

A photograph of a creek with a dam and a large tree in the background. The creek is brown and flows through a rocky bed. A large, gnarled tree stands in the background. The sky is overcast. The image is partially covered by a dark blue triangle in the top right and a teal triangle in the middle right.

17. Measuring and monitoring



17.1 Basin Plan requirements

The Basin Plan requires the Wimmera-Mallee WRP to include information about the:

- best estimate of the total long-term annual average quantity of water taken that is measured and
 - how the quantity measured was calculated
 - the proportion of the quantity measured that is measured in accordance with agreed metering standards
- best estimate of the total long-term annual average quantity of water taken that is not measured and how the quantity not measured was calculated
- actions and timeframes for actions for maintaining and, if practicable, improving:
 - the proportion of take that is measured
 - the standard to which take is measured
- monitoring of water resources to fulfil the reporting obligations under section 13.14.

17.2 Victorian Water Accounts

The annual Victorian Water Accounts provide detailed information about water availability and use. The first accounts were produced for 2003-04 and have been produced every year since.

Surface water accounts are produced for each of Victoria's 29 river basins, the definitions of which are based on the river basin boundaries designated by the former Australian Water Resources Council.

Groundwater accounts are produced for each of Victoria's groundwater basins. Rigorous accounting standards and practices are applied. These boundaries do not align with the Wimmera-Mallee WRP area.

17.2.1 Surface water accounts

Surface water data in the water accounts generally aligns well with river basin boundaries. The only instance where this does not occur is where water is diverted from a waterway in one river basin and then used in another. For the purposes of the basin water accounts, water is accounted for at the point of diversion from the waterway and not the point of use.

The surface water accounts present the catchment water balance for each basin. The water balance is made up of:

- change in the volume stored in the basin
- inflows to the basin
- diversions
- losses
- water passed at the outlet of the basin.

Information for the surface water accounts is obtained from:

- the Victorian Water Register
- data from water corporations, VEWH, DELWP, major users of water and the MDBA
- water consumption and recycled water data collected from water corporations by the Essential Services Commission
- hydrological information from selected streamflow monitoring sites
- climate information from selected rainfall and evaporation monitoring sites provided by the Bureau of Meteorology and water corporations

- estimated relationships between water use and climate or hydrological data, which is produced by water supply system modelling
- water corporation annual reports.

Details of the methodology used to quantify each component of the water balance are described in the Victorian Water Accounts (see for example, Victorian Water Accounts 2014-15 (DELWP, 2016)). Accounts are prepared for the Wimmera (including Avon) and Avoca basins. No surface water balance is prepared for the Mallee basin because all surface water supplies used in this area are sourced from outside the basin.

17.2.2 Groundwater accounts

Groundwater accounts are presented for each groundwater catchment. Boundaries of these catchments are determined by hydrogeological features and differ from surface water catchments. The groundwater accounts present data about:

- licensed groundwater volumes and use
- urban groundwater use, which is a sub-category of licensed use
- estimated number and groundwater use from domestic and stock bores.

Information for the groundwater accounts is obtained from:

- the Victorian Water Register
- responses to requests for data to water corporations, DELWP and major users of groundwater
- hydrogeological information from selected groundwater monitoring sites
- estimated relationships between water use and hydrological data, which is produced by water supply system modelling
- water corporation groundwater statements and annual reports.

The Wimmera-Mallee groundwater basin includes the area covered by the Wimmera-Mallee WRP but incorporates groundwater data in the West Wimmera GMA and the South Australia-Victoria border zone. These areas are not included in the Wimmera-Mallee WRP area for the purpose of SDL calculations (see section 10.4 Annual determinations of groundwater permitted to be taken (BP 10.10) on page 117 for details).

17.2.3 Estimating evapotranspiration

Evapotranspiration estimates are provided as supplementary information in the accounts. Data used in the accounts are estimated by the SoilFlux model as the sum of transpiration by plants, evaporation from soil and open water surfaces, and evaporation from the wet surfaces of plants soon after rainfall.

SoilFlux is a one-dimensional water balance model. It requires many approximations and assumptions, which limit its accuracy. Major assumptions and limitations of the method used to derive the estimates of evapotranspiration include:

- not accounting for water applied by irrigation
- not allowing for changes in water storage (i.e. rises and falls in the water table and soil moisture) or lateral flow
- using land use information from 2009, which has been condensed from the Victorian Land Use Information System into 10 representative land use types to facilitate water balance modelling
- using one-kilometre gridded data for land use, geology, depth to groundwater and rainfall.

17.2.4 Victorian Water Register

The Victorian Water Register contains detailed water accounts. The Victorian Water Act requires records of all water entitlements to be recorded by the Victorian Water Register. The register is

the central source of information about surface and groundwater, and contains information on:

- bulk and environmental entitlements
- water shares (not applicable in the Wimmera-Mallee WRP area)
- water use registrations (not applicable in the Wimmera-Mallee WRP area)
- take and use licences
- works licences.

The register records details about:

- ownership
- changes in ownership
- entitlement characteristics including maximum volume
- allocations to entitlements (where relevant)
- use
- carryover.

The register's water entitlement records are reconciled quarterly and finalised at the end of each financial year.

17.3 Collecting data for the accounts

17.3.1 Bulk entitlements

Each holder of a bulk or environmental entitlement must prepare and implement a metering plan that is designed to collect the data necessary to determine that the holder has complied with entitlement conditions. Entitlement holders are required to report on the amount of water taken at each offtake point. The metering plans must be prepared in accordance with the Minister's Guidelines for the Development of Bulk Entitlement Metering Programs (DSE, 2009), including meeting the relevant national standards.

Entitlement holders are also required to keep records collected from the metering program and provide reports to the Minister upon request. Water corporations report on their take and use of water in their annual reports, which are tabled in Parliament. They are also required to include details of any non-compliance in these annual reports.

For example, GWMWater's audited annual report provides detailed reporting about water consumption, including compliance with the requirements of its bulk water entitlements (GWMWater, 2016).

17.3.2 Environmental entitlements

The Ministerial rules relating to the Victorian Environmental Water Holder, 2014 (Gov Gazette, 2014) require the VEWH to report each year on:

- the rights and entitlements in the Water Holdings at the end of the year
- water allocations made available
- changes in the Water Holdings
- the use of carryover
- water trading activity.

The VEWH annual report, which is also tabled in Parliament, contains comprehensive information about the use of environmental holdings in response to these requirements (see for example, the Victorian Environmental Water Holder Annual Report 2015-16 (VEWH, 2016)).

17.3.3 Take and use licences

Victoria's metering policy for non-urban water supplies (DEPI, 2014) includes:

Where a delegate issues, renews or approves the transfer of a licence to take water in a non-urban situation, the following conditions apply:

- a. *All new licences where the water taken under the licence is to be used for irrigation or commercial purposes must be metered.*
- b. *Existing licensed extraction sites must be metered if the licensed volume is –*
 - i. *10 megalitres or greater, for surface water, or*
 - ii. *20 megalitres or greater, for groundwater.*
- c. *The obligations in paragraph (a) and (b) 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:*
 - i. *Cost of metering can be shown to significantly outweigh the benefits*
 - ii. *Resource management objectives can still be achieved without impacting negatively on the resource, the environment or other users*
 - iii. *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 Federal water accounting and reporting requirements.*

The above requirements do not preclude a delegate from requiring more extensive metering.

This policy is implemented through the Minister's *Policies for Managing Take and Use Licences* (DELWP, 2014). Water corporations that provide non-urban supplies must prepare and implement metering action plans that comply with the Victorian Implementation Plan for the National Metering Standards for Non-urban Water Meters (see clause 7.4 of DEPI (2015)).

The Minister's Policies require details of all take and use licences to be recorded on the Victorian Water Register. Metered use is also recorded on the register.

17.3.4 Farm dams

No affordable method is available to measure the amount of water diverted from farm dams. There is no practicable way of metering (the mainly stock) use from these dams. The volume of water harvested by small dams is included in the Victorian Water Accounts. The volume is estimated based on the total volume of small catchment dams in a basin obtained from DELWP's Sustainable Diversions Limits project in 2002 and Flow Stressed Ranking Procedure project in 2005, and computer-based simulation modelling of the impact of small catchment dams on mean annual streamflow.

The estimated total water harvested by (or total impact of) small catchment dams in a basin are represented in the water balance as two separate components:

1. The estimated volume that owners extract from dams to supply their needs is accounted for as a diversion in the surface water balance. The volume extracted is based on the estimated capacity and assumed use of small catchment dams in a basin (dams are categorised as being for domestic and stock purposes or commercial and irrigation purposes based on their estimated size).
2. The estimated volume of evaporation from small catchment dams is accounted for as a loss

in the surface water balance. This volume is determined to be the difference between the estimated total water harvested (or total impact of) small catchment dams and the estimated volume extracted for use.

The method used to estimate the number and capacity of dams utilises outputs from aerial photography. The estimates of the number and volumes of the dams are imprecise and significant assumptions are required to convert estimates of take from the estimated volumes of the dams. These estimates are not sufficiently precise to provide accountable volumes of take.

17.3.5 Section 8 rights

The Victorian Water Accounts do not include estimates of the amount of water taken under the section 8 rights provisions of the Victorian Water Act, called basic rights in the Basin Plan. The most significant use under this category is by stock drinking from unfenced waterways. There is no practicable way of estimating the volume taken and, given the relatively small volumes likely to be involved, no attempt has been made to estimate this volume.

Similarly, the use of groundwater from domestic and stock bores is not known with any precision. Records are kept of the works licences required to construct a domestic and stock bore. However, these bores are not metered and there is no record of which bores are actively used.

The number of domestic and stock bores includes all bores on the groundwater management database that are not licensed bores and that are less than 30 years old. The volume of domestic and stock use is estimated by assuming each bore uses 2 ML per year (DELWP, 2016).

17.4 Information related to take

The best estimate of the total long-term annual average quantity of surface water taken that is measured and not measured in the Wimmera-Mallee WRP area is set out in [Table 17](#).

Table 17 – Surface sustainable diversion limits (SDL) and method used to quantify take in the Wimmera-Mallee WRP area(6)

Form of take	SDL (GL)	Method used to quantify take
Surface water		
Take from regulated rivers (excluding basic rights)	44	metered
Take from regulated rivers under basic rights	No estimate	No estimate
Take from watercourses that are not regulated rivers (excluding take under basic rights)	6	Measured
Take from watercourses that are not regulated rivers under basic rights	No estimate	No estimate
Take by runoff dams (excluding take under basic rights)	13	Estimated
Take by runoff dams under basic rights -	30	Estimated
Total Items (e) and (f)	43	n/a
Net take of water by commercial plantations	6	Estimated
Total surface water	99	51% measured, 49% estimated (by entitlement volume)

Notes:

1. Refer to section 13.3.1 Farm dams in the Wimmera-Mallee WRP area page 144 for details of method used to estimate farm dam take

GWMWater is responsible for ensuring meters comply with the requirements of the National Metering Standards for Non-urban Water Meters.

Measured take is determined in accordance with the metering plans of each bulk water entitlement. Measurement usually includes a combination of stream gauging and metering, depending on the physical water harvesting arrangements.

The best estimate of the total long-term annual average quantity of groundwater taken that is measured and not measured in the Wimmera-Mallee WRP area is set out in [Table 18](#).

Table 18 – Groundwater entitlements and method used to quantify take in the Wimmera-Mallee WRP area

MDBA Groundwater SDL Unit	SDL (ML)	Victorian groundwater management	Licensed volume (ML)	Domestic and stock (ML)
Sedimentary	190,700 ML less West Wimmera take	Murrayville GMA	9,634	214
		Wimmera-Mallee Groundwater Catchment (less Murrayville)	16,032	1,187
		Avoca Groundwater Catchment	1,169	60
Deep	20,000 ML	Murrayville GMA	0	0
		Wimmera-Mallee Groundwater Catchment	0	0
		Avoca Groundwater Catchment	0	0
Highlands	2,140 ML	Wimmera-Mallee Groundwater Catchment	886	65
		Avoca Groundwater Catchment	1,200	66
		Total volume measured (licensed)	28,921 (or 95%)	
		Total volume estimated (domestic & stock)		1,592 (or 5%)

Notes to table:

1. SDL and entitlement data in this table are sourced from [Table 6](#)

Victoria will incorporate WRP reporting requirements about actual take of water into the existing processes to prepare the annual Victorian Water Accounts. In this way data that is already collected and reported will be used for both purposes.

**BASIN
PLAN
10.44**

From **Table 17** the best estimate of the total long-term annual average quantity of surface water that is measured is 50 GL. The proportion measured is calculated by summing flows through metering points or gauging stations.

The proportion of take that is measured in accordance with agreed metering standards is 100%.

From **Table 17** the best estimate of the total long-term annual average quantity of surface water that is not measured is 48 GL. The proportion not measured is estimated by subtracting the proportion measured from total estimated take.

From **Table 18** the best estimate of the total long-term annual average quantity of groundwater that is measured is 80.1 GL.

The proportion of take that is measured in accordance with agreed metering standards is 100%.

From **Table 18** the best estimate of the total long-term annual average quantity of groundwater that is not measured is 2.2GL. The proportion not measured is estimated by subtracting the proportion measured from total estimated take.

17.5 Improving measuring

Stream gauges are maintained by water corporations and DELWP according to national standards. Meters are installed and maintained by water corporations according to national standards. Non-urban metering is being progressively upgraded consistent with the National Metering Standards for Non-urban Water Meters.

The Victorian Government has made the following commitments in *Water for Victoria* (actions 8.4 and 8.11) to improve water use information (DELWP, 2016):

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.

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.

These actions are ongoing and will be reported through *Water for Victoria* implementation progress reports.

**BASIN
PLAN
10.45(1)**

Victoria has committed to improve the quality and accuracy of monitoring data through investment in infrastructure upgrades and new technologies to receive more timely data.

**BASIN
PLAN
10.45(2)**

These actions, listed above, are ongoing.

17.6 Monitoring water resources

In relation to reporting obligations under section 13.14 of the Basin Plan, Schedule 12 lists 21 matters that states, the MDBA, the CEWH and the relevant Commonwealth department must report on, annually or five yearly. From this list, Basin states are required to report on 13 of the matters, and monitoring of water resources is relevant to only eight of these 13 matters (4, 8, 9, 10, 12, 14, 18 and 19). Four core matters require monitoring of water resources in order to report against them:

- Matter 8 – The achievement of environmental outcomes at an asset scale
- Matter 9 – The identification of environmental water and the monitoring of its use
- Matter 12 – Progress towards the water quality targets
- Matter 19 – Compliance with WRPs.

Table 19 describes the monitoring of water resources to be undertaken to meet the accreditation requirements of 10.46 BP.

Table 19 – Monitoring of water resources of the Wimmera-Mallee WRP area that will enable Victoria to fulfil its reporting obligations under section 13.14 (Accreditation table for clause 10.46 BP)

Matter	Relevant indicators	What will be reported	Monitoring to fulfil reporting obligations
8	Asset-scale indicators will be developed by Basin states following the development of objectives and targets for long-term watering plans and annual priorities using the Environmental Management Framework	Report on achievement of environmental outcomes at an asset scale as per indicators in the long-term watering plan	The monitoring to be undertaken is detailed in Chapter 8 of the long-term watering plan – Wimmera-Mallee
9	9.1 Volume of water that was available for the identification and accounting of HEW	Volume of HEW entitlements by SDL resource unit Carryover and forfeiture of HEW by SDL resource unit Volume of HEW used by SDL resource unit	The monitoring to be undertaken is that required for reporting purposes in VEWH annual reports
	9.2 Volume of planned environmental water that was available	There is no planned environmental water in the Wimmera-Mallee WRP area	N/A
	9.3 Purpose and consequences of environmental water use	This indicator has been excluded	N/A
12	12.1 Implementation of measures identified in Water Quality Management (WQM) plans (s10.33).	A summary of the implementation of measures set out in the WQM plan in each WRP area	The monitoring to be undertaken is detailed in the Water Quality Management Plan
	12.3 The number and severity of blue-green algae and blackwater events	An analysis of the frequency, duration and extent of blue-green algae and blackwater events	Blue-green algae monitoring to be undertaken by GMW and GWMWater as part of the Major Storages Operational Monitoring Program. Victoria does not currently monitor blue-green algae for recreational water quality unless notified of a possible problem (reactionary monitoring only)
19	The Authority does not propose reporting beyond the Statements of Assurance as agreed in the Implementation Agreement	Statement of Assurance	The monitoring to be undertaken is that required to measure compliance against the tasks under the Statement of Assurance. No additional monitoring is proposed





18.
**Risks to water
resources**



18.1 Commonwealth Water Act

The Commonwealth Water Act 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 basin water resources which arise from the taking 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 of which estimates about matters relating to basin water resources are made.

18.2 Basin Plan requirements

Consistent with the Commonwealth Water Act, Chapter 4 of the Basin Plan identifies potential risks to Basin water resources particularly to the condition and/or continued availability of water, and strategies to manage or address these risks. The risks identified include:

- insufficient water available for the environment
- water being of unsuitable quality for use
- poor health of water-dependent ecosystems.

The Basin Plan identifies that the consequences of these risks eventuating would be insufficient water of suitable quality being available:

- for consumptive and other economic uses
- to maintain social, cultural, Indigenous and other public benefit values.

Key mechanisms to manage risks identified in the Basin Plan:

- environmental watering plan
- water quality and salinity management plan
- water trading rules
- water resource planning and ensuring water resource plans:
 - are prepared having regard to identified risk management strategies (4.03) in the Basin Plan, based on best available knowledge and in consultation with relevant stakeholders and amended from time to time as necessary
 - promote a risk-based approach to water resource planning and management
 - manage flows to optimise outcomes across the range of water uses (or what Victoria terms 'shared benefits')
 - ensure effective monitoring and evaluation of Basin Plan implementation
 - promote and enforce compliance with the Basin Plan and water resource plans
 - continuously improving knowledge of water requirements including for environmental watering, social, spiritual and cultural uses of water by Aboriginal people, the impact of climate change, water required to deliver social and economic benefits to Basin communities
 - improve knowledge of the impact on water resources of interception activities and land use changes, floodplain harvesting, peri-urban and industrial take and climate change
- increased knowledge of ground and surface water resources including through improved measurement, improved understanding of the causes of water quality degradation and the effects of water quality on environmental assets and ecosystem functions.

18.3 Water resource plan requirements

Chapter 10 of the Basin Plan requires states to have regard to risks to the condition and continued availability of water resources when preparing WRPs. The requirements for the risk assessment, described in the Basin Plan, cover a mix of primary causes, threatening processes and implications for beneficial uses. These requirements are set out in multiple cross-referenced provisions within the Basin Plan (see below).

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 (Basin Plan 10.41(1)).

A WRP must identify, list, assess and define the level of risk (high, medium or low), describe the data and methods used to assess the risk and describe quantified uncertainties. For medium and high risks, a WRP must describe the risks and the factors contributing to the risks as well as describing strategies to address them.

When preparing a WRP, Chapter 10 requires a water resource plan to have regard to the risks, strategies and guidelines from 'Chapter 4 – Identification and management of risks'.

The Basin Plan describes the requirements for determining risk. Under the provisions of the Basin Plan, the risk assessment must consider:

- risks relating to water condition and availability (10.41 (1)) for economic (4.02 (2) (a)), social, cultural, Indigenous and other public benefit values (4.02 (2) (b))
- risks that water will not be of a suitable quality for use (4.02 (1) (b)) including salinity (10.41 (2) (d))
- poor health of water-dependent ecosystems (4.02 (1) (c))
- risks to meeting environmental watering requirements (identified in Victoria's long-term watering plans) (10.41 (2) (a))
- risks to groundwater systems (including structural damage and groundwater/surface water connections) (10.20 (1) (a) and (b))
- risks from interception activities (10.23).

This subset of identified risks applies to the following (refer Appendix 2 for details):

- 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))
- risks arising from elevated salinity and other types of water quality degradation (10.31 and 10.41(2)(d))
- interception activities (10.23).

As required by the Basin Plan, a WRP must describe how the water resources of the WRP 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 events were included in the risk assessment, and management mechanisms are described in Chapter 12 of the WRP.

Under the Basin Plan, a WRP must identify the objectives and outcomes sought by Aboriginal people in relation to the management of water resources in the WRP area (10.52). Regard must be had to the social, spiritual and cultural values of Indigenous people and the uses of water resources for these purposes.

18.4 Victoria's approach to the risk assessment

18.4.1 Method

Victoria undertook a [preliminary] risk assessment in accordance with the requirements of the Basin Plan (Alluvium, 2016), as described above.

Risks were identified in terms of causes, threats and beneficial uses, whereby the beneficial use of water may be impacted by threats arising from various causes (see [Table 22](#) for more information).

The assessment examined risks in a consistent, structured and transparent way. Risks were assessed taking into account Victoria's comprehensive water management arrangements and influencing factors such as environmental management, land use planning and emergency management to determine the residual risks on identified beneficial uses.

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

- DELWP WRP risk assessment working group: comprising subject matter leads from within DELWP, with skills and responsibilities in fields of surface water policy, interception (farm dams and forestry), climate change, groundwater, water quality and drought. This group provided preliminary review and input to data, methods and project outputs before a review by the WRP risk assessment advisory panel.
- WRP risk assessment advisory panel: this panel was established to provide milestone review of the risk assessment. It consisted of representatives from DELWP, rural water corporations, CMAs, VicWater, MILDRIN and VEWH. 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.

This approach is consistent with international and national standards for risk assessment (AS/NZS ISO 31000:2009), with risk being assessed as the product of the likelihood and consequence of a threat impacting on an asset. Importantly, the method used for the assessment means it can be adapted easily to review and updated with new risks, changing conditions and improved information.

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

18.4.2 Temporal and spatial scale

The Basin Plan requires WRPs to address risks to the availability and condition of water resources in Victoria's WRP areas. For the purpose of this assessment, risks were assessed in terms of their scale of impact on the water resources and the beneficial uses of the WRP area. This scale of impact included explicit assessment of the magnitude, spatial extent and duration of impact within the WRP area over the life of the WRP plan (2019 to 2029) and beyond. This approach has enabled site-specific and broad-scale risks to be assessed, reflecting the issues within each WRP area.

18.4.3 Residual risks

The risk assessment was undertaken based on the regulatory framework, policy and strategies in place in Victoria in 2016. The assessment was based on the assumption that the Basin Plan is in place and that the Basin Plan does not in itself represent or impose a threat to the continued availability and condition of the water resources. The Basin Plan definitions have been adopted for this risk assessment and as a consequence the condition of the water resource includes not only water quality, but the health of water-dependent ecosystems.

Victoria's focus was therefore on identifying residual risks that would need to be addressed under the Water Resource Plan. Residual risks were identified as those that remained after existing management practices were applied. These management practices included existing regulations, Ministerial policies or programs. The assessment would therefore identify a plausible risk, but would be excluded from the final list of risks on the basis that arrangements were already in place to manage that risk into the future.

It is expected that some of the risks identified in this assessment might be considered before 2019, as the water resource plans are being prepared. In such instances, the residual risk set out in this preliminary assessment will require reassessment. Further information gathered through more detailed investigations and ongoing consultation, as part of WRP development, may also lead to a reassessment of risk. As a consequence, it is expected that the preliminary risk assessment will be updated and finalised in tandem with the finalisation of the WRPs.

Many of the risks identified through the risk assessment are expected to be addressed through ongoing management programs, policies and strategies. *Water for Victoria* was finalised after the preliminary risk assessment was completed, and it addresses many of the identified risks.

18.4.4 Priority environmental assets

The risk assessment is to include risks to meeting environmental watering requirements, identified in Victoria's long-term watering plans. Victoria has developed a Long Term Watering Plan for the WRP area. The priority environmental assets identified in Victoria's long-term watering plans are set out below and are the environmental watering assets assessed in this preliminary risk assessment.

Table 20 – Waterways in the Wimmera-Mallee WRP area

River	Type	Catchment	CMA	Terminates
Wimmera River	Regulated	Wimmera	Wimmera	Lakes Hindmarsh and Albacutya
Mount William Creek	Regulated	Wimmera	Wimmera	Lakes Hindmarsh and Albacutya
Mackenzie River	Regulated	Wimmera	Wimmera	Lakes Hindmarsh and Albacutya
Bungalally Creek	Regulated	Wimmera	Wimmera	Lakes Hindmarsh and Albacutya
Burnt Creek	Regulated	Wimmera	Wimmera	Lakes Hindmarsh and Albacutya
Outlet Creek	Unregulated	Wimmera	Wimmera	Lake Albacutya
Yarriambiack Creek	Regulated	Wimmera	Wimmera, Mallee	Lake Coorong
Avon-Richardson River	Unregulated	Avoca	North Central	Lake Buloke
Avoca River	Unregulated	Avoca	North Central	Kerang Lakes

Table 21 Wetlands in the Wimmera-Mallee WRP area

Wetland	Complex	Catchment	CMA
Barbers Swamp, Broom Tank, Bull Swamp, Carapugna, Challambra, Cherrip Swamp, Chiprick, Clinton Shire dam, Cokym bushland reserve, Considines on Tyrrell, Corack Dam, Coundons wetland, Creswick Dam, Cronomby Tanks, Crow Swamp, Davis Dam, D Smith, Falla Dam, Fieldings Dam, Goulds Reserve, Greens wetland, Homelea, J Ferrier Wetland, Jeffcott Wildlife Reserve, Jesse Swamp, John Ampt, Kath Smith Dam, Krong Swamp, Lake Danaher Bushland Reserve, Lake Marlbed (Towma), Mahoods Corner, Moreton Plains Reserve, Mutton Swamp, Opie's Dam, Pam Juergens Dam, Part of Gap Reserve, Paul Barclay, Pinedale, Poyner, R Ferriers Dam, Rickard Glenys Dam, Roselyn Wetland/Reids Dam, Round Swamp Bushland Reserve, Sawpit Swamp, Schultz/Koschitzke, Shannons Wayside, Tarkedia, Tchum Lake North, Wal Wal Swamp	Wimmera Mallee pipeline wetlands	Wimmera Mallee pipeline	Wimmera Mallee North Central
Beulah weir pool	-	Wimmera	Mallee
Avoca River marshes	-	Avoca	North Central
Lake Albacutya	Terminal lakes	Wimmera	Wimmera
Lake Hindmarsh	Terminal lakes	Wimmera	Wimmera

18.4.5 Risks in the Wimmera-Mallee WRP area

The Basin Plan requires WRPs to describe the data and methods used to identify and assess risk. The descriptions provided in the WRP and risk assessment report in Appendix 2 are considered to be adequate for the MDBA.

Risk levels, ranging from very low to very high, were determined as a product of likelihood and the consequence of a risk occurring. When assessing the consequence of the risk occurring, it was considered on a water resource plan scale rather than on a local scale.

A set of potential causes of risk were identified from the literature and through the engagement process. The causes identified (e.g. climate change) were 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 risk assessment included:

- 16 causes
- 13 threats
- 37 beneficial use categories.



Table 22 – Causes, threats and uses identified in the risk assessment for WRP areas

		
<p>An event (and specific scenario) that gives rise to or generates a threat. 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.</p>	<p>A threat is a deviation from the starting point that may affect beneficial uses.</p> <p>A deviation from the starting point includes:</p> <ul style="list-style-type: none"> • adverse changes in the volume or pattern of water • continuation or changes in water quality or ecosystems that renders them not fit-for- purpose. 	<p>The WRPs protect the ‘condition and continued availability’ of Basin water resources for beneficial uses, defined as the uses to which water resources are applied including environmental, consumptive, social and Indigenous.</p> <p>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.</p> <p>Isolated beneficial uses of local importance were not examined in the risk assessment.</p> <p>Beneficial uses have been assessed in terms of:</p> <ul style="list-style-type: none"> • consumptive uses • environmental uses • social uses • Indigenous uses.

		
<p>Causes considered in this assessment:</p> <ul style="list-style-type: none"> • bushfires • climate change • earth resource extraction • existing land use practices and waterway condition and use • extreme drought • extreme wet periods • farm dams • flooding and overbank inundation • increase in the number of rights and volume of entitlements • increased utilisation of water access rights • land use change (affecting availability) • land use change (affecting condition) • major asset failures • non-compliance with the Victorian Water Act • pest animals and weeds • point source discharges 	<p>Threats considered in this assessment:</p> <p>Availability</p> <ul style="list-style-type: none"> • Surface water <ul style="list-style-type: none"> - reduction in volume - changes to seasonal pattern - changes to the inter-annual pattern • Groundwater <ul style="list-style-type: none"> - decline in inflow to the aquifer - adverse change to the seasonal pattern of inflow to the aquifer <p>Condition of the (water) resource</p> <ul style="list-style-type: none"> • Water quality <ul style="list-style-type: none"> - elevated levels of salinity - elevated levels of suspended sediment and/or nutrients - elevated levels of toxicants (pesticides, herbicides, heavy metals, hydrocarbons) - pathogens (giardia, cyanobacteria) - other (water temperature, ph and/or dissolved oxygen) - Structural form - longitudinal connectivity - lateral connectivity - instream physical habitat 	<p>These beneficial uses have been assessed based on risk to:</p> <ul style="list-style-type: none"> • Surface water availability based on categories that define the legal entitlement or right to water • Groundwater availability based on categories that reflect the physical attributes of the aquifer from which water is derived • Water quality condition based on the State Environment Protection Policy (Vic.) beneficial use categories • Structural form of surface water resources based on categories that reflect priority assets – • wetlands and rivers • Structural form of aquifer

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 the purpose of 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 brief description of each adopted scenario within each WRP area is set out in the table below with further detail provided in Appendix E of Alluvium (2016). Criteria adopted for the selection of scenarios included:

- the probable scenario that produces the highest risk (e.g. extreme drought) and
- an extrapolation of past trends (e.g. farm dams, land use) or
- 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 WRP area (see [Table 23](#)) scale to ensure their relevance to the causes and threats that will potentially drive risks in each area.

Table 23 – Adopted scenarios for the Wimmera-Mallee WRP area

Cause	Consequence	Adopted scenario
Bushfires	Impacts on availability and condition of water resources arising from bushfires	Major fire during WRP period followed by significant flow event (based on worst known examples, including post 2005-06 Grampians bushfire)
Climate change	Likely to lead to reduced rainfall over south-eastern Australia, increased variability of rainfall and increased mean temperatures	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 the 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 outputs from Scenario B from the Western Region Sustainable Water Strategy (2011) and the Northern Region Sustainable Water Strategy (2009).

<p>Earth resource development</p>	<p>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)</p>	<p>The adopted scenario includes the following:</p> <ul style="list-style-type: none"> • Coal seam gas: No coal seam gas development in Victoria's WRP areas (there may also be effects on Victoria's groundwater resources due to gas development in NSW) • 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 facilities. • Open pit: Quarrying – 20% expansion of existing floodplain-based sand and gravel extractions (particularly in the Upper Goulburn river floodplain) with onsite disposal dams. Mineral sands – development in the Wimmera and Mallee.
<p>Existing land use practices and waterway condition and use</p>	<p>Failure to invest in best practice management: grazing, irrigation, cultivation, clearing, road and other infrastructure construction</p>	<p>Continuation of existing land and waterway management practice in the absence of ongoing support for existing strategies and management plans.</p>
<p>Extreme drought</p>	<p>An extended period of low rainfall resulting in severe, low water availability</p>	<p>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.</p>
<p>Extreme wet period</p>	<p>An extended period of above average rainfall, which may lead to rising groundwater levels and associated waterlogging and salinity threats</p>	<p>Wet period equivalent to late 1980s to early 1990s scaled to represent the rarity of a 1 in 100 year wet period. Scenario includes periods of low-flow (events) within the wet period.</p>
<p>Farm dams</p>	<p>Increased construction of farm dams to supply water for domestic and stock consumption</p>	<p>4 GL increase in the volume of small farm dams in rural-residential developments over 10 years.</p>
<p>Flooding and overbank inundation</p>	<p>Significant flooding can adversely impact on the condition of water resources</p>	<p>5% AEP event (or appropriate historical example).</p>

<p>Increase in the number of rights and volume of entitlements</p>	<p>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 (GMAs) or in GMAs where total entitlement volumes are lower than the Permissible Consumptive Volume</p>	<p>For surface water resources, the only plausible increase in rights or entitlements could be through domestic and stock use, excluding farm dams. Even a generous estimate of increase in these small entitlements would represent a negligible proportion of the overall unregulated licence pool. On this basis, this scenario has not been applied to surface water. 5% increase in unincorporated areas.</p>
<p>Increased utilisation of water access rights</p>	<p>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</p>	<p>2006-07 levels of demand occurs on two or more occasions and a 5% increase in domestic and stock bores.</p>
<p>Land use change (affecting availability)</p>	<p>In western Victoria, significant revegetation activity is being undertaken under the Wimmera Regional Salinity Action Plan (2005) to protect soils. Revegetation activity is also being undertaken under several other funding arrangements including vegetation and carbon offsets</p>	<p>Increase in catchment vegetation cover consistent with Wimmera Region Salinity Action Plan.</p>
<p>Land use change (affecting condition)</p>	<p>Conversion from grazing to cropping is likely to have a significant impact on runoff water quality in stream systems particularly in the western areas of the state In the Wimmera Mallee, the conversion of grazing land to cropping could generate some adverse impacts on the condition of the water resource This issue is not expected to have any measurable effect on groundwater recharge rates, and has therefore not been considered for groundwater WRPs</p>	<p>Conversion of 5% of grazing land to cropping.</p>
<p>Major asset failure</p>	<p>A catastrophic failure of major water harvesting and storage infrastructure</p>	<p>50% reduction in the available storage volume in Lake Bellfield over the period of the WRP.</p>
<p>Non-compliance with the Victorian Water Act</p>	<p>Includes the unauthorised take and/ or use of water or the constructing or altering of works without consent</p>	<p>5% illegal take and continuation of current level of unauthorised works on waterways.</p>

<p>Pests and weeds</p>	<p>Considers the impact of weeds such as willow colonisation of stream systems 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. Willow can lead to seasonal increases in Biological Oxygen Demand and decreases in dissolved oxygen levels. Willow 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</p>	<p>Adopt current level of willow extent. Adopt 25% increased level of carp.</p>
<p>Point source discharges</p>	<p>Point source discharges are assumed to be a continuation of existing licensed discharges, urban stormwater runoff, and accidental spills.</p> <p>Note: Point source discharges associated with mining are described under the 'earth resource development' cause.</p> <p>Point source discharges associated with irrigation drainage are assessed as a component of 'Land use practice'.</p>	<p>Continuing current practice consistent with existing strategies with the potential for small increase in sewage discharges.</p> <p>Other potential point source discharges include:</p> <ul style="list-style-type: none"> • Dairying (licensed and unlicensed discharges) • Stormwater in developing urban areas (not otherwise assessed in the risk assessment) • Fuel spill associated with a tanker accident on major rivers • Agricultural chemical spills • Failure of sewerage systems • Greywater discharge from Eildon houseboats. <p>In terms of groundwater, a leaking landfill site was assessed.</p>

18.4.6 Summary of risks

The identified risks need to include (but not be limited to) those specified in the Basin Plan. Victoria's risk assessment includes these risks and others identified through the risk identification process. The Basin Plan requires all the identified risks to be listed in the WRP (10.41 (4)). Such a listing has been provided as A1 size charts in the Appendices to the Risk Assessment report in Appendix 2.

Many thousands of potential risks are included in these charts. A hierarchical structure has been adopted to manage the analysis and management of these risks. Importantly, this hierarchal structure has not resulted in the arbitrary exclusion of risks. The approach adopted has enabled detailed analysis of specific risks and grouping of risks into themes that allows broad analysis of issues.

Surface water

A total of 114 consolidated risks were identified in the Wimmera Mallee surface water WRP area. Of these, 77 were identified to be of moderate to very high risk.

Threats to water availability

Surface water availability was assessed on the form of legal entitlement of beneficial users to the surface water. Due to this level of assessment, a large number of risks were identified.

It was found that climate change could activate threats related to a reduction in volume and/or change to seasonal pattern across:

- low reliability water and uncontrolled water for environmental purposes
- low reliability and section 51 licences for consumptive purposes
- recreational bulk entitlements for social purposes.

Extreme drought leading to a reduction in volume, change to seasonal pattern and/or changes to inter-annual pattern also generated high risks across low reliability, uncontrolled, section 51 and section 8 licences under the Act, and recreational bulk entitlements; while bushfires, land use change: availability, farm dams and major asset failure generate some medium level risks across environmental, consumptive and social uses.

Threats to water condition

Surface water condition assessments were based on the beneficial uses and users of water (based on Victoria's State Environmental Protection Policy).

The risk assessment found that climate change could activate threats related to salinity, suspended solids and nutrients, toxicants, pathogens and other water quality impacts which may pose a very high, high or medium risk to the consumptive use of water for human drinking, agricultural and irrigation, aquaculture, industry and commercial and fish/crustaceans consumption, and medium threats across the other beneficial consumptive uses. Release of toxicants also posed a very high risk to environmental use of water.

The risk assessment found that continuing existing land and waterway management practice in the absence of ongoing support for existing strategies and management plans would trigger very high threats of salinity across environmental beneficial uses and several consumptive beneficial uses.

High risks were recorded across the causes of extreme drought, extreme wet and pests and weeds.

Threats to social (recreational and amenity) and Aboriginal uses – water condition and availability

Risks to recreational and amenity and Aboriginal cultural values were assessed in terms of the risks associated to the condition and quality of water available for these purposes, and the availability of water for these functions. The social, 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 which is why a large number of risks have been generated as high at this stage in the risk assessment.

Climate change generated very high risks associated with impacts on Aboriginal cultural uses of water with regard to:

- reduction in volume
- change to seasonal pattern
- salinity

- suspended solids and nutrients
- toxicants
- other water quality impacts
- loss or decline in longitudinal connectivity
- loss or decline in lateral connectivity
- loss or decline in instream physical habitat.

Climate change and extreme drought also posed medium or high risks to recreational and amenity uses due to threats associated with declines in water availability and changes to seasonal patterns of inflows with regard to climate change only.

Threats to rivers and wetlands (structural form – waterway biota)

Climate change generated high and very high risks with regard to waterway biota in rivers and wetlands including:

- loss or decline in longitudinal connectivity
- loss or decline in lateral connectivity
- loss or decline in instream physical habitat.

Extreme drought generated some high level risks, while extreme wet, flooding and overbanking inundation, existing land use practices and pests and weeds were also assessed as having the potential to generate medium level threats to waterway biota in rivers and wetlands.

A note on uncertainty

To understand and assess the WRP and the risk assessment against Basin Plan requirements, there is also a requirement for the WRP 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, including the risk register.

The approach adopted for the risk assessment provides for the quantification of uncertainty for each assessment of probability, susceptibility and sensitivity. As such the approach provides for an explicit assessment of uncertainty for every individual risk (i.e. each and every individual combination of cause, threat and beneficial use). This treatment of uncertainty is not only required under the Basin Plan, but also enables the effective management of risk.

The causes of risks to the availability and condition of water resources together with a description of the risks, the estimated level of the risk and the level of confidence in the estimate and the strategies in place to mitigate the risk are set out in [Table 24](#).

Groundwater

For the Wimmera Mallee groundwater WRP area, 66 consolidated risks were identified. Of these, 29 were identified to be of moderate to very high risk. Causes associated with the high occurrence of these moderate to very high risks were:

- climate change – very high risk
- land use change: condition.

Threats to water availability

Groundwater availability was assessed on the biophysical attributes of the aquifer. The risk assessment found that climate change could cause medium to very high level risks across the availability of water for environmental and consumptive uses, with the exposure to risk depending on individual aquifers. Drought also generated a number of medium risk areas.

It was found that climate change could activate threats related to:

- a decline in inflows to or increased extraction of water from the aquifer
- adverse changes to the seasonal pattern of inflow or extraction
- increased salinity affecting water availability for consumptive uses.

Threats to water condition

Groundwater condition assessments were based on the beneficial uses and users of water (based on Victoria's State Environmental Protection Policy).

The risk assessment found that climate change could activate threats related to increased salinity which poses very high risk across a variety of consumptive uses.

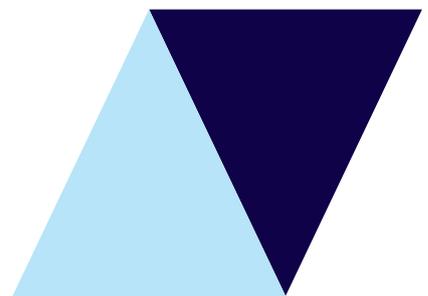
The risk assessment also found that land use changes within the WRP area had the potential to impact on some consumptive uses generating medium range threats related to increasing salinity and the potential release of toxicants into aquifers.

Threats to water condition and availability – social (recreational and amenity) and Aboriginal uses

Risks to recreational and amenity and Aboriginal cultural values were assessed in terms of the risks associated to the condition or quality of water available and the availability of water for these functions. The social, environmental and consumptive uses of water are relatively well understood as water resource planning concepts. However, Aboriginal use or value of water is not as well understood, contributing to the large number of risks generated at this stage in the risk assessment.

Climate change generated very high risks associated with impacts on Aboriginal cultural uses of water, followed by land use changes affecting water condition, and threats generated from earth resource development which were assessed as high risks.

Climate change also posed medium risks with regard to recreational and amenity uses due to threats associated with declines in water availability and changes to seasonal patterns of inflows to or extraction from aquifers.



18.4.7 Addressing risks

In addressing the risks, the WRPs must describe the risks and the factors contributing to those risks. The section above clearly describes the causes, activated threats and stress test scenarios. Adequate information must be, and has been, captured in the data gathering process to enable the development of a description of the risks and the factors contributing to the risks. The risks and factors contributing to these risks and the assumptions underlying the risk assessment were set out in the risk assessment report and an accompanying risk register (Alluvium 2016).

Under Victorian legislation there is no one 'water resource plan'. Rather, risk-based water resource planning is undertaken through a range of processes, plans and strategies, many of which embed risk management practices.

The causes of medium, high and very high risks need to be addressed in the WRP plan prepared for the area. For the Wimmera Mallee, this includes:

- bushfire
- climate change
- earth resource development
- existing land use practice
- extreme drought
- extreme wet
- farm dams
- flooding and overbank inundation
- increased utilisation of water access rights
- land use change (impacts on availability and condition)
- major asset failure
- non-compliance with the Victorian Water Act
- pests and weeds.

The causes of risks to the availability and condition of water resources together with a description of the risks, the estimated level of each risk and the level of confidence in the estimate and strategies in place to mitigate each risk are set out in [Table 24](#).

The table simplifies the detailed analysis provided in the risk assessment report (Alluvium, 2016) by aggregating sub-categories of threats and consequences. It shows the highest level of identified risk and the associated highest level of activated threat/s related to a particular cause for both surface water and groundwater.

The assessed level of risk assumes that existing legislation and management practices are in place, but that no future mitigation strategies (such as those introduced in *Water for Victoria*) are in place. As indicated by [Table 24](#), mitigation strategies/measures are in place for the causes of very high, high and medium risks.

Identified medium, high and very high risks are managed in Victoria through various mechanisms commensurate to their risk level. Risks are managed through a combination of long-term water resource planning, water allocation, land use/catchment management planning, environmental protection policies and enforcement provisions.

Table 24 – Results of the risk assessment for the Wimmera-Mallee WRP area (see Appendix 2 for detail)

A	B	C			D		
		Surface water Highest level of risk			Groundwater Highest level of risk		
Cause	Highest activated threat	Availability	Condition	Structural form priority environmental assets	Availability	Condition	Strategies for addressing risk
Bushfires	Availability: <ul style="list-style-type: none"> • Reduction in volume • Condition: • Other water quality impacts – temperature, pH and/or dissolved oxygen 	Moderate	Moderate	N/A	N/A	N/A	Statement of Obligations Urban water strategies (see section 12.2.3, page 132) Drought response plans (see section 12.3, page 134) 5-1 Managing risks (e.g. GWMWater, Coliban Water, Wannon Water and Central Highlands Water risk management strategies) 5-2 Managing incidents and emergencies (e.g. GWMWater, Coliban Water, Wannon Water and Central Highlands Water Emergency Management Plan)

A	B	C				D	
		Surface water Highest level of risk			Groundwater Highest level of risk		
Cause	Highest activated threat	Availability	Condition	Structural form priority environmental assets	Availability	Condition	Strategies for addressing risk
Climate change	<p>Availability:</p> <ul style="list-style-type: none"> Reduction in volume Change to seasonal pattern Decline in inflow to, or increase in extraction from, aquifer (GW) Adverse change to the seasonal pattern of inflow to, or extraction from, aquifer (GW) <p>Condition:</p> <ul style="list-style-type: none"> Salinity Toxicants Other water quality impacts – temperature, pH and/or dissolved oxygen <p>Structural form priority environmental assets:</p> <ul style="list-style-type: none"> loss or decline in longitudinal connectivity loss or decline in lateral connectivity loss or decline in instream physical habitat 	Very high	Very high	Very high	Very high	Very high	<p>Western Region SWS 2012 (see section 12.2.1, page 131)</p> <p>Victorian Waterway Management Strategy (see section 15.2.2, page 161)</p> <p>Wimmera, Mallee and North Central Waterway Strategies 2014-2022 (see section 15.2.3, page 162)</p> <p>Long-term water resource assessments (see section 12.2.2, page 131)</p> <p>Action 2.2 and Action 2.3 of <i>Water for Victoria</i> regarding the application of climate science to water management and climate change adaptation across the water sector (see section 12.2, page 131)</p> <p>Statement of Obligations (see section 12.3, page 134)</p> <p>6-A Modelling for Climate Change and Supply Forecasting</p> <p>6-1 Urban water strategies (e.g. GWMWater Water Supply Demand Strategy)</p> <p>6-5.1(c) Contingency plans for managing severe water shortages</p> <p><i>Our Catchments, Our Communities</i> (DELWP, 2016e)</p> <p>Wimmera, Mallee and North Central RCS 2013-19 (see section 16.2.3, page 175)</p> <p>Basin Salinity Management 2030 (see Appendix 1, section 2.2, page 265)</p>

A	B	C			D		
		Surface water Highest level of risk			Groundwater Highest level of risk		
Cause	Highest activated threat	Availability	Condition	Structural form priority environmental assets	Availability	Condition	Strategies for addressing risk
Earth resource development	Condition: Toxicants	N/A	Moderate	N/A	N/A	N/A	Environmental assessment and licensing legislation and regulations (see section 15.2, page 157) Licence and Work Authority (<i>Mineral Resources (Sustainable Development) Act 1990</i>)
Existing land use practice	Condition: Salinity Structural form priority environmental assets: loss or decline in longitudinal connectivity loss or decline in lateral connectivity loss or decline in instream physical habitat	N/A	Very high	Moderate	N/A	N/A	Basin Salinity Management 2030 (see Appendix 1, section 2.2, page 265) SEPP (WoV) (see section 16.2, page 173) Wimmera, Mallee and North Central Regional Catchment Strategies (see section 16.2.3, page 175) Victorian Planning Provisions (see section 13.2.2, page 141)
Extreme drought	Availability: Reduction in volume Change to the inter-annual pattern Condition: Salinity Toxicants	High	High	High	N/A	N/A	Statement of Obligations (see section 12.3, page 134) 6-4 Drought response plans for urban systems (e.g. GWMWater DRP) 6-5.1(c) Contingency plans for managing severe water shortages Wimmera, Mallee and North Central Waterway Strategies (see section 15.2.3, page 162) Wimmera River and W-M Pipeline Wetlands environmental watering proposals (see section 15.2, page 157) Emergency management plans (see section 12.5, page 136)

A	B	C				D	
		Surface water Highest level of risk			Groundwater Highest level of risk		Strategies for addressing risk
Cause	Highest activated threat	Availability	Condition	Structural form priority environmental assets	Availability	Condition	
Extreme wet	Condition: Salinity	N/A	High	Moderate	N/A	N/A	Wimmera, Mallee and North Central Regional Catchment Strategies (see section 16.2.3, page 175) Basin Salinity Management 2030 (see Appendix 1, section 2.2, page 265) North Central Regional Sustainable Agriculture Strategy 2016 (NCCMA, 2015)
Farm dams	Availability: Reduction in volume Condition: Salinity Suspended solids and nutrients	Moderate	Moderate	N/A	N/A	N/A	Victorian Planning Provisions (see section 13.2.2, page 141) Western Region SWS 2012 (see section 12.2.1, page 131)
Flooding and overbank inundation	Structural form priority environmental assets: loss or decline in instream physical habitat	N/A	N/A	Moderate	N/A	N/A	Victorian Floodplain Management Strategy (DELWP, 2016) Wimmera, Mallee and North Central Floodplain Management Strategies (see section 6.3, page 61)
Increased utilisation of water access rights	Condition: Suspended solids and nutrients	N/A	Moderate	N/A	N/A	N/A	Victorian water entitlement framework (see section 7, page 67) Enforcement provision of the Victorian Water Act

A	B	C				D	
		Surface water Highest level of risk			Groundwater Highest level of risk		
Cause	Highest activated threat	Availability	Condition	Structural form priority environmental assets	Availability	Condition	Strategies for addressing risk
Land use change	Availability: Reduction in volume Condition: Salinity Salinity (G/W) Toxicants (G/W)	Moderate	Moderate	N/A	N/A	Moderate	Wimmera, Mallee and North Central Regional Catchment Strategies (see section 16.2.3, page 175) Basin Salinity Management 2030 (see Appendix 1, section 2.2, page 265) Victorian Planning Provisions (see section 13.2.2, page 141)
Major asset failure	Availability: Reduction in volume Change to seasonal pattern Condition: Other water quality impacts – temperature, pH and/or dissolved oxygen	Moderate	Moderate	Moderate	N/A	N/A	Strategic Framework for Dam Safety Regulation (DSE, 2012) Statement of Obligations (see section 12.3, page 134) 5-3 Dam Safety
Non-compliance with the Victorian Water Act	Condition: Suspended solids and nutrients	N/A	Moderate	N/A	N/A	N/A	Enforcement provision of the Victorian Water Act
Pests and weeds	Condition: Suspended solids and nutrients Structural form priority environmental assets: Loss or decline in longitudinal connectivity loss or decline in instream physical habitat	N/A	High	Moderate	N/A	N/A	Wimmera, Mallee and North Central Regional Catchment Strategies (see section 16.2.3, page 175) Wimmera and Mallee CMA's Invasive Plant and Animal Management Strategy 2010-15 (see section 6.3, page 61)

Addressing risks to Aboriginal Values

The risk assessment showed that the availability (or lack thereof) of water for Aboriginal cultural uses had significantly more risks than any other beneficial use. One reason for this is that, in all cases, there was very limited information to determine how Aboriginal uses of water might be affected by changes in water resources. For example, Aboriginal uses of water may be affected by salinity, pathogens or changes in surface water seasonality, but there was no information available on which to base this relationship. As a consequence, Aboriginal uses of water were assumed to have a very high sensitivity to any changes to surface water or groundwater.

The recently released *Water for Victoria* – Water Plan commits the Victorian Government to a number of specific actions to better recognise and understand Aboriginal values of water. These actions, which are scheduled to be completed by 2020, include:

Action 6.1 – Recognise Aboriginal values and objectives of water

The Government will invest \$4.7 million over four years to establish the Aboriginal Water Program, a statewide approach to incorporate Aboriginal values and expertise into water management. DELWP and the Aboriginal Water Reference Group will co-design the Aboriginal Water Program, which 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:

- ensure 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 6.4 – Build capacity to increase Aboriginal participation in water management

DELWP 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 ways of providing access to water and shared benefits.

For more information about Aboriginal water values and use and how this is being addressed through the development of *Water for Victoria*, see section 9.3 on [page 101](#).

- BASIN PLAN 10.41(4)** Column A of **Table 24** lists the risks identified for the purposes of subsection (1).
- BASIN PLAN 10.41(5)** Appendix 2 contains the risk assessment (Alluvium 2016) and accompanying risk register.
- BASIN PLAN 10.41(6)** Column C in **Table 24** defines the level of risk for each risk.
- BASIN PLAN 10.41(7)** Appendix 2 contains the risk assessment (Alluvium 2016) containing the description of the data and methods used to identify and assess the risks.
- BASIN PLAN 10.41(8)** Appendix 2 contains the risk assessment (Alluvium 2016) containing any quantified uncertainties and the results of any sensitivity analysis.
- BASIN PLAN 10.42** (a) Appendix 2 contains the risk assessment (Alluvium 2016) describing each of the risks that have been identified in Column A of Table 24 and defined as having a medium or higher level of risk in Column C of **Table 24**.
- (b) Column C of **Table 24** describes each risk with a medium or high level of risk and Column B describes the factors contributing to those risks.
- BASIN PLAN 10.43(1)** Appendix 2 contains the risk assessment (Alluvium 2016) describing the Victoria’s relevant strategies to address the risk.
- BASIN PLAN 10.31** Column C in **Table 24** identifies risks related to the condition (quality) of water resources. Column D describes the strategies for management of identified risks.



19.
**Water Resource
Plan review
process**



Taylors Lake boat ramp by 55chris.

Part or all of this WRP will be reviewed where the following have a material effect on it:

- legislative changes to the Victorian Water Act
- changes to policy or the Victorian framework to respond to emerging water management issues
- preparation for developing a new WRP.

**BASIN
PLAN**

10.47&48

Where the responsible Victorian Minister requests a review of this Plan, Victoria will provide to the Murray-Darling Basin Authority:

- the report of the review within 30 days of the report being finalised
- where the review results in recommendations for changes to the Plan, reasons for any amendments to the Plan in writing.

If the review requires amendments to the WRP, the responsible Minister must undertake the following consultation in developing the changes:

- For small or technical changes (for example, updating references or correcting errors), the Minister (or DELWP) will consult key water industry stakeholders and publish notification of the changes on the DELWP and water authority websites;
- Where changes are made to instruments made under Victorian law that are identified in the WRP, the statutory processes for consultation under the Victorian Water Act or the *Subordinate Legislation Act 1994* will be complied with;
- Where substantive (not small or technical) changes are made to the text of the WRP, at least 28 days of public consultation will occur, where the Minister considers that there has not been sufficient consultation on a matter to which the amendment relates. This public consultation will allow for submissions to be made on the changes before seeking accreditation from the Commonwealth Minister for Water for the proposed amendments.

The accreditation process under section 65 of the Commonwealth Water Act applies to changes to the WRP except those identified in regulations made under section 66 of that Act.