliban River
	Ensure that water-dependent ecosystems are resilient to climate change and other risks and threats	Improve the extent of aquatic vegetation	Lake Leaghur, Lake Yando, Meran Lakes complex (Lake Meran and Little Lake Meran) Campaspe River, Loddon River (mid, upper), Goulburn River, Broken River
		Improve the abundance of aquatic vegetation	Moodies Swamp, Lake Meran Birch's Creek, Coliban River, Goulburn River
		Improve the species richness of aquatic vegetation in wetlands	Lake Boort, Lake Leaghur, Lake Yando, Meran Lakes complex (Lake Meran and Little Lake Meran)
		Improve the species richness of in-channel aquatic vegetation	Birch's Creek, Coliban River, Goulburn River
		Improve species richness of river red gum dominated ecological vegetation classes	Doctors Swamp

Theme	Basin Plan objective	Long-term watering plan objective	Assets
Connectivity and functions[1]	Protect and restore the ecosystem functions of water-dependent ecosystems	Improve longitudinal connectivity (between river reaches and with the Murray)	Campaspe River, Ovens River, Loddon River
		Maintain water quality within an appropriate range to allow for ecosystem processes	Birch's Creek, Campaspe River, Coliban River, Loddon River (mid, upper), Ovens River, Broken River
		Maintain the quality of geomorphic habitat (maintain channel form, clean substrates, prevent stream bed colonisation)	Coliban River, Loddon River (mid, upper), Goulburn River, Ovens River, Broken River
Other values	Ensure that water-dependent ecosystems are resilient to climate change and other risks and threats	Improve breeding of platypus and rakali	Birch's Creek, Campaspe River, Coliban River
		Improve breeding of frog communities	Doctors Swamp, Lake Yando
		Improve abundance of macroinvertebrates	Goulburn River, Birch's Creek, Coliban River, Loddon River (mid, upper)
		Improve number of macroinvertebrate functional groups present	Birch's Creek, Campaspe River, Coliban River Loddon River (mid, upper)
	Protect and restore water-dependent ecosystems	Maintain abundance of platypus and rakali	Loddon River (mid, upper)
		Maintain species richness of frog communities	Reedy Swamp
		Maintain abundance of platypus and rakali	Loddon River (mid, upper)

1. *The long-term watering plan objectives for connectivity and functions are Victoria's priority ecosystem functions*

Table 12: Victorian Murray water resource plan area

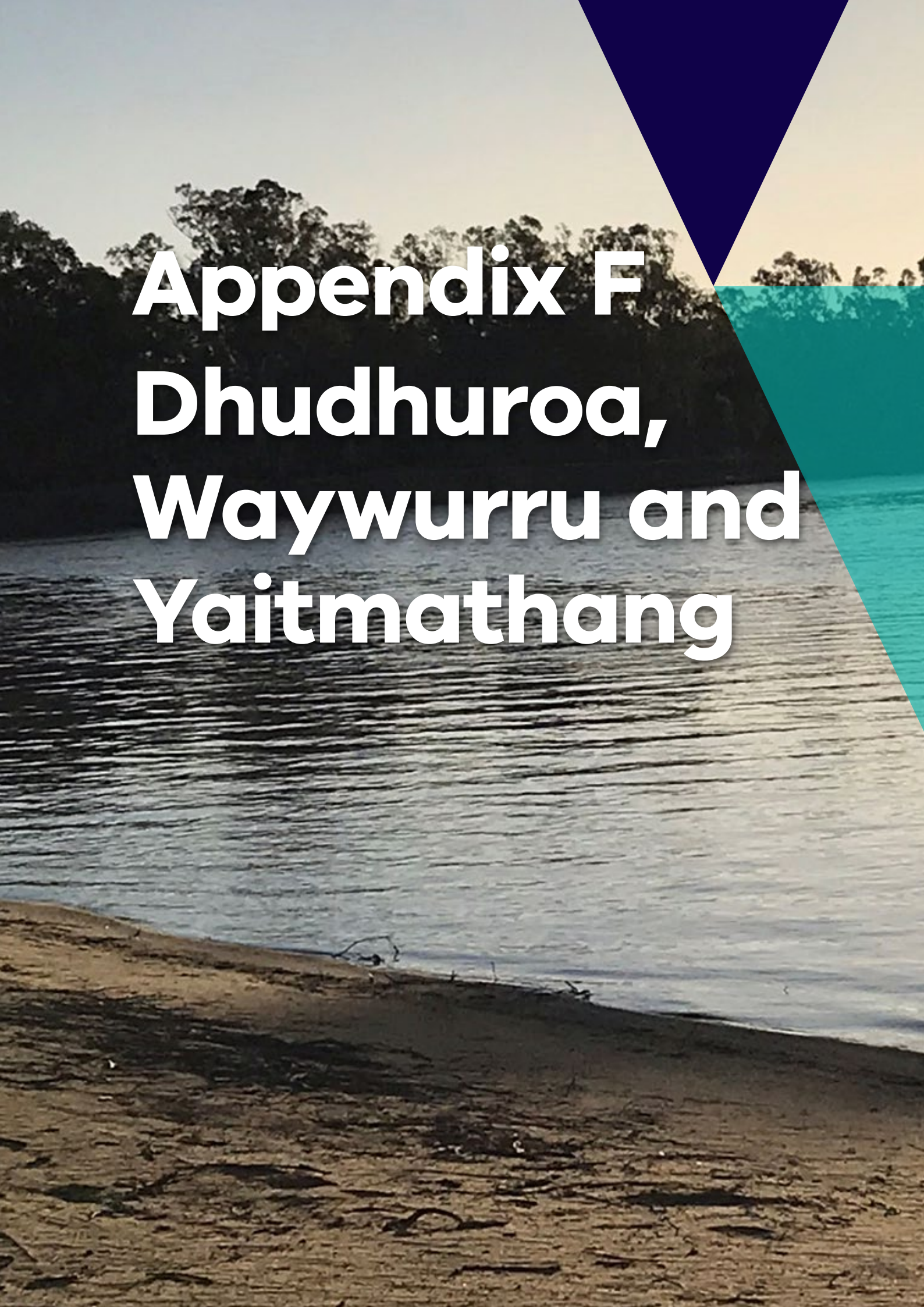
Theme	Basin Plan Objectives	Long-term Watering Plan Objective	Assets
Fish	Ensure that water-dependent ecosystems are resilient to climate change and other risks and threats	Improve abundance of large-bodied native fish	Loddon River (lower), Bumbang Island, Broken River and Nine Mile Creek (Reaches 1-4), Lock 6 to 10 (wetlands/ floodplain), Lindsay-Walpolla, Mulcra Islands
	Protect and restore water-dependent ecosystems	Maintain abundance of small-bodied native fish in wetlands	Bumbang Island, Lock 15 (wetlands/ floodplain), Lock 6 to 10 (wetlands/ floodplain), Walshes Bend, Gunbower Forest, Lindsay-Wallpolla Islands, Hattah Lakes, Margooya Lagoon, Bottle Bend, Karadoc, Lake Hawthorn, Spence's Bend, Barmah-Millewa
		Maintain distribution of threatened small-bodied native fish in wetlands	Gunbower Forest, Lake Elizabeth, Bottle Bend, Karadoc, Lake Hawthorn, Bambang Island, Spences Bend, Walshes Bend, Margooya Lagoon, Hattah Lakes
		Improve habitat for native fish	Bottle Bend, Karadoc, Lake Hawthorn, Spences Bend, Hattah Lakes, Lock 6 to 10 (wetlands/floodplain), Broken River and Nine Mile Creek (Reaches 1-4)
		Maintain species richness of native fish	Lindsay-Walpolla, Loddon River (lower), Gunbower Forest, Bambang Island, Lock 15, Lock 6 to 10, Walshes Bend

Theme	Basin Plan Objectives	Long-term Watering Plan Objective	Assets
Waterbirds	Ensure that water-dependent ecosystems are resilient to climate change and other risks and threats	Improve breeding opportunities for colonial-nesting waterbirds	Gunbower Forest, Hattah Lakes, Barmah-Millewa, Lock 15 (wetlands/ floodplain), Lock 6 to 10 (wetlands/ floodplain)
		Improve breeding opportunities for waterbirds	Kinnairds Wetland, Bottle Bend, Bumbang Island, Karadoc, Lake Hawthorn, McDonalds Swamp, Wirra-Lo, Black Swamp, Lindsay-Wallpolla , Mulcra Islands, Johnson Swamp, Lake Elizabeth, Lake Murphy, Lock 15 (wetlands/floodplain), Lock 6 to 10 (wetlands/floodplain), Hattah Lakes, Barmah-Millewa
	Protect and restore water-dependent ecosystems	Improve habitat for waterbirds	Hird Swamp, Bottle Bend, Bumbang Island, Karadoc, Lake Hawthorn, Johnson Swamp, Pig Swamp, Lake Elizabeth, Lake Murphy, Gunbower Forest, Cokum Bushland Reserve
		Improve feeding areas for waterbirds	Kinnairds Wetland, Bottle Bend, Karadoc, Lake Hawthorn, Lock 15 (wetlands/floodplain), Lock 6 to 10 (wetlands/floodplain), Hattah Lakes, Johnson Swamp, Lake Elizabeth, Lake Murphy, Cokum Bushland Reserve

Theme	Basin Plan Objectives	Long-term Watering Plan Objective	Assets
Vegetation	Ensure that water dependent ecosystems are resilient to climate change and other risks and threats	Improve the species richness of aquatic vegetation in wetlands	Hird Swamp, Merbein Common, Bumbang Island, Piambe, Psyche Bend Lagoon, Spences Bend, Tata, Walshes Bend, McDonalds Swamp, Pig Swamp, Lake Elizabeth
		Improve the species richness of in-channel aquatic vegetation	Loddon River (lower)
		Improve the extent of aquatic vegetation	Hird Swamp, Lake Cullen, Richards Lagoon, Loddon River (lower), Bumbang Island, Burra Creek, Psyche Bend Lagoon, Spences Bend, Walshes Bend, McDonalds Swamp, Wirra-Lo, Johnson Swamp, Pig Swamp, Lake Murphy, Broken and Nine Mile Creek, Gunbower Forest, Hattah Lakes
		Improve the condition of river red gum dominated EVCs	Belsar and Yungera Islands, Margooya Lagoon, Nyah Vinifera, Kings Billabong, Carina Bend, Merbein Common, Murrumbidgee Junction, Wemen-Liparoo, Loddon River (lower), Burra Creek, Karadoc, Piambe, Pound Bend, Spences Bend, Tata, Wirra-Lo, Gunbower Forest, Pig Swamp, Kinnairds Swamp, McDonalds Swamp, Barmah-Millewa
		Improve the condition of black box dominated EVCs	Belsar and Yungera Islands, Carina Bend, Merbein Common, Wemen-Liparoo, Burra Creek, Karadoc, Lake Hawthorn, Piambe, Spences Bend, Tata, Wirra-Lo, Gunbower Forest, Johnson Swamp, Hattah Lakes
		Improve the condition of Shrub and Lignum dominated EVCs	Carina Bend, Merbein Common, Wemen-Liparoo, Burra Creek, Bottle Bend, Karadoc, Lake Hawthorn, Piambe, Psyche Bend Lagoon, Spences Bend, Tata, Wirra-Lo, Johnson Swamp, Pig Swamp, Lake Murphy, Lindsay Wallpolla, Mulcra Islands, Pound Bend, Hird Swamp, Cokum Bushland Reserve, Considines, Poyner

Theme	Basin Plan Objectives	Long-term Watering Plan Objective	Assets
	Protect and restore water-dependent ecosystems	Maintain the extent of Black Box dominated ecological vegetation classes	Lake Cullen, Richards Lagoon, Lake Murphy, Cokum Bushland Reserve, Considines, Poyner
		Successful growth and flowering of Moira Grass plants	Barmah-Millewa
	Protect and restore the ecosystem functions of water-dependent ecosystems	Improve connectivity between floodplains, anabranches and wetlands.	Murrumbidgee Junction, Wemen-Liparoo, Lock 15 (wetlands/floodplain), Lock 6 to 10 (wetlands/floodplain), Loddon River (lower), Bottle Bend, Spences Bend, Tata, Lindsay-Wallpolla, Mulcra, Broken and Nine Mile Creek, Johnson Swamp, Pig Swamp, Hird Swamp
Connectivity and functions[1]	Protect and restore the ecosystem functions of water-dependent ecosystems	Maintain water quality within an appropriate range to allow for ecosystem processes	Merbein Common, Loddon River (lower), Bumbang Island, Lock 15 (wetlands/floodplain), Lock 6 to 10 (wetlands/floodplain), Psyche Bend Lagoon, Spences Bend, Walshes Bend, Broken and Nine Mile Creek, Lake Elizabeth
		Improve habitat of frog communities	Bottle Bend, Karadoc, Barmah-Millewa, Pig Swamp, Lake Murphy, Wirra-Lo
Other values	Protect and restore water-dependent ecosystems	Maintain species richness of frog communities	Kinnairds Wetland, Lock 15 (wetlands/floodplain), Lock 6 to 10 (wetlands/floodplain), McDonalds Swamp, Gunbower Forest, Johnson Swamp, Black Swamp
	Ensure that water-dependent ecosystems are resilient to climate change and other risks and threats	Improve habitat of turtle and crayfish communities	Barmah-Millewa
		Improve abundance of macroinvertebrates	Loddon River (lower), Lake Elizabeth, Johnson Swamp, Pig Swamp,
		Improve number of macroinvertebrate functional groups present	Loddon River (lower), Lake Elizabeth, Johnson Swamp

1. *The long-term watering plan objectives for connectivity and functions are Victoria's priority ecosystem functions*



Appendix F Dhudhuroa, Waywurru and Yaitmathang

Appendix F Dhudhuroa, Waywurru and Yaitmathang

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1. Dhudhuroa, Waywurru and Yaitmathang

The Dhudhuroa, Waywurru and Yaitmathang contribution was signed off by the Board of Directors of the Dhudhuroa Waywurru Nations Aboriginal Corporation.

Figure 1: Mountain Creek

Credit: Ngarra Murray

Nhakai Ngarrinbai Warra-Ngalindha Warrabe
'Look, Listen and Hear Our Water Speak'

Dhudhuroa and Waywurru Language (2018)

1.1 Description

1.1.1 Our Country

Our waterways and cultural landscapes include pristine peatlands, forest landscape, urban and lifestyle landscapes, alpine and agricultural landscapes that rely on our waterways beginning at the Australian Alps and flowing to the Upper Murray.

1.1.2 Our Clans

Our First Nations Clans are classed as Nations and language groups and clans in their own right with Country, language, clans, ancestors and direct descendants, lore and authority, traditions and customs, arts, music, song and ceremony.

1.1.3 Corporate Entities (NRM)

- Dhudhuroa Waywurru Nations Aboriginal Corporation ICN 7181 ABN: 49 376 014 401
- Yaitmathang Indigenous Lands Incorporated ABN: 40774510028

1.2 Current or pending agreements

The Dhudhuroa, Waywurru and Yaitmathang peoples are working towards their Native Title matter which may include progressing to a Settlement Agreement under the Traditional Owner Settlement Act 2010 (Vic).

The Dhudhuroa, Waywurru and Yaitmathang peoples do not currently have RAP status, however they are working towards their application to be recognised as a RAP for their Country.

1.3 Memberships

- MLDRIN
  - Yaitmathang
  - Waywurru
  - Dhudhuroa
- Victorian Traditional Owner Land Justice Group

1.4 Partnerships and Projects

North East Catchment Management Authority

- Working together with Complementary Measure project
- Scoping a Dhudhuroa Steering Committee

North East Water

- Working together with Integrated Water Management project

Goulburn-Murray Water

- Working together with Dartmouth Dam project

DELWP

- Working together with Integrated Water Management project
- Biodiversity projects

Parks Victoria

- Working together with Peatlands Project

1.5 Preferred means of engagement

- Water Policy Officer
  - Reporting to CEO
    - Reporting to Board of Directors
- Email and phone
- One month's notice
- All First Nation participants engaged in meetings/workshops should be valued for their input and remunerated accordingly on a fee for service basis.

1.6 *Dhudhuroa, Waywurru, Yaitmathang First Nations Clans:* Water Resource Plan

1.6.1 Introduction

This Water Resource Plan (WRP) is to provide the State and Commonwealth Governments an opportunity to support the *Dhudhuroa, Waywurru and Yaitmathang Nations* and the relevant agencies that include Department of Environment, Land, Water and Planning (DELWP), Parks Victoria (PV), North East Catchment Management Authority (NECMA) and provide ongoing funding and resources to assist the implementation of the land and water managers key plans and aspirations of our Nations.

It is in our view that there are funding and resourcing opportunities to establish a permanent water unit and steering committee. A multifunction water and cultural facility is being scoped by the First Nations.

This WRP also provides the State and Commonwealth Governments an opportunity to make a priority to build on our existing community and Government partnerships that improves the physical, social, emotional, cultural, spiritual, economic and ecological wellbeing of both the individual and Nations level.

A water resource plan is the opportunity for our Nations to map out our spiritual and cultural connections to our waterways and cultural landscapes. These waterways and cultural landscapes include pristine peatlands, forest landscape, urban and lifestyle landscapes, alpine and agricultural landscapes that rely on our waterways.

This WRP is about bringing youth and Elders together with GPS, video cameras, high tech drones, and trail cameras assessing and recording the health, monitoring and mapping of culturally significant waterways, medicinal plants, food and fibre plant sources, cultural heritage sites and places that significantly link our Nations to our cultural responsibilities and obligations to environment, community and culture.

It has been identified that while our Nations carry out these assessments, implementing key land and water catchment management plans and providing cultural knowledge we are reconnecting to our cultural and spiritual landscapes from both a cultural and scientific perspective.

Our Nations have the aspiration to ensure that all our waterways are healthy, by working with the relevant agencies under a strategic alliance driven by a fully funded and resourced steering committee that brings both science and culture together that assist the implementation of land and water managers key plans and aspirations of our Nations.

The steering committee must be made up of professional expertise that identify, create and exploit economic development and employment opportunities for all people. First Nations Clans Ownership and management of water is the basis for exerting our priori rights to water and to ensuring a high quality of life for our People.

With an appropriately funded and resourced strategic steering committee in place our Nations can then begin to identify where and when the right water in the right place at the right time will meet the needs of the environment, aspirations and vision of our Nations, land and water managers and the broader community.

The purpose of this WRP is that our Nations have a recognised and legitimate role in water ownership and governance, with genuine consultation and substantive negotiations in policy development and a part in decision-making about our waterways and surrounding flora and fauna.

Under this WRP our Nations must be securing by ownership and management adequate and equitable water rights that meet our social, cultural, spiritual, economic and environmental needs.

Our Nations have expressed their need and responsibility to share our sacred creation stories to teach all Peoples of our cultural, spiritual and economic connection to water in the landscape and how we are all connected to water both physically and spiritually.

We need to build our capacity to be major contributors and beneficiaries into water use in North East Victoria and the Alps. This will include the New South Wales areas connected to our Country.

Our Nations have come together to form a strategic alliance to be a clearly identified group of Nations and Clans with well-defined strategic visions, goals and objectives, authority and leadership structures. A group of Nations that have a strong, well-governed corporation that effectively represents the interest of each Nation. This may also include having each Nations established as legal entities in the own right.

Also have an active and engaged community that participates in all aspects of society.
Our Nations have the aspiration to grow our asset base and use it wisely and sustainably to generate socio-economic benefits for our Nations, attract and secure the professional expertise required to create and exploit economic development and employment opportunities.

1.6.2 Values and uses

Cultural Values

Having access to our natural and cultural resources is a fundamental human right. Our story to water is a cultural place and belonging. Our water is our culture, it is our life, it preserves our ancient stories that continues to give our culture life. Our people have a physical, social, emotional, cultural, spiritual and ecological connection both individually and collectively as a Nation. Our culture in this modern world and society is determined by the ways our water is managed and maintained. As a people of this community we also enjoy the recreational activities that bring us together. We need our waterways to be culturally and environmentally safe that integrate the positive perspectives of our cultural knowledge, customs and beliefs.

Our story to water continues to be ignored by others from different parts of our region and communities. Our understanding of our waterways and landscapes need to be respected and resourced in a way that meets our aspirations and cultural obligations that protect our cultural waterways and landscapes while educating others of our culture and history.

We have to be strict in respect to cultural values along the waterways as this is a cultural connection the wider public don't really understand. The communities within a clan or traditional

owner group need to have a say in the local Shire or City Council to set up Cultural Committees for the cultural awareness of that region. We need sustainability through involvement from our people having the cultural integrity and knowledge respected and maintained as long as the rivers flow; we are keepers of the stories and belong as custodial caretakers for the past 60,000 plus years of occupancy.

First Nations Alpine Water and Climate Change Interpretive Centre

Our Nations have the aspiration under this strategic steering committee alliance with interested State Government agencies to work toward building a unique alpine architectural designed water interpretative centre. This major development will reflect the commitment between key land and water managers and our Nations. The centre can also sustain businesses in industries such as aquaculture and horticulture, as well as ecotourism and cultural tourism.

We need to ensure the healthy flow of water, that it does not become stagnant or poisoned. Water is a rejuvenation for us all. There are 8 to 10 alpine seasons we understand to our water the wider community does not understand, such as when the fish are spawning, when to carry out cool burns and how to manage animals around waterways. There is history whereby the mail could not be delivered unless they had a traditional Aboriginal person to get the mail across the rivers. This cultural knowledge was relied upon by non-Aboriginal society.

We are concerned about the current disconnection to our waterways and not having control over our waterways. It is our dispossession of our land and water that creates a subculture of poverty. The cycle of water and our life is broken and there is a need for us to turn this around through working with DELWP and forming other partnerships so that we all work towards a common goal.

We need cultural spaces for our cultural practices, so we can conduct cultural activities in safe cultural environments. We would like to manage the parks and the water that comes into those areas that will also be ours to manage. It is important we have our own rangers, fisheries officers and game authority officers, forest fire management officers and wildlife protection officers.

Past, Present and Future

- Our cultural and environmental values are dependent on our people being more involved in protecting our environment.
- We need capacity building toward taking on the roles as environment protection officers, game authority officers, forest fire officers and rangers.
- Our people need to be able to respond to emergency environmental disasters and contribute to community safety and objectives.
- Our Ancestors in the old days-built dams, and parks and reserves that stored and captured water, fish and game for wild harvest.
- We have not been provided with opportunities to work with authorities and Government to identify these places where we can capture our own water, fish and game that we need to survive our culture.
- We should be able to store water, in our own storage facilities or wetlands where environmental flows are captured and used for other Nations.
- We have a right to have our own healthy waterways and develop further opportunities around water and learning from other first Nations around the world.
- We have the right to be funded and resourced to establish a steering committee set up educational centres around sharing our cultural knowledge of the environment and our cultural landscapes.
- We have all of these opportunities now to work together and build all of our capacities to work together strategically for the betterment of all people throughout our communities and Nations.

- We have the capacity now to collaborate with agencies to better manage and control the numbers and impacts of feral deer and horses throughout our cultural landscapes and waterways.
- We need to create strategic partnerships to protect the living cultural environment and waterways.
- We need to be managing our waterways by bringing both science and culture together as our Ancestors did in the old ways and prospering in the wealth of culture and enriching our health and well-being.
- The non-Aboriginal Australians are widely benefiting from the ways in which our waterways are managed and controlled.
- Our people are not benefiting economically, culturally and productively as our Ancestors did in the past.
- Our people need to be part of the shaping and making of new innovative policies and management plans that allow our people to regain more control over the management and commercial benefits of our waterways.
- Currently we do not have control of our waterways and this directly impacts on our people and depletes the health and wellbeing of our people and communities.
- These current management policies and legislations control the destiny of our people and the future of our culture.
- We should be bought into the economic opportunities and helping to create more healthier and more accessible cultural living environments throughout our landscapes, suburbs and communities for our people's needs.
- Our people need to be helping design new and innovative cultural living environments that will enable us to all benefit commercially, culturally, socially and physically and take more control of our destiny and enjoy accessing our waterways while contributing to the local economy.

1.6.3 Cultural flows

The purpose of the Aboriginal Waterways Assessment (AWA) is to provide a tool for our Nations to consistently measure and prioritise peatlands, rivers and wetland health so that we are better placed to negotiate for our water needs.

The AWA tool is intended to capture information about the cultural values, uses and health of peatlands, waterways and wetlands to assist our people to be more meaningfully involved in water planning processes. The survey tool used to conduct our Aboriginal Waterway Assessments is based on the Aboriginal Waterways Assessment developed collaboratively by the Murray Lower Darling Rivers Indigenous Nations (MLDRIN), the Northern Basin Aboriginal Nations (NBAN) and the Murray-Darling Basin Authority (MDBA).

Following a trial of the original AWA tool, the Nations can modify the tool to better reflect our Nations interests and the management and implementation of our water resource plan.

Objectives and outcomes

Basin Plan s10.52(1)

Table 1.6.1: Objectives and outcomes

Strategic objectives	Outcomes
Setup strategic water planning steering committee	Establishment of a natural resource management steering committee that ensures a whole of land and water approach is taken on Country. Ensure our rivers, waterways and cultural landscapes are culturally safe and healthy, with the right water, in the right place, at the right time to meet the needs of our cultural environment, our Nations and the broader community Have a recognised and legitimate role in water governance, with genuine consultation in policy development and a part in decision-making about our waterways in a culturally safe process and environment Secure the right and means to effectively protect and manage our waterways, cultural landscapes and cultural heritage sites Ensures that our full range of rights and interests are legally recognised and reflected in their policies of Government Sharing our stories to the key land and water managers of how water works throughout our waterways and cultural landscapes with appropriate funding and resources Continue building our water officer capacity, identifying further opportunities to be fully funded and resourced appropriately Promotes reconciliation and community engagement Integration of cultural knowledge and science Strategic planning and workshopping between our Nations and the key land and water managers Strategic management plans to eradicate, control and manage pest plants and animals that combine cultural knowledge and science Capacity building in governance and natural resource management Access to all waterways in North-East Victoria Strengthening existing partnerships with key land and water managers Accessible diversified training and employment opportunities Opportunity to develop a climate change management plan Working together strategically for the betterment of all people throughout our communities and Nations Collaborating with key land and water managers to better manage and control the numbers and impacts of feral deer and horses throughout out waterways and cultural landscapes Creating strategic partnerships to protect the living cultural environment and waterways More of our people working on Country and in stable employment

Environmental Objectives	Outcomes
Renaming rivers and wetlands	Promotes reconciliation and community engagement Reclaim, revive and rejuvenate our language throughout our waterways Increases wider-community awareness of language and culture Promotes our strong connection to Country
Protecting the plants and animals that are important to us	Promotes the right species in the right places in a sustainable way
Understand what plants and animals now exist throughout our waterways and understand what condition they are in, so we can better define appropriate ways to manage and maintain	Increase our understanding of waterways and cultural landscape Better defined measures and more effective management plans that are culturally appropriate
Economic Objectives	**Outcomes**
Develop funding opportunities for commercial businesses	Employment and economic opportunities *Develop and sustain businesses in industries such as aquaculture and horticulture, as well as ecotourism and cultural tourism.* Improve health and well-being of our Nations Rebuilding capacity for our Nations people to care for Country Promotes self-determination Self-governance and management
Create a Water Trust owned and controlled by our Nations.	Employment, training and economic opportunities Secures adequate and equitable water rights that meet our social, cultural, spiritual, economic and environmental needs in a culturally safe way
Cultural Objectives	**Outcomes**
Providing cultural awareness training to key land and water managers	Advances reconciliation with the broader community by sharing our stories, values and customs Provides economic opportunities and contribution Strengthens existing partnerships

Actively practice our ceremonies on and around our waterways	Passing on of our cultural knowledge by teaching our people the principles and values of the old ways Consolidating and protecting our traditional knowledge and using it to guide cultural practices and the way our waterways and cultural landscape is managed Advance reconciliation with the broader community by sharing our stories, values and customs Sustaining our culture and environment in a culturally safe and effective way
Climate Change Objectives	**Outcomes**
Build a First Nations alpine water and climate change interpretive centre	Creating public space, redeveloped and integrated into cultural, economic, educational, social and environmental learning spaces. Diversified training and employment opportunities Promote environmental and economic values Opportunity to develop a climate change management plan Showcase our links to a strong Biami story Sharing cultural knowledge and science together Mending the cycle of water and life – spiritual revival through education Promote the benefits of allowing rivers to flow naturally Celebration of songs and dances to the public, schools and tourists Cultural education on the importance of rivers and having more native wildlife along the waterways Promoting healthy water from the source to the Murray Promote introduced animals off all waterways Promote improved health and well-being of community Provide greater understanding of cultural seasons and water Promote and showcase healthy peatlands Develop community plans with broader community and projects for river changes Environmental and economic water storage in dams and wetlands

1.7 Case Study – Aboriginal Waterway Assessment (AWA)

Aboriginal Waterway Assessments have been an important tool for the Alps and Rivers Nations to engage on Country and reconnect to family, clans and the waterways. The Nations strive to have an inclusive and transparent process that is representative of as many interested parties as possible. "The inclusion of representatives from each of the Nations is crucial to the "mental well-being" of all descendants. We need to work together to ensure our waterways are healthy and care and respect each other's Nations."

In 2015 Dhudhuroa and Waywurru representatives were involved in a pilot Aboriginal Waterways Assessment study to assess the AWA process. According to the Murray-Darling Basin Authority, "the research from the pilot program found that the Aboriginal Waterways Assessment tool and process is a culturally appropriate, safe and strengthening way to assess the health of river and wetland places.

Additionally, the Aboriginal Waterways Assessment was found to:

- produce accurate, accessible and useful information
- be good for people's health and wellbeing
- increase Aboriginal peoples' confidence in using their knowledge in water planning and management environments
- enable members of Nations with limited knowledge of Country to contribute to river and wetland health assessment
- provide local knowledge of:
  - biodiversity and flow conditions
  - extended time-frames of flow characteristics
  - current observations of the local impacts of water policy and regulation on Nations
- help prevent further loss of Traditional Owners' knowledge of Country by:
  - providing an analysis of river and wetland health relative to cultural uses
  - recording the current state of cultural values and uses of Country
  - contributing to cultural transmission including historical stories
  - providing valid and locally-owned information for caring for Country."

In particular, the 2015 AWA established that the Dhudhuroa and Waywurru people wanted to spend more time on Country to learn more about it. "Before we fill out surveys and that, reconnect to Country.''

The Murray-Darling Basin Authority report noted that most of the Dhudhuroa and Waywurru Nations of the Alps are city residents who had not spent much time in their Country. The Aboriginal Waterways Assessment Program report mentioned that two members of the team who knew the Country well were able to share their knowledge. "As the team travelled up and down the Ovens and Kiewa valleys, they gathered knowledge from the research team of how the valleys had been used since occupation. This helped them understand the condition of the rivers, and they could then imagine how the places might have been used traditionally: 'I really enjoyed it today. I got a better understanding of how events like the dredging have affected the river. And I can visualise how the last place wouldn't have been a camping site, because the water wasn't flowing fast enough.'"

According to the report when asked what they had got out of the week, every member of this assessment team said: 'I've got more connected to my Country.'

This theme was also reflected in the results of a second AWA process carried out in February 2019 by representatives from the Waywurru, Dhudhuroa and Ngurai Illum. Yaitmathang were also invited however were unable to send a representative at this time.

Through funding secured from MLDRIN, the AWA team enjoyed being able to reconnect to Country and engage with the natural resource managers from the region. The sheer expanse of the region and access to all the numerous waterways made an audit of the whole Country a difficult prospect and participants decided that more time is needed just to "sit on the land to feel the country, language and culture."

The group also recognised that as peoples removed from their land so early in Victoria's history, a lot more historical research is required to reconnect people back to Country.

"We want more information about what our families and People would have been doing in those actual areas – more research into what was done at each area."

The group acknowledged that there was no reference at all to Traditional Owners throughout the area and a significant research and signage project needs to take place.

The February AWA team visited 10 very diverse sites in an effort to understand many components of the waterways system in the Victoria's north and north east. In general, the team found most of the sites to have average waterway health with higher results associated with cultural values and uses. It was apparent, however, that river health and cultural values and uses have a direct relationship.

None of the sites were considered to be in very poor condition however the group believed that more time was needed to investigate each site properly, especially in terms of assessing the cultural health of the waterways.

The team also noted that assessment should be carried out in the different seasons to get a better picture of the overall health of the waterways. Some of the sites were compared with the 2015 AWA results and the seasonal variation was believed to have had an impact on the results.

The following table shows the assessment data for each site:

Site Name	Place Identifier	Part 1: Waterway Health (%)	Part 2: Cultural values and uses (%)	Values and uses supported?
Mitta Mitta	D1S1	67.53%	76.56%	Yes: 61.5% No: 30.8%
Kiewa River, West Branch	D2S1	47.4%	62.2%	Yes: 26.7% No: 60%
Kiewa River, Mongan's Bridge	D2S2	48.65%	58.49%	Yes: 15.4% No: 69.3%
Kiewa River, Killara	D2S3	51.52%	61%	Yes: 8.3% No: 83.3%
Stony Creek	D3S1	77.2%	65.33	Yes: 93.3% No: 6.7%
Snowy Creek	D3S2	58.7%	62.2%	Yes: 23% No: 76.9%
Washbed Creek	D4S1	74%	67%	Yes: 84.6% No: 2%
Pretty Valley	D4S2	57%	68%	Yes: 46.7% No: 46.7%
Reedy Creek	D5S1	52%	70%	Yes: 21.4% No: 78.6%
Reedy Creek 2	D5S2	47%	68%	Yes: 8.33% No: 91.7%

The values, threats and objectives were considered for each site and themes of removal of pest species, Traditional Owner signage and Traditional Owner involvement were prevalent across the sites.

Participants expressed a strong interest in conducting the assessments more regularly and engaging with DELWP, CMAs and MLDRIN to progress actions and project ideas.

The outcomes of Alps and Rivers Nations February 2019 Aboriginal Waterway Assessment are as follow:

- more involvement in management of waterways
- cultural and educational centre and spaces
- signage
- protection of heritage sites
- weed and pest control
- native revegetation programs
- more people on Country
- historical research and connection.