Review of the Water Allocation Plan for the Western Mount Lofty Ranges

May 2024

LANDSCAPE SOUTH AUSTRALIA HILLS AND FLEURIEU

Report prepared by the Hills and Fleurieu Landscape Board, in collaboration with the Department for Environment and Water, Green Adelaide and the Northern and Yorke Landscape Board.

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How to navigate this document

This report summarises the work undertaken throughout 2022-2023 for the comprehensive 10-year review of the Western Mount Lofty Ranges (WMLR) Water Allocation Plan (WAP).

Part One of this report addresses the legislative requirements for the comprehensive WAP review, including an assessment of the success of the plan and whether it remains appropriate moving forward.

Part Two of this report details the technical investigations underpinning the review, including; status of water resources, ecosystems and allocation and use. Findings from community and stakeholder engagement are also detailed here.

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Abbreviations

BCG	Biological Condition Gradient
BoM	Bureau of Meteorology
CMCM	Contemporary Macroinvertebrate Condition Model
CRP	Current Recommended Practice
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEW	Department of Environment and Water
DEWNR	Department of Environment, Water and Natural Resources
EMLR	Eastern Mount Lofty Ranges
EWPs	Environmental Water Provisions
EWR	Environmental Water Requirements
GIS	Geographic Information System
HFLB	Hills and Fleurieu Landscape Board
IPCC	Intergovernmental Panel on Climate Change
LFRs	Low Flow Releases
LiDAR	Light Detection and Ranging
NARCliM	New South Wales and Australian Regional Climate Modelling
MERI	Monitoring, Evaluation, Reporting and Improvement
PDI	Planning Development and Infrastructure
PIRSA	Department of Primary Industries and Regions
PWRA	Prescribed Water Resources Area
SAFPA	South Australian Forest Products Association
SARDI	South Australian Research and Development Institute
SDLAM	Sustainable Diversion Limit Adjustment Mechanism
SWMZ	Surface Water Management Zone
S&D	Stock and Domestic
UWMZ	Underground Water Management Zones
WAP	Water Allocation Plan
WMLR	Western Mount Lofty Ranges
WRP	Water Resource Plan

Definitions

Allocation: The total volume of water allocated to licence holders each year. Also 'water allocation'. Allocation figures listed in Table 5 are given both excluding the SA Water allocation volume and including that allocation volume, for the five catchments which contain public water supply reservoirs. Where a surface water allocation is associated with a dam, the allocation volume is not necessarily the total volume of the dam.

Amendment: In the context of this report, refers to a Water Allocation Plan (WAP) amendment process which follows the comprehensive review of a WAP and involves the development of new WAP policies.

Aquifer: A permeable zone of rock or sediment in which underground water is stored and moves.

Catchment: The area of land determined by topographic features within which rainfall contributes to runoff at a particular point. For example, the Onkaparinga River Catchment encompasses all the land area that contributes surface water runoff to the Onkaparinga River.

Environmental water provisions: The WMLR WAP defines environmental water provisions to mean '*those parts of environmental water requirements that can be met at any given time, with consideration of existing users' rights and social and economic impacts*'.

Environmental water requirements: The Landscape SA Act defines environmental water requirements as '*those water requirements that must be met in order to sustain the ecological values of ecosystems that depend on the water resource, including their processes and biodiversity, at a low level of risk*'.

Existing user process: The process for issuing licences to existing users, independent to the process of developing the WAP.

Existing user: In the WMLR Prescribed Area, an existing user is a person who:

- took water at any time during the period 1 July 2001 to 13 October 2004 (inclusive); or
- needs water for a development, project or undertaking to which they were legally committed or in respect of which they had, in the opinion of the Minister for Sustainability, Environment and Conservation (the Minister), committed significant financial or other resources between 1 July 2001 and 13 October 2004; and
- applied for a water licence on or before 20 April 2006.

Extraction limit (also, 'take limit', 'WAP limit', 'sustainable extraction limit'): The limit set out in the WAP for a sustainable level of annual take from surface water and groundwater resources, set at the management zone level.

Flow regime: The flow regime is the flow pattern seen in rivers, streams and wetlands, and has the basic components; magnitude, frequency, duration and timing.

Forestry: In this context means tree plantations grown or maintained for commercial purposes. The figures listed within the 'Forestry' column in Table 5 refer to the estimated water use volumes calculated for commercial forestry across the PWRA at the time of developing the WMLR WAP. Commercial forests are not irrigated, but are significant users of water through their interception of surface water run-off and absorption of groundwater. The figures in Table 5 reflect only the surface water usage element.

Groundwater level: The distance from the natural ground surface to the underground water surface.

Groundwater management zone (GWMZ): The eight catchments in the Prescribed Area are divided into underground water management zones for the purposes of managing the taking and use of underground water. The boundaries of underground water management zones are based on surface water sub-catchment boundaries and hydrogeology.

Groundwater resources: Water occurring naturally below ground level in aquifers, or water pumped, diverted or released into a well for storage underground.

High demand zones: Zones where the volumes of total allowable use, which includes estimated volumes of non-licensed water use and the total volume of water allocations exceeds the WAP limits for the zone.

Licenced water uses: Require an allocation and includes irrigation of pastures or crops, industry use (eg mining), intensive animal raising and public water supply from reservoirs.

Macroinvertebrate: Aquatic 'waterbugs' that you can see without using a microscope that live part or all of their lives in water - such as yabbies, dragonfly larvae or native shrimp.

Metered water use: Some water uses are required to be metered, including all licenced groundwater use and a small proportion of licenced surface water use (from dams or watercourse pumping). Water used for non-licenced purposes is not required to be metered, and estimates are used instead.

Millennium drought (also, 'the drought'): The drought across south east Australia from 1997 to 2009, which devastated communities, industries and the environment.

Non-licenced water uses: Do not require an allocation and includes water used for stock and domestic purposes and water that is naturally intercepted by forestry plantations (not via direct irrigation).

Resource capacity: Resource capacity is sometimes referred to as the long-term average size of the 'bucket' for total water availability. In the case of the WMLR WAP, surface water resource capacity was calculated based on long-term average rainfall and streamflow data for the years 1974-2006. The actual surface water volume available in any given year will be highly variable, and depend upon factors such as climate, water movement, land uses and land management and other demands. Resource capacity can be seen as the foundational figure of the WAP, from which all other subsequent limits and rules are calculated.

Review: in this context, refers to a WAP review, or comprehensive review as defined in section 54 the Landscape South Australia Act 2019.

Stock and domestic: The taking of water for watering stock (stock that are not subject to intensive farming) and/or domestic purposes (e.g. watering less than 0.4 hectare of garden, not used commercially). The figures shown in Table 5 for stock and domestic use were calculated by identifying the number of stock and domestic dams, estimating total dam storage volumes and establishing standard assumed use from all stock and domestic dams to be 30% of total dam volume. Estimates for stock and domestic use from watercourses are not defined in the WMLR WAP, and not included in Table 5.

Sub-catchment: An intermediary spatial scale used when managing or referring to surface water resources. A sub-catchment is smaller than a catchment, larger than a surface water management zone (SWMZ).

Surface water management zone (SWMZ): The finest scale of management adopted by the WAP for the purposes of establishing rules and limits. Surface water management zones have been developed on the basis of reach types: the confluence of reach types (with the exception of headwaters) has generally been used to define each surface water management zone.

Surface water resources: Water flowing over land after having fallen as rain and the water flowing in watercourses or held in dams and reservoirs is defined as a surface water resource for the purposes of the WMLR WAP.

Total allowable use: The maximum volume that could be used by all licence holders in a given year (including SA Water), plus the estimated figures for stock and domestic and forestry surface water use. This number remains constant in all years, because it reflects maximum allowable use and not actual use.

Total estimated use 2021-2022: The summed total of; metered use for 2021-2022 by those licence holders with meters installed, plus 'assumed use' by licence holders who do not have a meter, plus the standard estimated figures for non-licenced uses (stock and domestic and forestry uses). The only change to yearly 'total estimated use' from 'total allowable use' is the metered usage of those licence holders who are metered. There are very few surface water licence holders who have meters installed in the WMLR.

Water affecting activity (WAA): These are activities that can have adverse impacts on the health and condition of water resources, catchment hydrology, water users and ecosystems that depend on water resources. These water resources include watercourses, lakes or dams, floodplains, groundwater, springs, wetlands, waterholes and catchment landscapes. The relevant authority for a WAA could be the Landscape Board, or the Minister.

Water dependent ecosystems (WDE): Water dependent ecosystems include watercourses, riparian zones, wetlands, floodplains, swamps, estuaries and aquifer systems. These ecosystems have complex dependence on water availability and flow, and comprise an array of plant, animal and micro-organism communities

Executive Summary

The Water Allocation Plan (WAP) for the Western Mount Lofty Ranges (WMLR) Prescribed Water Resources Area (PWRA) was adopted in 2013 and provides rules for the management of watercourse water, surface water and groundwater resources. The *Landscape South Australia Act 2019* (the Act) requires a landscape board to review a WAP on a comprehensive basis at least once every ten years. This review began in 2022 and is supported by a range of technical investigations, alongside broad reaching community and stakeholder engagement.

The review of the WMLR WAP sought to answer two key questions;

> **Key question 1:** Has the WAP been successful in achieving the outcomes it set out to achieve?
>
> **Key question 2:** Does the WAP remain appropriate going forward or does it require amendment?

In answering these two key questions, the review largely takes the current WAP policies (and their underpinning information, approaches, etc.) as they stand, in order to assess whether they were effective and whether they remain appropriate. Where amendments are found to be required, it is during the amendment process, rather than this review process, that alternative policies and approaches are explored in full.

The WAP is a key component of the water planning arrangements for the Mount Lofty Ranges. These arrangements have been largely successful in:

- halting uncontrolled expansion of dam development and surface and ground water take,
- introducing a water licensing system, and
- regulating water affecting activities.

However, the level of achievement relating to the health of water dependent ecosystems has fallen well short of the outcomes sought to be achieved.

The review has found that amendments to the WAP policies are required to address gaps and limitations and to bring the science, policy and implementation approaches in line with contemporary information and community expectations. The principles of the WAP and the outcomes sought to be achieved through those principles depended upon the full implementation of supporting programs, which have not been implemented to the levels anticipated. Considerable amendments to the current plan are required to address the disconnect between the WAP policies themselves, the outcomes sought and the implementation of supporting programs.

The challenges relating to the management of surface water resources are far more complex and contentious than those relating to the management of groundwater resources.

The volume of total allowable use (full allocations and non-licensed use estimates, combined) exceeds the current WAP extraction limits for 63% of surface water zones and 29% of groundwater zones across the WMLR and there has not been a subsequent process to align allocations with extraction limits. The estimated volumes of use by non-licensed purposes (commercial forestry, stock and domestic use) also contribute to zones exceeding WAP extraction limits.

The surface water extraction limits in the WAP are currently set at 25% of resource capacity, which assumed full implementation of low flow releases. To date, only a small number of in-scope sites in the WMLR are passing low flows, significantly undermining the achievement of stated environmental objectives.

Modelling undertaken during development of the 2013 WMLR WAP showed that without implementing low flow releases, surface water extraction limits would need to be five times less (5% of resource capacity) to meet equivalent environmental objectives.

The stated environmental objectives of the WMLR WAP were developed using a combination of monitoring data and modelling approaches that drew upon information current at the time of developing the WAP. This

review has recognised opportunities for the stated environmental objectives, monitoring processes and methods used for evaluating condition and trend to be improved through new information and insights that are now available.

The review was supported by investigations undertaken to understand the status and condition of the resources, with key findings highlighted below:

- Detailed analysis of long-term annual, seasonal and monthly rainfall totals across the Mount Lofty Ranges highlights that the 1974-2006 baseline climate period adopted by the WAP no longer remains appropriate.
- Spring season rainfall has seen the greatest impact (predominantly in October) when comparing pre-Millennium drought years (1900-1996) to post-drought years (2009-2022). For example, post-drought median spring rainfall reduced by 28% in Gumeracha, compared to the pre-drought period.
- Since the onset of the drought, streamflow patterns have been altered to varying extents in the three catchments investigated. These changes in flow patterns were also observed between the WAP development and post-WAP development periods.
- Ecological monitoring data highlights declining trends in native fish populations and macroinvertebrate communities and provides evidence that the environmental objectives set out in the WAP have not been achieved.
- The ecological condition of monitoring sites is generally poorer to the north of the region, while sites in the Fleurieu Peninsula are generally in better condition.
- Long-term trends in groundwater (aquifer) levels for 10 zones with highest metered use showed aquifer levels to be generally stable. Salinity monitoring for these areas show generally stable long-term trends.

In addition to the above findings, the engagement undertaken with local community members and stakeholder bodies identified a number of areas where future efforts will need to be focussed, including; clear identification of environmental objectives (outcomes) through a process of community engagement, the basis for calculating environmental water requirements and low flow releases, management of non-licensed stock and domestic water use and commercial forestry water use, support for current licence holders through any changes to their entitlements and exploring how future policies can adapt to climate change and year-to-year variability.

The lands and waters of the WMLR PWRA includes parts of the traditional Country of the Kaurna, Peramangk, Ngarrindjeri and Ngadjuri nations. First Nations representatives expressed that any future amendment should enable First Nations people to participate fully in water planning and management processes, including First Nation representation in future advisory groups.

The engagement and investigations of the review have informed 'Focus Areas' that are required to develop new information, policies and approaches throughout the WAP amendment process and these are described in Section 4 of this report.

One of the most significant areas in which the current plan was found to require amendment is in relation to climate change. Amendment of the plan will need to consider sustainable extraction limits in the context of changing rainfall and run-off patterns, and updating policies to enable adaptive management of water resources in the future.

1 Introduction

1.1 The WAP area

The Western Mount Lofty Ranges (WMLR) WAP manages the water resources of the WMLR Prescribed Water Resources Area (PWRA) and the Little Para Proclaimed Watercourse. The WMLR PWRA covers an area of 2,750 km^2 and extends from Gawler in the north, to Middleton and across to Cape Jervis on the south coast, and includes four watercourses across the Adelaide Plains. The area encompasses some of the highest rainfall areas of the state, alongside rich soils and favourable conditions, making it a highly productive area for viticulture, forestry, horticulture and grazing. A number of townships in the prescribed area are experiencing rapid population growth due to their relative proximity to Adelaide and the sought-after lifestyles they afford residents.

The WMLR PWRA has been divided into eight catchments based on surface water catchment boundaries, displayed in Figure 1 on the following page:

- South Para River catchment
- Little Para River catchment
- River Torrens catchment
- Onkaparinga River catchment
- Willunga Basin catchment
- Myponga River catchment
- Hindmarsh and Inman rivers catchment
- Fleurieu Coastal catchment.

The WMLR PWRA also includes three watercourses that cross the Adelaide Plains to Gulf St Vincent:

- Gawler River – downstream of the junction of North Para River and South Para River
- River Torrens/Karrawirra Parri – downstream of Gorge Weir
- Onkaparinga River – downstream of Clarendon Weir.

These watercourses, together with the portion of Little Para Proclaimed Watercourse that is downstream of Little Para Reservoir, are referred to as the 'Watercourses Across the Plains'.

There are two types of aquifers in the WMRL PWRA: fractured rock aquifers and sedimentary aquifers. Fractured rock aquifers occur where groundwater is stored and moves through joints and fractures in the basement rocks. There are three main sedimentary groundwater systems within the WMLR PWRA: the Permian Sand, Tertiary limestone and Quaternary aquifers.

The area also includes the McLaren Vale Prescribed Wells Area (MV PWA). The MV PWA covers an area of approximately 320 km^2, with the Onkaparinga River forming part of the northern boundary, while much of the south-eastern boundary follows the ridge of the Sellicks Range. The surface water in the MV PWA is prescribed in the WMLR PWRA and is managed by the WMLR WAP. However, the groundwater of the MV PWA is currently managed by the WAP for the MV PWA, which was reviewed in 2022. The outcomes of that review are discussed in Section 4.1 of this report, including the recommendation for integrating the management of surface and groundwater water resources.

Figure 1, overleaf, displays the WMLR PWRA and the boundaries of surface water catchment areas, alongside major townships and rivers.

Figure 1 Western Mount Lofty Ranges (WMLR) Prescribed Water Resources Area (PWRA) and its catchment areas.

1.2 Legislative context

Sections 54(1) and 54(2) of the *Landscape South Australia Act 2019* (the Act) requires that a landscape board must review a WAP on a comprehensive basis at least once every ten years. This document summarises the comprehensive review of the *Water Allocation Plan for the Western Mount Lofty Ranges Prescribed Water Resources Area,* adopted in 2013.

Under s. 54(2) the purpose of a comprehensive review is to:

(a) provide a review of—

(i) the principles reflected in the plan; and

(ii) the success of the plan after taking into account the outcomes sought to be achieved by the water allocation plan; and

(b) provide an assessment of whether the water allocation plan remains appropriate or requires amendment.

(c) assess or address any other matter prescribed by the regulations.

Section 54 also provides that in undertaking a review, boards are to undertake such consultation as it determines to be reasonable, taking into account any regulations made pursuant to s. 54(5) or guidelines specified by the Minister pursuant to s. 54(4). While no such regulations or guidelines have been developed, general guidelines (DEW 2022) in relation to how landscape boards should engage with the community have been issued by the Minister, and consultation conducted for this review had regard to those guidelines.

For the purpose of Section 54 of The Act, the Hills and Fleurieu Landscape Board (the board) recognises its role as the *designated entity* in holding primary responsibility for the review of the WAP. It is further recognised that the work involved in preparing, implementing, reviewing and amending water allocation plans is underpinned by the collaborative efforts of the Government of South Australia's Department of Environment and Water (DEW) Water Science, Environmental Science, Data and Information, Water Policy, Water Licensing teams and relevant Landscape Boards who have a share of the prescribed areas.

1.3 Background of the WAP

The WAP is a major component of the water planning and management arrangements for the Mount Lofty Ranges. The establishment of these arrangements formally commenced in 2004 with the publication of Notices of Intent to Prescribe, and Notices of Prohibition. These arrangements have been successful in:

- halting uncontrolled expansion of dam development and water take,
- introducing a water licensing system, and
- Regulating water affecting activities.

These reforms were designed to:

- Greatly improve the water security of Adelaide's public water supply reservoirs.
- Protect water users from the impacts of additional upstream development and over-extraction of groundwater, and establish tradable rights to access water.

- Secure a portion of available water to maintain the health of water dependent ecosystems through halting further development to reduce the risk of further ecological degradation.

When the WMLR WAP was adopted in 2013, it was part of a significant transition from unregulated water use, to a regulated system with water licences and allocation limits. During this transition, water licences were issued to existing water users, through a separate but parallel process to developing the WAP. The allocation volumes on each licence were based on calculations for theoretical enterprise requirements[1], so that allocation volumes were roughly equivalent to existing (estimated) volumes of use. In many areas of the WMLR the allocation volumes granted exceed the sustainable extraction limits set out in the WAP and there has not been a subsequent process to align allocations with extraction limits. The estimated volumes of use by non-licensed purposes (commercial forestry, stock and domestic use) also contribute to zones exceeding WAP extraction limits.

The Act allows the Minister to reserve 'excess' water[2]. Normally excess water would be available for allocation to new users. However, as a precautionary measure it was decided that it was desirable to have a higher level of confidence in the sustainability of the WAP limits before releasing unallocated water. For surface water, the uncertainty was related to the participation rate and timeframe needed to secure low flow releases[3] (LFRs) from 'in-scope'[4] farm dams and watercourse diversions. In relation to groundwater, the reservation on excess water provided time to develop a higher level of confidence in WAP limits once several years of metering data for licenced use was available. Consequently, all 'excess' water was reserved at the time of adopting the WMLR WAP in 2013.

The WAP contains provisions that enables the Minister (in practice, the delegate) to refuse certain types of applications (including the construction of new dam capacity) if there is a reservation in place. The Medium Term Arrangements, a policy guideline developed by the then Department for Environment, Water and Natural Resources (DEWNR) in 2014, sets out the circumstances in which applications are to be refused pursuant to the reservation rules.

1.4 Review Approach

The *Guideline for Review of Water Allocation Plans – A risk based approach* (DEW 2022a, unpublished) summarises that the purpose of the comprehensive review process is to answer two key questions:

> **Key question 1:** Has the WAP (including its principles) been successful in achieving the outcomes it set out to achieve?
>
> **Key question 2:** Does the WAP remain appropriate going forward or does it require amendment?

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[1] Theoretical enterprise requirements were calculated based on the type and size of the enterprise (i.e. 10 hectares of grapevines) and applying a megalitre per hectare volume using the internationally recognised Food and Agricultural Organisation (FAO) methodology. The prescribed area was divided into climate zones to recognise differences in crop water needs

[2] After allocations have been granted to existing users, excess water is the remaining un-allocated portion below the WAP limit. Excess water does not exist for all zones.

[3] LFRs underpin the extraction limits set out in the WAP and were found through earlier investigations to enable a sustainable balance across the water needs of environments, communities and industries. See section 5.2.1 for more details on LFRs.

[4] 'In-scope' sites for the passing of LFRs are defined as all licensed dams (regardless of size), all non-licensed dams over 5ML in size and all licensed watercourse diversions.

Taking into account the challenges and learnings throughout the implementation of the WAP, as well as more recent development of best-practice water management approaches[5], there was compelling justification for the amendment of the WAP at the outset of the review process. The early acknowledgement of the need to amend the WAP enabled efforts during the 2023 review to directly contribute to an effective amendment process which would follow on from the review and take many years with its own consultation.

The overarching objective of the review was to evaluate the effectiveness of the WAP, its policies and supporting programs, to identify the focus areas for the amendment. Furthermore, the following considerations were critical in shaping the review approach:

- The engagement program was designed to build community trust and understanding in the science, policy and social drivers informing the WMLR WAP and allowed time for listening. A specific objective was to understand community and industry experiences with current policy and build community capacity to participate during the amendment process.
- Community engagement was implemented using a 'broad reach' approach so that many perspectives from communities, industries and stakeholders could be heard.
- Early targeted engagement conversations identified gaps in scientific understanding. Information about the trend and condition of the water resources was required to answer fundamental questions and inform broader discussions during community engagement.
- To avoid a prolonged amendment process, work commenced as soon as possible on the science and other inputs which can be reasonably anticipated as required (or those identified during the course of the review).

The Eastern Mount Lofty Ranges (EMLR) and WMLR WAPs were reviewed in parallel as they were both due for the legislated 10 year review at the same time, and are both presently within the care and control of the Hills and Fleurieu Landscape Board. Because the reviews of these two plans were undertaken concurrently, many of the investigations undertaken to support the reviews include data and information for both regions.

[5] An example is the 'unbundling' of the water licensing system in the MDBA to allow the conversion of one property right to a bundle of separate instruments.

Part One

- Success of the WAP in achieving its objectives
- Appropriateness of the WAP going forward
- Amendment Focus Areas

2 Success of the WAP in achieving its objectives

The review of the WAPs success and deficiencies has considered the outcomes sought to be achieved, the WAP principles themselves and the supporting programs intended to support the achievement of stated outcomes. In order to evaluate success and deficiencies, the stated outcomes, principles and programs are taken as they stand. It is during a subsequent amendment process that changes to these would be considered, rather than as part of this review.

Acknowledging that prior to the prescription of the WMLR PWRA, the use of water resources in the area was largely unregulated, it can be seen that the set of reforms that included the development of the WAP has achieved much. However, the level of achievement relating to the health of water dependent ecosystems has fallen well short of the outcomes sought to be achieved.

The principles of the WAP and the outcomes sought to be achieved through those principles depended upon the full implementation of supporting programs. The implementation of those supporting programs is below the level anticipated by the WAP and this has led to the stated environmental objectives not being fully achieved.

In relation to **surface water**, flow targets have not been met and the ecological health of watercourses continues to decline. The key implementation factors that have led to the decline are:

- the process of issuing allocations to existing users resulted in total allowable use volumes that exceed WAP extraction limits for many management zones,
- the program to manage high demand zones did not progress to the point of reducing allocations so that they aligned to WAP extraction limits,
- the WAP extraction limits for surface water were set at 25% or total resource capacity and assumed the full implementation of low flow releases in order for that extraction limit to be sustainable,
- low flow releases have largely not been implemented in the WMLR, as the level of funding able to be secured has only supported a small number of trial sites, and
- the ecological health of watercourses below the reservoirs is supported by environmental releases by SA Water under a program called Eflows. A recent evaluation of this program found that the overall objectives and program design require amendments.

Groundwater resources are generally in good health, and in nearly all management zones actual use is below the full allocation volumes. However, in many zones the allocation volumes significantly exceed the sustainable limits set by the WAP. This creates a future risk as the current rules allow use to expand to full allocation.

2.1 Introduction

It is a requirement of the Act to review the success of a WAP against the outcomes it sought to achieve and to provide a review of the principles reflected in the WAP. In addition to the outcomes and principles of the WAP itself, consideration has also been given to the supporting programs designed to enable implementation of the WAP.

This chapter focusses on the review of the WAP's success in achieving the stated outcomes. Appendix 1 of this report provides further details of the review of WAP principles and the supporting programs.

To assess the success and deficiencies of the WAP in achieving the stated outcomes, this chapter draws upon the following:

Technical Assessment of the Achievement of Current WAP Objectives.

The Objectives Assessment process assembled a panel of people with experience in the operation of the EMLR and WMLR WAPs and with expertise in ecology, hydrology, hydrogeology, licensing, administration of water affecting activities, policy, and water planning. Participants included officers from DEW, Hills and Fleurieu Landscape Board (HFLB) and neighbouring Landscape Boards. The process included two half-day workshops, with participants preparing input between the workshops. The panel systematically assessed the success in achieving the current objectives of the EMLR and WMLR WAPs.

Feedback from DEW Licensing and HFLB officers on the operation of WAP principles.

In order to identify if there were operational issues, or perverse outcomes from the administration of WAP principles, input was sought from officers who work daily with the WAP principles.

DEW technical reports.

Knowledge of the condition and trend of the water resources is underpinned by long term monitoring. A range of reports to analyse the long term monitoring data and results were commissioned for this review. The following reports supplemented the Technical Assessment of WAP Objectives, and have informed this review generally:

- *Impacts of changing rainfall patterns on the hydrology of the Mt Lofty Ranges* (DEW 2024a)
- *Hydro-ecological investigations to inform Water Allocation Plan reviews of the Eastern and Western Mount Lofty Ranges Prescribed Water Resource Areas*, (DEW 2024b)
- *Hills and Fleurieu Landscape Region PWRA ecological condition assessment 2022 (DEW 2024c)*
- *Western Mt Lofty Ranges Prescribed Water Resources Area - Groundwater resource assessment (DEW 2024d)*

Community and stakeholder engagement.

The engagement process consisted of multiple activities to gather diverse perspectives from a range of community and stakeholder groups about their experiences of WAP policy implementation over the last ten years. The feedback contributed to the evaluation of the WAPs effectiveness and informed development of future 'Focus Areas'.

2.2 Review of outcomes

The outcomes that the WAP seeks to achieve are set out in the Act and in the objectives of the WAP. There are 29 objectives in the WAP. There is a degree of overlap in many of the objectives, with some being more specific and others higher level. The following three overarching objectives summarise the overall intent of the WMLR WAP objectives:

- Allocate and use water resources sustainably.
- Maintain water-dependent ecosystems.
- Minimise the impact of the taking and use of water on prescribed water resources, other water resources, other water users and the environment.

To guide the review of outcomes, the overarching objectives described above, have been distilled into the following key components: the environment, consumptive water use, social water values and First Nations values. The components are interdependent and in combination they provide indications of the successes or deficiencies of the WAP. An analysis of each component is provided below.

2.2.1 Water for the environment

Successes

- The WAP together with the regulatory arrangements (prescription of the resource, licensing, Water Affecting Activity rules) and supporting programs (Medium Term Arrangements) have halted the expansion of dam development[6] and placed an upper limit on water take. The change has mitigated further risk of ecological degradation to the environment, noting that the interception of flows by dams is the recognised as a key source of impact from water resource development on water dependent ecosystems (AMLR NRM, 2013).
- The WAP identifies a balance between environmental and consumptive water needs by setting out Environmental Water Provisions (EWPs) which underpin the stated surface water extraction limits. While implementation to deliver EWPs has been incomplete, the existence of EWPs and extraction limits has provided an important framework for the implementation that has occurred (licensing, Low Flow Releases (LFRs), Medium Term Arrangements). The collective impact has been that a portion of the surface water resource is available for maintaining the health of water dependent ecosystems.
- DEW modelling shows that the level of implementation that has been achieved to date has decreased the overall level of risk to environmental objectives compared to pre-WAP development, when the effects of climate are excluded from the modelled scenarios (DEW, 2024b).
- Setting groundwater allocation limits coupled with the introduction of licensing have provided a framework for protecting groundwater dependent ecosystems (such as wetlands) and processes (such as baseflows in watercourses) from the risk of over use.

[6] No net increase to dam volumes have been approved whilst the reservation and Medium Term Arrangements have been in place. However, the board is aware that a number of dams have been illegally constructed since these rules have been in place and further investigations of those instances are underway.

- The regulation of Water Affecting Activities, including those relating to dam construction or modification, works in watercourses and construction of bores, has allowed for environmental risks to be mitigated at the individual activity scale.
- Monitoring programs undertaken throughout the WAP implementation period have enabled tracking of surface water flows, groundwater levels and salinity and ecological health.

Deficiencies

- The ecosystem condition assessment (DEW, 2024c – discussed in Section 5.3) shows that water dependent ecosystem conditions are generally in decline. At a number of fish monitoring sites there are species which were once recorded but have disappeared during the life of the monitoring program.
- DEW modelling shows that if the WAP had been fully implemented, the level of risk to environmental objectives would have been lower than with the current level of implementation for modelled scenarios (DEW, 2024b – discussed in Section 2.2)
- There has been a very limited implementation of LFRs in the WMLR as a result of insufficient funding, and this significantly undermines the ability for the stated environmental objectives in the WAP to be achieved (discussed further in Section 5.2.1).
- The current regulatory arrangements are not able to restrict the take of water for stock and domestic purposes from significant environmental assets (such as pumping from permanent pool refuges).
- The WAP and its supporting programs have not addressed high demand zones. Currently the total allowable use[7] exceeds the limits set in the WAP for 58% of surface water zones and 36% of groundwater zones.
- In groundwater zones where allocation is above the WAP limit, actual (metered) use is below or only slightly above limit. This means that currently the risk of aquifer degradation is low. However licensees are permitted to take their full allocation and the WAP does not contain a mechanism to limit future increases in use to within the limits, creating the potential for future risks to groundwater resources.
- While there has been considerable monitoring of the resources and ecosystems across the region, a formal Monitoring, Evaluation, Reporting and Improvement (MERI) plan was never developed to support the WAP, and this would have enabled strategic improvements to the existing monitoring programs. It is recognised that more data collection is needed to address gaps and improve representation for some parts of the region, for example within the Fleurieu Peninsula's streamflow monitoring network. Furthermore, funding of long term monitoring is vulnerable to short term budgetary constraints, or the conclusion of programs.

Discussion

The WAP, regulatory arrangements and supporting programs have established a framework which places limits on further development and within which implementation programs have been able to operate. The level of implementation of supporting programs has resulted in some reduction of risk to water dependent

[7] Total allowable use is the combined total of full allocation volumes held by licencee's, estimated use by non-licensed stock and domestic users and non-licensed forestry use.

ecosystems. However the degree to which these programs have been implemented is still well short of the level anticipated by the WAP. The health of water dependent ecosystems has generally continued to decline to the point where many are not only failing to meet the stated ecological targets and objectives but showing significant declines since WAP adoption.

Consequently the WAP, taken in context with the associated supporting programs, has not fully succeeded in relation to the environmental outcomes that it sought to achieve on a whole PWRA or whole of catchment scale.

2.2.2 Water for consumptive use (licenced and non-licenced)

Successes

- The process for issuing licences to existing uses where allocation volumes were based on theoretical enterprise requirements, meant that the introduction of controls did not require a decrease to the current levels of water use at that time
- The introduction of the water licensing system created a tradeable property right which created an asset for licensees and enabled trade of water.
- The WAP provides a level of protection to existing surface water licensees from inappropriate upstream development,
- The WAP provides a level of security to existing groundwater users by setting a limit on the volume of groundwater that may be extracted and a level of protection from interference caused by new wells being located too close to existing wells.
- The WAP has significantly improved the security of Adelaide's public water supply by preventing any further expansion in dam development in the reservoir catchments.

Deficiencies

- The WAP's trade and transfer rules are difficult to interpret and assess based on the feedback from water licensees and the DEW Water Licensing branch. The difficulties create a barrier to trade and impede the operation of a market which was intended to allow water demands to be met within the overall extraction limits.
- The Medium Term Arrangements were maintained throughout the WAP implementation period which prevented any allocation of new water or expansion of dam capacity within zones that are not fully allocated
- There have been a small number of reports to the board and DEW Water Licensing branch that some licence holders have not been able to access their full entitlements (largely from watercourse or surface water resources).

Discussion

The WAP, taken in context with the associated supporting programs, has been largely successful in relation to the consumptive use outcomes that it sought to achieve notwithstanding the deficiencies identified.

2.2.3 Water supporting social values

While WAP policies recognised that there needed to be a balance between environmental, social and economic needs, there were few if any policies specifically related to social values. Social values related to water planning tend to be closely linked to economic or environmental factors.

Economic factors that relate to social values include the employment and local economic activity generated by enterprises that rely on consumptive use of water. This in turn generates business for secondary enterprises that supply goods and services to water reliant enterprises and their employees, and leads to thriving local towns.

Environmental factors that relate to social values include the amenity value of natural habitats, and the host of ecological services which functioning environments provide.

Both the development of the WAP and the conduct of this review included extensive engagement with local communities.

Social values have been implicitly considered through the community engagement, and the linkages between social values and economic and environmental factors discussed above. However, recognising that it is a specific requirement of the Act for the balance of policies in a WAP to consider social needs, the WAP amendment process may choose to consider whether it is appropriate to explicitly consider social values.

2.2.4 First Nations Objectives

The WAP does not contain specific objectives relating to First Nations water values, and this has been recognised as an area which needs to be addressed (see Section 9 for further details).

2.3 Hydro-ecological modelling findings

DEW's Surface Water Science Team undertook hydrological modelling (DEW, 2024b) of various climate and WAP implementation scenarios to assess the effectiveness of:

I. policies and principles for surface water that underpin the environmental objectives of the WAPs i.e., what is expected to have happened if the WAPs were implemented as intended?

II. the actual implementation of the policies in meeting the WAP's environmental objectives i.e., what has happened given how the WAPs have been implemented?

The modelling was applied to three catchments which represent a range of climates, landscapes and extent of water policy implementation across the Eastern and Western Mount Lofty Ranges. The catchments are the Bremer in the Eastern MLR, the Carrickalinga in the Western MLR Fleurieu peninsula, and two sub-catchments of the Onkaparinga in the central hills area of the WMLR.

Overall, the modelling investigations found:

- The current extent of implementation of the key WAP rules decreases the overall level of risk to environmental objectives (i.e. likely improved environmental outcome) compared to pre-WAP development, when the effects of climate are excluded. However, this improvement is not sufficient to meet the catchment-scale flow objectives that underpin the WAP's environmental objectives.

- The climate experienced since the WAPs were developed has variable effects on the pattern of flow and hence on the level of risk to environmental objectives, increasing the risk for the majority of surface water management zones, but decreasing the risk for some zones.
- The combined effect of the current level of implementation and climate results in a small increase in the overall level of risk to environmental objectives since WAP development (i.e. likely poorer environmental outcome). For some zones, the benefits of current implementation are offset by negative effects of the climate experienced since WAP development on the pattern of flow.
- Full implementation of the key WAP rules would further reduce the level of risk to environmental objectives, compared to the current extent of implementation.
- However, the climate experienced since WAP development means that full implementation of the key WAP rules would not be as effective as intended in meeting the flow objective for 2 of the 3 modelled catchments.

These findings support a decision to amend the WAPs, in order to allow them to be more effective in meeting their environmental objectives for surface water, under the current and likely future climate. The findings also support the need for new environmental objectives to be determined so that they better reflect the current and likely future climate.

2.4 Conclusion

Acknowledging that prior to the prescription of the WMLR PWRA, the use of water resources in the area was largely unregulated, it can be seen that the set of reforms that included the development of the WAP has achieved much. However, the level of achievement relating to the health of water dependent ecosystems has fallen well short of the outcomes sought to be achieved. The principles of the WAP and the outcomes sought to be achieved through those principles, depended upon the full implementation of supporting programs. Namely, the delivery of LFRs and addressing high demand zones where total allowable use exceeds WAP extraction limits. The implementation of those supporting programs is below the level anticipated by the WAP and this has led to the stated environmental objectives not being achieved.

With the adoption of the WAP, there was a decision made to adopt the plans before:

- the development of a broad outline of how implementation would proceed, and
- commitments by the relevant agencies to that implementation – neither in principle, nor with commitment to resourcing.

The WAP relied on an ambitious implementation program for its policies to be successfully implemented. Had it been clear prior to the adoption of the WAP that the full implementation program would not be undertaken, then there would have been an opportunity to develop a different set of policies. That different set of policies would have required some difficult conversations about reducing the level of water take and adjusting targets for environmental sustainability.

Consequently it is recommended that the board adopts as a guiding principle for the WAP amendment process that:

- *Greater improvement can be achieved through a plan with an agreed implementation pathway, than to pursue an aspirational plan is not able to be implemented.*

- *The adoption of the WAPs must be accompanied by (and contingent upon) an implementation plan that is formally supported (including commitment to resourcing) by agencies responsible for implementation.*

The degree to which the WAP has fallen short in achieving its surface water objectives, and the obstacles to implementing the ambitious approach set out in the current WAP, means that the amendment process will need to consider the WAP policies, the outcomes sought and the supporting programs in their entirety in order to achieve any improvement in the way that surface water is managed in the Western Mount Lofty Ranges.

3 Appropriateness of the WAP going forward

The 2023 review of the WAP has found that it is not appropriate in its present form to effectively manage the water resources of the area going forward.

Amendments to the WAP policies are required to address gaps and limitations and to bring the science, policy and implementation approaches in line with contemporary information and community expectations. The principles of the WAP and the outcomes sought to be achieved through those principles depended upon the full implementation of supporting programs, which have not been implemented to the levels anticipated. Considerable amendments to the current plan are required to address the disconnect between the WAP policies themselves, the outcomes sought and the implementation of supporting programs.

Without an amendment taking place, the declining ecological conditions observed across the region are likely to continue, and the impacts of climate change would introduce new risks to the environment, people and industries that depend on the regions water resources.

Section 4 outlines a wide range of areas requiring further investigation, in order to understand how the current policies could be amended to better manage the regions water resources. There are two particular aspects which are discussed here:

- the effects of a changing climate, and
- changes to State legislation[8] and national reviews of water policy which recognise the need for greater inclusion of First Nations values and interests in water planning[9].

3.1 Climate change

The WAP acknowledges that changing climatic conditions may have potential impacts, the extent of which will have the potential to pose significant challenges in future for water resources and how they are managed. As acknowledged in section 4.4 of the WAP, the information and projections available at the time it was being

[8] The objects of the Landscape SA Act 2019 include a number of new (compared to previous NRM Act) objects that relate to recognising First Nations interests in natural resources management. For example, s. 7(3)(a).
[9] Nationally, this includes the Productivity Commissions national water reform 2020 and also within its 2023 implementation review of the Murray Darling Basin Plan.

drafted were not able to be applied to great specificity, and could not be directly incorporated into the policies.

It was envisaged that improvements to the understanding of climate change and the future impacts upon water resources management would be incorporated into future review and amendment of the WAP. Additionally, the WAP highlighted the importance of ongoing ecological and water resource monitoring in order to identify climate-driven trends and inform future management strategies.

The historical practice of using the 'longest available hydrological data sets' in developing rainfall-runoff relationships, quantifying resource capacities, defining environmentally sensitive flow regimes and establishing sustainable extraction limits requires careful consideration. While long-term future climate is expected to be highly variable, modelling using climate projections for the MLR similar to the work undertaken for the Barossa PWRA (DEW, 2022 and DEW, 2023) is likely to provide further insight into whether the near-future climate is expected to be similar to recent past climate (DEW, 2024a).

DEW has developed the *Guide to Climate Projections for Risk Assessment and Planning in South Australia 2022*, which provides dynamically downscaled projections for South Australia from the NARCliM 1.5 regional modelling project. The purpose of the guide is to provide information about the changes in climate likely to occur and to provide guidance on the use of climate projections for risk assessment and planning. The guide will be updated in 2024 with new regional-scale model data from the NARCliM 2.0 project, which will include new emissions scenarios that were developed as part of the Intergovernmental Panel on Climate Change (IPCC) 6th Assessment Report.

3.2 First Nations

Since the development of the WAP social expectations and policy contexts have changed at the state and National level regarding the representation of First Nations peoples and their values within water planning and policy. For example, recognition of 'the spiritual, social, customary and economic significance of landscapes, and especially natural resources, to Aboriginal people' (s. 7(3)(a)) now appears within the LSA Act, replacing the NRM Act 2004 current at the time of adopting the WAP.

Since the WAP was adopted, there has been some progress nationally to recognise First Nations people and actions that realise First Nations' objectives in water management and planning policy. These are briefly described below:

- The recent Basin Plan Implementation Review 2023 (Productivity Commission 2023) includes reforms to strengthen the roles of Aboriginal and Torres Strait Islander people and states that a 'core objective of the Water Act and the Basin Plan is to enshrine and give prominence to First Nations' rights and interests'.
- The recommendations from The National Water Reform 2020 (Productivity Commission 2021) include the co-design of a First Nation people's interests in water and involvement in water management with specific improvements to cultural outcomes and access to water for economic development.
- The 2021 National Agreement on Closing the Gap target 15 has a commitment to the target 'People maintain a distinctive cultural, spiritual, physical and economic relationship with their land and waters'.

Section 9 of this report discusses these points of progress in more detail, as well as highlighting the opportunities for further progress to be made, in partnership with the First Nations peoples of the EMLR region.

4 Amendment Focus Areas

The review has identified a number of areas requiring specific attention in the amendment process to develop new information, policies and approaches to improve the WAP. These are collectively referred to as the 'Focus Areas' for amendment, and are listed in Table 1, on the following page.

As the amendment progresses and new information becomes available, it is likely that additional Focus Areas will be identified, or that changes to those listed below will be made. Notwithstanding, the list below will help to direct and prioritise action.

The relative level of priority is indicated alongside each of the Focus Areas listed in Table 1. These prioritisations are informed by the 'amendment program logic', illustrated in Figure 2, below.

Figure 2 illustrates the key components or steps (numbered 1-4) of amending the WAP and developing new policies. Whilst there is some flexibility to the design of an amendment process and the order in which particular questions are answered, there are also inherent dependencies where some questions must be answered first before it is possible to answer the next. A number of the Focus Areas listed below are relatively independent of other aspects, and are able to be progressed as discrete projects, such as the work relating to the Fleurieu Peninsula Swamps.

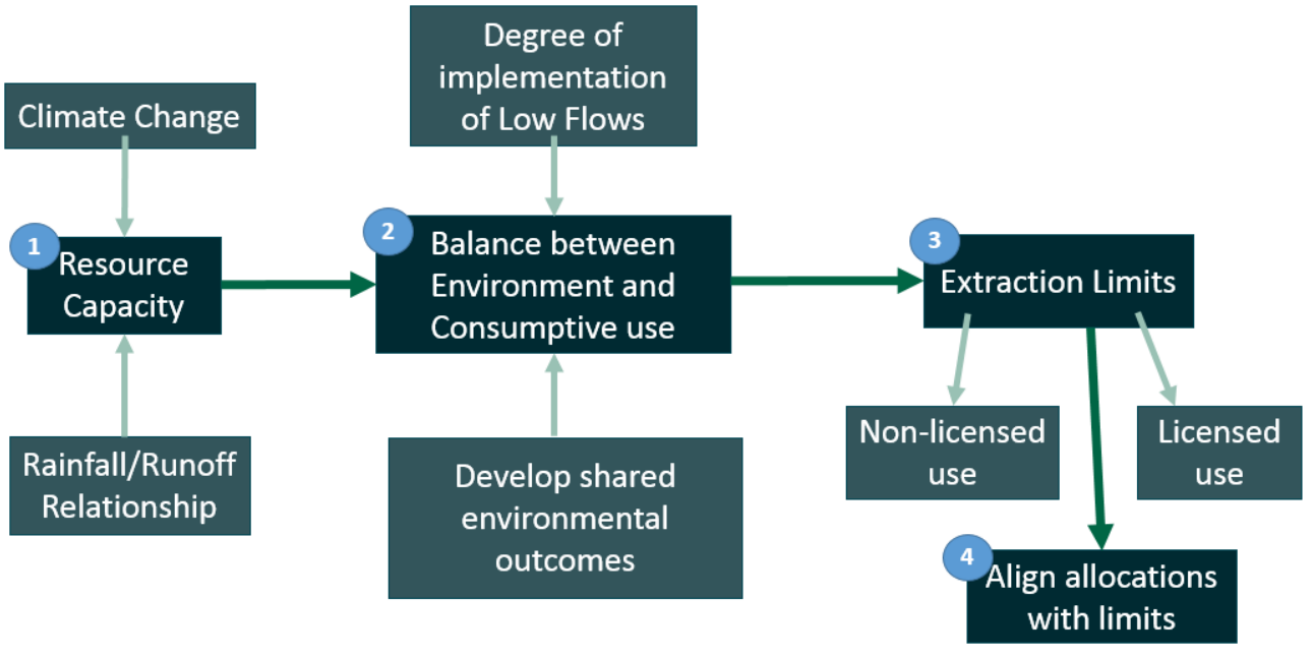


Figure 2 Program logic underpinning the prioritisation of Amendment Focus Areas.

Table 1 Focus Areas and prioritisation for WMLR WAP Amendment

Priority	Focus Area
1. Development of new ***resource capacity*** figures	Selecting a more appropriate climate period to serve as the 'baseline'.
	Incorporating future climate change projections for the region.
	Updating information on changes to land uses, land cover and land management practices since 2005 which influence water movement across the land (rainfall/runoff relationship). Including: • Large-scale revegetation projects • Expansion/ contraction to horticultural or viticultural plantings • New data or methods to improve existing estimates for commercial forestry water use • Regenerative farming uptake (changes to water absorption by soils) • Urban developments (i.e. housing estates) completed since 2005
	Undertake GIS analysis to identify changes to dam sizes and water holding capacities, including instances of illegal dam construction and enlargement. Update catchment models to reflect additional dam capacity identified.
	Explore alternative methods for estimating the capacity of existing dams (for example, using LiDAR) to improve accuracy of data.
	Undertake updates to catchment models to incorporate the most recent data on land use/ land cover and other factors affecting rainfall / runoff relationships and groundwater recharge.
	Undertake specific investigations into the unique hydrological functions of landscapes characterised by Fleurieu Peninsula Swamps, including rainfall runoff relationships for those landscapes.
2. Find a new **balance** between all water needs	Develop options and targets for future levels of low flow implementation, including the exploration of new methods and approaches and supportive actions to complement low flow implementation. Community and stakeholder engagement will be an important part of this process.
	Use contemporary climate data and projections for future climate conditions to determine new environmental outcomes and environmental water requirements for water dependent ecosystems across the region.
	Undertake specific investigations to determine the environmental water requirements of Fleurieu Peninsula Swamps and develop new targets and metrics[10].

[10] Initial work to scope out a full program of investigations has commenced, in partnership with DEW, LHF and researchers from La Trobe University.

Priority	Focus Area
	Undertake revisions and improvements to the SA Water Environmental Flows Program, including the development of a new flow release schedule, targets and program MERI Plan. Agreed releases to be reflected as a new licence condition.
	Investigate opportunities to align water allocation planning with the State Water Security Statement and related water security programs.
	Work with First Nations bodies to develop cultural water aspirations and determine policies that support First Nations' water interests.
	Develop better estimates for contemporary stock and domestic use of surface and groundwater resources across the region. In particular, identify methods for quantifying non-licensed watercourse extractions.
	Undertake an assessment of future demand upon prescribed water resources by non-licenced water users (stock and domestic, commercial forestry).
	Undertake an assessment of contemporary and future water demands from commercial sectors, including agriculture. The present WMLR WAP relies on data current up to 2004.
	Include consideration for the provision of Critical Human Water Needs as part of developing a new balance across all needs.
3. Calculate new **extraction limits** for management zones	Using the information gathered from 'part 2' determine new extraction limits that are environmentally, economically, socially and culturally sustainable.
	Strategies for reducing non-licensed water demand will likely need to be explored, depending on the findings of 'part 2'.
	Strategies for reducing licensed water demand will also likely need to be explored, depending on the findings of 'part 2'.
	Although outside of the direct control of the WAP, broader water management strategies and actions will support this stage of the WAP amendment. Including: • Exploring opportunities to improve water efficiency and other climate-ready adaptations • Undertaking water security planning for water-stressed areas of the region. Similar to existing strategies for Barossa and McLaren Vale. • Explore opportunities for alternative water supplies to reduce pressure on native surface and groundwater resources. I.e. recycled wastewater. • Working with industry bodies and other agencies to improve the support available for land managers facing water challenges now and into the future.

Priority	Focus Area
4. **Align allocations** to new extraction limits	Explore options with community and stakeholders for aligning allocation volumes to new extraction limits
5. Specific **policy improvements** for amended WAP	Explore opportunities to improve the regulation of non-licensed water use (forestry, stock and domestic) where this could help to achieve the outcomes of the new plan.
	Develop policies in the new WAP to address turkey nest/ off-stream dams and stormwater detention basins.
	Consider the need in the amended WMLR WAP for 'high intensity use zone' rules relating to groundwater, which have been difficult to administer previously.
	Improve the Water Affecting Activity policies, guidelines and Current Recommended Practice (CRP) documents to better support future assessments.
	Reduce the current complexity of trade and transfer rules, including through improved decision support, information systems or rule simplifications where appropriate.
	Develop mechanisms and policies to improve the level of protection for significant environmental assets, including permanent pool refuges in watercourses.
	Explore policy pathways for the consideration of habitat restoration projects looking to access carbon credits (presently these projects fall within the definition of 'commercial forestry').
	Explore options for greater flexibility year-to-year, in relation to allocations and other water-taking policies. Additionally, exploring adaptive management pathways and trigger mechanisms that allow for decisions to be made in response to climate variability, climate extremes and other changing conditions.
	Improve monitoring programs (surface water, ecological, groundwater salinity monitoring) to address data gaps and allow for greater spatial representation in trend analysis. Develop Monitoring, Evaluation, Reporting and Improvement (MERI) Plan to support the outcomes of the new WAP and allows for continual adaptations and improvements.
	Investigate opportunities to improve linkages between the WAP and the *Planning Development and Infrastructure Act 2019 and PDI Regulations 2019* to ensure there is strategic alignment in how water resources are managed. Including, to protect prescribed water resources from housing developments not proposed to be connected to reticulated mains water supply.

4.1 Integration of McLaren Vale Prescribed Wells Area

Following the 2022 Review of the MV PWA WAP, a decision was made by the Hills and Fleurieu Landscape Board to integrate the policies of that WAP with the broader WMLR WAP, to enable more cohesive management across both the surface water and groundwater resources in the region. Therefore, in addition to the Focus Areas listed above, the amendment of the WMLR WAP will also need to consider the findings and recommendations of the MV PWA WAP Review (HFLB, 2022). The recommendations outlined in the MV PWA WAP Review Report are listed below, and are to be seen as additional Focus Areas:

- **Kaurna peoples' relationship with water is vital for maintaining cultural heritage and spirituality.** The absence of cultural flow considerations and lack of documentation associated with surface water and groundwater [in the MVWAP] dismisses the cultural relationship between these core aspects of Kaurna being. Additionally, the capacity to develop and access water for cultural flows and practices is of paramount importance in sustaining Kaurna's connection to water, country and sky.

- **There are little data on the condition and trend of Groundwater Dependent Ecosystems (GDEs).** Most of the GDEs in the region however, are connected to the aquifers which are less used for irrigation.

- **Evidence of small downward trends in aquifer water and pressure levels in four of the five main aquifers**. DEW's report attributed more recent declines to being predominantly driven by rainfall trends rather than extraction (DEW, 2022b). The report also described areas in two aquifers with a total of four salinity hotspots. Introducing limits at aquifer and management zone scales could assist in managing these issues.

- **Groundwater extraction was well within the limits set in the MV WAP and there were no compliance issues with the rules relating to drilling wells or managed aquifer recharge.** However, the MV PWA had not maintained groundwater at the year 2000 levels. In the context of climate change, that goal may not be achievable with the instruments available through a water allocation plan (WAP).

- **The risk assessment identified 'groundwater extraction' as the source of the six risks that were ranked medium to high**. Some of the risks were related to specific regions and were assessed as being able to be influenced by factors regulated by the WAP. In particular, the salinity hot spots in some areas are likely to need to be treated by changes to WAP principles.

- **Climate change projections show that over the long term, climate change will impact aquifers through a reduction in recharge**. The unconfined aquifers and those aquifers with limited storage capacity will be more vulnerable than confined aquifers and those with large storage.

- **Stakeholders were most concerned about supporting irrigated agriculture and GDEs.** In an online community survey 59% of respondents agreed that the MV WAP is effectively managing groundwater in the region with the most important issues being supporting irrigated agriculture and sustainably managing GDEs.

Progress has already been made against a number of the above recommendations.

Part Two

Status of resources

Allocation and use

Economic context

Community and Stakeholder Engagement

First Nations Engagement

5 Status of resources

As part of the 2023 WMLR WAP Review a range of investigations have been undertaken to collate key data from monitoring programs and other sources to provide an understanding of the overall status of resources and important trends. This section provides a summary of the key findings from the analyses of long-term rainfall, streamflow, groundwater and ecological monitoring data.

The information in this section forms part of the evidence base drawn upon in Part One to evaluate how effective the WAP has been in sustainably managing the region's water resources, and whether it remains appropriate.

5.1 Status of surface water resources

Summary

- Rainfall records from 24 BoM stations across the Mount Lofty Ranges as a whole indicate a declining trend in long-term (1900-2022) annual rainfall in large parts of the region, particularly since the onset (1997) of the Millennium drought.
- Seasonal and monthly rainfall records highlight shifting climatic conditions to those anticipated by the WMLR WAP, which adopts 1974-2006 as the baseline climate period.
- Spring rainfall has seen the greatest impact (predominantly in October) across all stations investigated, with median spring rainfall reducing by as much as 29% in Gumeracha for the post-drought period.
- Evidence was weaker in the Fleurieu for a reduction in spring rainfall, although October rainfall was still shown to be impacted for the majority of stations.
- Median seasonal streamflows for spring and autumn have reduced significantly, in both the Onkaparinga and Torrens sub-catchments when comparing WAP development (1974-2006) to Post WAP-development (2007-2022) years.
- For example, median seasonal flows for spring have reduced by 82% at Mount Pleasant in the Torrens River for the Post WAP-development period, compared to the WAP development period.
- Myponga sub-catchment is hydro-climatically different to the other four sub-catchments investigated.
- Overall, the analysis provides evidence of alteration of flow regimes since the start of the Millennium drought and during post-WAP development period in the sub-catchments investigated (excluding Myponga).
- The continued use of the 1974-2006 baseline period is expected to result in an overestimation of the resource capacity, and would ignore the fact that the climate, along with rainfall-runoff responses of catchments and their flow regime is changing.

Data collected from rainfall and streamflow monitoring sites across the PWRA were analysed to understand the overall status of the region's surface water resources and trends over time. Rainfall is the key driver for surface water availability, whilst streamflows (measured at monitoring stations along watercourses) provide insight to the rainfall-runoff relationship and overall ecosystem health.

Of the many rainfall and streamflow monitoring stations across the WMLR region, a subset with good quality long-term data were chosen for the investigations discussed here. Sites that were installed more recently will provide the same valuable data in years to come, and improve spatial representation.

A detailed investigation was undertaken for five surface water catchments across the Eastern and Western Mount Lofty Ranges, with three of those catchments being located within the WMLR - Onkaparinga River, Torrens River and Myponga River Catchments. The full details of this investigation can be read in the published technical report; *Impacts of changing rainfall patterns on the hydrology of the Mt Lofty Ranges* (DEW 2024a).

The investigation compared observed data at different time scales (decadal, annual, seasonal, monthly and daily) for different climate and planning comparison periods, listed below;

- WAP development (1974-2006)
- Post-WAP development (2007-2022)
- Pre-drought (1900-1996)
- Drought (1997-2008)
- Post-drought (2009-2022)

The purpose of the investigation was to inform the review of the WAPs by:

- Identifying if rainfall, streamflows and their relationship ('rainfall-runoff response') patterns changed during the Millennium drought ('drought') (1997-2008), and if they have recovered to pre-drought conditions (pre-1996) during post-drought (2009-2022) period; and
- Identifying if streamflow volumes and overall flow patterns during the post-WAP development period (2007-2022) were different from those used to develop the WAP (1974-2006)

5.1.1 Summary of rainfall findings

Rainfall records from 24 Bureau of Meteorology (BoM) stations across both the WMLR and EMLR regions were analysed using various statistical methods to investigate long-term trends, periodic shifts within long-term data and the impacts of the drought on rainfall totals and seasonality. Key findings for the entire Mount Lofty Ranges region are provided below, followed by further WMLR catchment-specific findings.

Whole of Mount Lofty Ranges Summary

The combined results of the analyses provide evidence of a declining trend in long-term annual rainfall in large parts of the region, particularly since the onset of the Millennium drought. This is largely due to a possible downward shift in spring season rainfall (predominantly in October) and to a lesser degree in autumn rainfall (in April), with spring rainfall yet to recover to pre-drought conditions and autumn rainfall showing signs of recovery since the drought period. Winter season rainfall has generally recovered to pre-drought conditions across the stations investigated. A long-term decline and/or a negative shift in spring and autumn rainfall was not observed at some stations, and these stations are located predominantly across the Fleurieu.

Onkaparinga Catchment

Rainfall sites analysed - Uraidla, Bridgewater Post Office, Cherry Gardens, Lobethal, Hahndorf Post Office and Echunga Golf Course.

Findings - Spring has shown an increase in rainfall variability since the mid-2000s, while the other seasons have shown a decrease in variability over the past two to three decades. However, rainfall in warmer months (November to March) and in July have shown some significant jumps at certain times in the post-drought

period, suggesting an increase in high intensity rainfall events during these months in particular. Some stations appear to show recovery of rainfall post-drought (e.g., Uraidla, Echunga, Cherry Gardens) while others (e.g., Hahndorf) indicate a downward shift in rainfall has occurred, with decreased post-drought median rainfall.

Torrens Catchment
Rainfall sites analysed - Birdwood Dept. of Transport, Gumeracha District Council, Cudlee Creek (Millbrook) and Mount Pleasant.
Findings - Summer rainfall showed an increase in the post-drought period at three of the four stations in the catchment, coinciding with indications of high intensity rainfall events occurring during some of the warmer months over the same period, in particular February, March and December. Winter rainfall has shown a reduced variability over the last couple of decades. Recovery of rainfall in the post-drought period is suggested at two of the stations (Mount Pleasant and Gumeracha) but does not appear to have recovered at the other two stations (Birdwood and Cudlee Creek).

Fleurieu Peninsula Catchment
Rainfall sites analysed - Victor Harbor, Willunga, Second Valley (Poolamacca), Yankalilla, Normanville and Port Elliot Caravan Park.
Findings - Evidence was weaker for a reduction in spring rainfall in the Fleurieu region compared to other WMLR catchments. The strongest indications of change were found at two of the mid-range rainfall stations at Willunga (23753) and Yankalilla (23754). Despite this difference, October rainfall was still shown to be strongly impacted in the post-drought period for the majority of Fleurieu stations. Winter and autumn rainfall appear to remain largely consistent with pre-drought rainfall. Summer rainfall for the post-drought period increased at three stations (Second Valley, Normanville and Port Elliot Caravan Park) by 27-30% compared to pre-drought median. Overall recovery of rainfall in the post-drought period is indicated at all stations but Yankalilla.

5.1.2 Summary of streamflow findings

The analysis included streamflow records for the period 1974 to 2022 for five gauging stations representing sub-catchments of the EMLR and WMLR regions. For the WMLR region, three gauging stations in the Torrens River, Onkaparinga River and Myponga River catchments were analysed. Key results are summarised below.

An important finding to acknowledge is that Myponga sub-catchment is hydro-climatically different to the other sub-catchments investigated, reflected in its rainfall and streamflow patterns, in particular the seasonality. Given this difference, the summary points below are largely made for the other sub-catchments investigated.

Streamflow recovery (*Comparison of drought and WAP-development related periodic medians*):
Comparison of flows between the three drought-related periods provides valuable insight into the extent of streamflow recovery, given the changes to rainfall experienced since the start of the drought. During the post-drought period (since 2009):

(a) Annual streamflow volumes increased in all four sub-catchments but were still lower than in the pre-drought period (considered a 'Partial recovery'). The annual increase is consistent with the increase, either 'Partial' or 'Full' recovery, in winter flows in all sub-catchments.

(b) Autumn experienced the lowest seasonal flows in all the sub-catchments ('yet to recover').

(c) Spring season flows are 'yet to recover' in the Torrens and Onkaparinga sub-catchments.

When comparing the two WAP development periods, a consistent statistic was that spring season median flows were lower in the post-WAP development period (except in Myponga River). This comparison is shown in Table 2 for the three WMLR sub-catchments:

Table 2 Median seasonal streamflow (ML) for WMLR sites across WAP development and Post WAP-development periods

Season	WAP development (1974-2006)	Post WAP-development (2007-2022)	Change (WAP dev to post-dev) (ML)	(%)
		Scott Creek, Onkaparinga (A5030502)		
Summer	49	32	-17	-35%
Autumn	144	89	-56	-38%
Winter	1779	1838	59	3%
Spring	911	517	-394	-43%
		Torrens River at Mount Pleasant (A5040512)		
Summer	2	1	0	-16%
Autumn	6	2	-4	-59%
Winter	751	368	-383	-51%
Spring	314	56	-258	-82%
		Myponga River (A5020502)		
Summer	45	138	93	204%
Autumn	426	452	27	6%
Winter	4528	4652	124	3%
Spring	1662	1347	-314	-19%

Flow regime (*Comparison of daily flow percentiles and flow duration curves*):
Since the beginning of the drought (26-year period since 1997), the daily flow durations have been altered to varying extents in the sub-catchments investigated (excluding Myponga). The average number of flowing days per year has reduced in all three WMLR sub-catchments when comparing pre-drought figures to post-drought figures, as shown in Table 3 below.

Table 3 Comparison of average annual flowing days across drought related periods (WMLR)

Streamflow Site	Average annual flowing days for drought periods		
	Pre-drought	Drought	Post-drought
Scott Creek (A5030502) Onkaparinga Catchment	362	358	341
Torrens River at Mount Pleasant (A5040512)	247	195	197
Myponga River (A5020502)	357	349	338

5.1.3 Rainfall-runoff response

Results of rainfall-runoff response analysis show that there is evidence to suggest that the underlying rainfall-runoff responses of Mt Pleasant sub-catchment in the Torrens River have potentially changed (or shifted) in the period since the Millennium drought. The evidence to suggest a shift in the rainfall-runoff response has occurred in the Onkaparinga or Myponga River sub-catchments is inconclusive.

It is uncertain whether this observed change (or negative shift) is permanent or temporary-and-prolonged. This non-stationarity in observed rainfall-runoff response may be caused by multiple drivers, not all of which are the result of climate change. And, for changes attributed to climate change, future trends may not continue at the same rate or in the same manner as historical trends (DCCEEW, 2023).

5.1.4 Implications for the WAP

Seasonality, average number of flowing days per year and the low, medium, and high flow ranges are some of the key metrics that characterise the flow regime of a catchment. These are also some of the key hydrological metrics used in defining and evaluating Environmental Water Requirements (EWR) metrics in the WAP. The investigations provide evidence of alteration of flow regimes since the start of the Millennium drought and during post-WAP development period in the sub-catchments investigated (excluding Myponga).

The continued use of a rainfall-runoff relationship developed from long-term (including pre-drought) hydrological data to underpin the WMLR WAP is expected to result in an overestimation of the resource capacity. In addition, this would ignore the fact that the climate, along with rainfall-runoff responses of catchments and their flow regime, is changing.

The hydrological models used in the development of the WAP were generally calibrated to streamflow records for the period 1974 – 2006, with one rainfall-runoff relationship developed for the entire period used in deriving resource capacities in the WAP. Given the shift in rainfall-runoff identified since the start of the drought in this investigation for some of the sub-catchments, recalibration of the models to include recent streamflow data is recommended for future use of the models, including while amending the WAP. To evaluate the impacts of future climate on rainfall-runoff response, the recalibrated models would have to be run with climate projection data sets.

Investigation using a larger sample of lower elevation rainfall stations across the WMLR is required to verify if the impacts of climate change and/or the drought on rainfall are primarily felt in the higher elevation sections of the WMLR. Further investigations into the weather systems that influence long-term rainfall patterns, the Millennium drought interface with those weather systems, along with more streamflow monitoring at more sites in the Fleurieu region is recommended for effective future investigations and water planning in the region.

5.2 Environmental objectives set by the WAP

Summary

- Section 5.3 presents ecological monitoring data alongside an assessment of ecological conditions relative to the ecological objectives set out by the WMLR WAP.
- For context, this section outlines what environmental objectives were set out in the WAP, and the process behind the setting of these objectives.

Under the Act, a water allocation plan must include an assessment of the quantity and quality of water needed by the ecosystems that depend on the water resource and the times at which, or the periods during which, those ecosystems will need that water [s. 53(1)(a)(i)]. A WAP must also include a statement of the environmental outcomes expected to be delivered on account of the provision of environmental water under the plan [s. 53(1)(b)(iii)].

Section 2 of the WAP outlines the process taken to define the needs of water dependent ecosystems, the objectives to be met and the indicators and metrics to be used for assessing achievement of objectives[11]. The process for defining ecological targets is briefly outlined below, as it is important context to how ecosystems are tracking against the WAP targets, discussed in Section 5.3;

1. An overall environmental objective was set '*to maintain and/or restore self-sustaining populations of aquatic and riparian flora and fauna which are resilient in times of drought*'. This was underpinned by two ecological targets, 1) Moderate to good macroinvertebrate community condition, and 2) successful recruitment of Mountain Galaxias and Southern Pygmy Perch in seven out of ten years.
2. To achieve the objective, it was determined that the flow regime of the rivers of the WMLR needed to be maintained within acceptable bounds around the 'natural'[12] flow regime.
3. The flow regime was broken down into a series of ecologically relevant flow metrics (called the Environmental Water Requirement (EWR) metrics) that empirically characterised the different parts of the flow regime under the 'natural' scenario. For each metric, the level of deviation allowable before adverse ecological outcomes were expected was identified, allowing an assessment of 'passing' or 'failing' for each metric (i.e. a reduction in the number of flowing days per year by 20% or more from 'natural' was considered to fail).
4. Hydro-ecological modelling was undertaken to link the number of passing metrics with the observed ecological condition for fish and macroinvertebrates (assessed against the targets) which allowed the establishment of an overall rate of 85% of metrics passing required to maintain an acceptable level of risk to the achievement of the ecological objectives.

[11] Section 2 of the WAP draws upon a suite of investigations documented within Vanlaarhoven and van der Wielen 2009, Vanlaarhoven and van der Wielen 2012, and Vanlaarhoven 2012.
[12] The 'natural' flow regime was defined as the flow regime with the impacts of dams and watercourse diversions removed. This does not represent a pre-European flow regime as the impacts of vegetation clearance, urban impacts and forestry are still included.

The flow objective of meeting 85% of the EWR metrics was used to set key water management rules underpinning the WMLR WAP, with various management scenarios tested in order to determine which could achieve the required number of passing EWR metrics.

The result of modelling different options for water take rules and other settings found that an environmentally sustainable take limit that could met the flow objective was 25% of the surface water total resource capacity, with 'low flows' (see Section 5.2.1 for more detail) passed by in-scope dams and watercourse diversions. The full implementation of the sustainable take limit and the requirement to pass low flows was expected to meet the flow objective, and allow the overall environmental objective to be met.

5.2.1 Low Flow Releases (LFRs)

Low flows are a small proportion of all flow events. They are critical to the health of waterways, especially in the lead up to and following the main rainfall periods where most flows are received.

At the beginning of the flow season when rivers commence to flow, dams capture incoming flows until they fill entirely and then spill (overflow). This significantly delays the delivery of water to reaches, rivers and streams that have been dry over summer. For many aquatic species of the WMLR the duration of flow is considered to the master driver of overall health, breeding success and ongoing survival. Therefore, shortening the flow season has a significant impact on the health of water dependent ecosystems.

The work underpinning the WAP found that the risk to environmental objectives could be significantly reduced by having all in-scope sites[13] undertake LFRs, and this would also allow for a higher sustainable extraction limit (25% of resource capacity).

To date in the WMLR, there has been limited implementation of LFRs at in-scope sites compared with the degree of implementation envisaged by the WAP in order for environmental objectives to be met. Through the Securing Low Flows program a total of 26 dams (all in the Carrickalinga catchment) were treated such that they have the ability to pass LFRs.

The Securing Low Flows program in the WMLR found three primary barriers which prevented a greater level of participation by landholders in the program, being;

- **Costs involved in a 'device-based' approach**
  The primary approach to LFRs involves the installation of a customised 'low flow device' which is designed to automatically provide low flows to the downstream environment. The design of each device seeks to accurately release low flows at a flow rate specifically calculated for each site, as well as minimise the operational and maintenance burden for the landholder. The scale of technical complexity and need for bespoke solutions contributed to far greater costs for implementing LFRs than originally anticipated.
- **Loss of control over water supply and management**
  Landholders wish to retain full control of their water resources as it is vital to the productive capacity of all farm enterprises. Controls which alter the supply of water to properties (in terms of timing or volumes) have the potential to impact the use of on-farm infrastructure or require changes to established farm management practices. The 'automatic' function of low flow devices was seen to reduce landholder control, and introduce another layer of uncertainty for farm water supply.

[13] In scope sites for the passing of low flows are defined as licensed dams (regardless of size), all non-licensed dams over 5ML in size and all licensed watercourse diversions.

- **Belief in the necessity of LFRs**
  In discussions with landholders it was evident that many questioned the need for LFRs and how they would benefit downstream ecosystems. Additionally, some landholders observed that the levels of water use and demand across the region had reduced, potentially reducing pressures upon water dependent ecosystems and lessening the need for LFRs.

In acknowledgement of the first two barriers listed above, a community-led trial was undertaken in the Inman River catchment, with a further four dams participating. The trial saw environmental flows[14] released from participating dams using existing outlets, to explore an alternative methodology that is low cost, low-tech and reduces landholder concerns for their water security risks.

Although there are multiple independent modelling processes that have identified the benefits of LFRs across the Mt. Lofty Ranges, an on-ground assessment of real world outcomes is yet to be undertaken. An assessment of the outcomes of LFRs is planned as part of the Flows for the Future (F4F) program, currently operating in the EMLR[15]. This assessment requires suitable levels of implementation of LFRs and sufficient time post implementation for benefits to be realised. To date, some monitoring sites downstream of LFRs have shown ecological improvement, however, the full assessment with a longer time series of data across more sites is still needed to assess the downstream benefits.

It is clear that the level of implementation and delivery of LFRs across the WMLR was insufficient due to multiple reasons including lack of funding and lack of a considered implementation plan. Further consideration of future implementation options will be required for the amended WAP.

[14] Environmental flow releases are different to LFRs, in terms of the timing, volume and method for flows passed, as well as the ecological outcomes they contribute to.
[15] This assessment will incorporate data collected under the Securing Low Flows program in the WMLR.

5.3 Status of water dependent ecosystems

Summary

- Across the WMLR there is a clear trend of declining ecological condition, relative to the targets set in the WAP and discussed in Section 5.2.
- 237 fish monitoring sites were sampled between 2006 and 2021. 23 of these had been sampled five times or more and could be assessed for trend over time.
- Of the 23, 11 sites (48%) were classed as declining and six sites (26%), all located in the Fleurieu Peninsula, were classed as improving.
- Across the Mount Lofty Ranges as a whole, 84.8% of the 303 sampling events where Mountain Galaxias were caught were at a 'high' or worse level of risk of not meeting the WAP targets for recruitment (successful breeding).
- The WAP sets a target of 'moderate or better community condition' for macroinvertebrates (waterbugs). At the most recent year of sampling 81% of sites across the Mount Lofty Ranges as a whole were considered to fail that target.
- A general trend towards lower species diversity and higher prevalence of species with more tolerance to poor conditions was observed, representing a significant shift in the character of the sites.
- The condition of sites is generally observed to become poorer to the north of the region, while sites in the Fleurieu Peninsula are generally in better condition. This is likely connected to higher average rainfall and streamflows and watercourses which still exhibit good vegetation cover.
- Future monitoring will prioritise repeat visits to ensure more sites can be assessed for trend in future evaluations.

The WMLR WAP sets out environmental objectives that if met, are designed to keep ecosystems at an acceptable level of risk. Ongoing ecological monitoring focuses on two primary metrics, the community condition and distribution of native fish populations and the community condition and distribution macroinvertebrates (waterbugs) to provide a picture of overall ecosystem health.

To inform this review and provide an understanding of the current condition of aquatic ecosystems across the region, DEW's Ecology Team prepared an ecological condition assessment for the WMLR and EMLR prescribed areas. This report is publicly available, and is published as the *Hills and Fleurieu Landscape Region PWRA ecological condition assessment 2022* (DEW, 2024c). The report draws upon data sourced from multiple programs and projects in order to provide an overarching assessment of trend and condition in native fish and macroinvertebrate communities, for both the WMLR and EMLR PWRA's. In some places, data from the neighbouring Marne Saunders and Barossa PWRA's were also considered in order to provide additional spatial context.

5.3.1 Native fish – condition and trend

Fish data presented in the ecological condition assessment for the WMLR region (DEW, 2024c) was sourced from the *Biological Review of the Freshwater Fishes of the Western Mount Lofty Ranges*, (Schmarr et al. 2022), produced by South Australian Research and Development Institute (SARDI) and Green Adelaide Landscape Board. The recent biological review completed in 2022 provided an update to an earlier biological review (McNeil and Hammer, 2007) by collating data from more recent fish sampling events.

Across the WMLR, a total of 237 individual sites had been sampled throughout spring and autumn fish monitoring events undertaken by SARDI between 2006 and 2021 (Schmarr et al.). On average there are 36 sites sampled per year within the WMLR, however, the sampling effort has not been consistent across years with 2013 having 120 sites sampled, whilst there are no samples recorded for 2009, 2010 and 2018.

The fish data collected from each site and each sampling event from 2006 to 2021 was given a Biological Condition Gradient (BCG) score between one (excellent) to six (very poor).

The BCG rating takes into consideration multiple 'attributes' relating to fish community condition and habitat condition to arrive at an overall score for each site. The attributes include; the presence or absence of particular species, the abundance of each species, the diversity of species caught, the age of fish caught (based on fish size), and environmental conditions including surrounding land uses, presence of vegetation, quality of flows and barriers to connectivity (weirs, waterfalls, dams, culverts etc.) (Schmarr et al. 2023).

Across all 237 sites sampled from 2006 to 2021 in the WMLR, an overall median BCG rating of 3.67 (fair) was given. The BCG score given to each of the sites at their most recent year of sampling is presented in Figure 3 , below.

Out of the 237 fish monitoring sites, 23 had been sampled five times or more and could be assessed for trend over time[16]. Of these 23 sites:

- 11 sites (48%) were classed as declining,
- six sites (26%) were stable, and
- six sites (26%) were improving.

As seen in Figure 3 below, the sites found to have improving trends in fish condition are all located in the southern reaches of the WMLR, within the Fleurieu Peninsula. It is worth noting that data collection for the trend assessment commences within or just following the drought, and so improving trends are not entirely unexpected and could instead be described as 'recovery' trends.

[16] The methodology used to characterise the likelihood of trend within the data was in accordance with the Intergovernmental Panel on Climate Change (IPCC) likelihood categories.

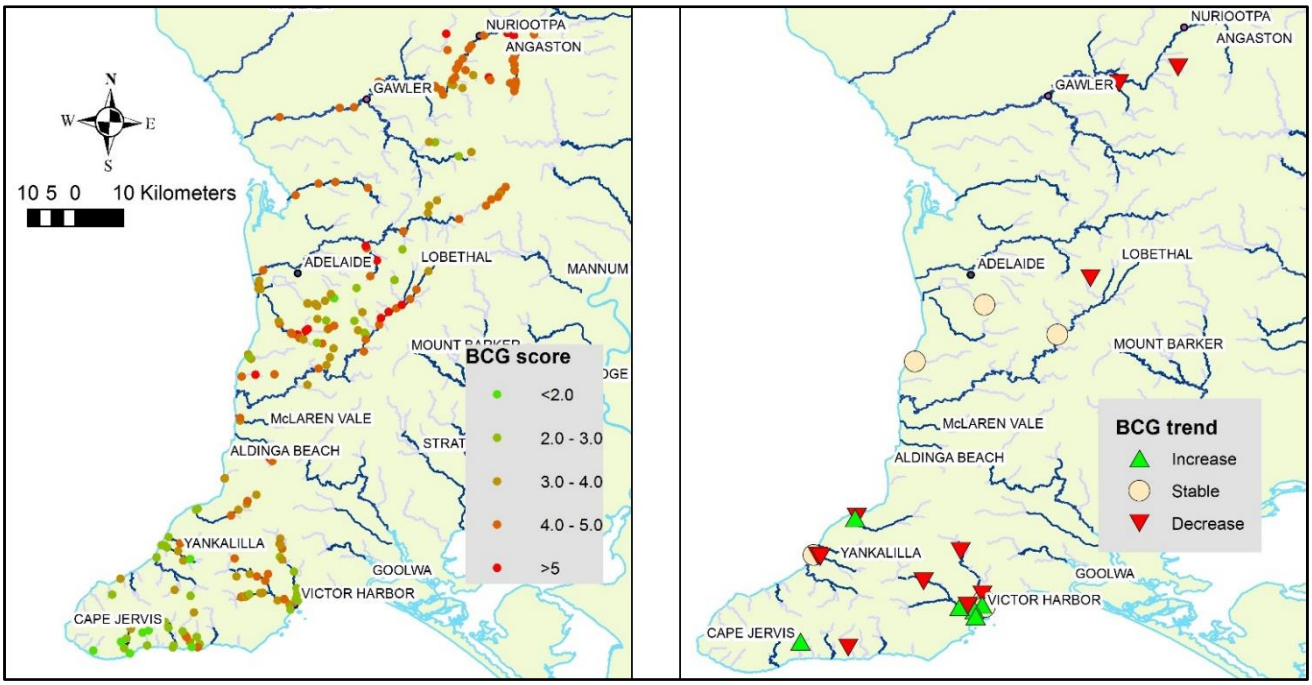


Figure 3 Fish monitoring Biological Condition Gradient (BCG) scores between 1 (excellent) and 6 (very poor) for all sites visited between 2006-2021 (left) and trend over time (right) for sites visited four times or more in the Western Mount Lofty Ranges (DEW 2024c).

In addition to the ecological targets for overall fish community condition, the WAP sets recruitment (or, successful breeding) targets for two indicator species of native fish to provide an overall picture of waterway health, with one of these - the Mountain Galaxias[17] – reported on here.

For the sites where Mountain Galaxias were present the number of young fish caught is recorded as a measure of how successfully they are breeding at that site, which is then compared to the WAP targets. Between 2012 and 2021 there were a total of 303 sampling events across both the EMLR and WMLR[18] where Mountain Galaxias were present and assessed against the WAP targets.

From 303 sampling events there was a total of 257 (84.8%) that were at a 'high' or worse level of risk of not meeting the WAP targets. There were 115 (38%) events which showed no recruitment at all at the time of monitoring. Three or more years with no recruitment is assumed to place Galaxias at extreme risk of a localized extinction event.

There were at least 13 sites throughout the WMLR where Mountain Galaxias were observed prior to 2007 but not in the period from 2007 to 2021 (Schmarr et al. 2022). The trend assessment showed only a few sites getting better, none of which were in the WMLR (see Figure 4, right hand side).

[17] The Mountain Galaxias is a good indicator species because they can be found in a wide range of habitat types and are relatively short lived (around 3 years).

[18] The data for Mountain Galaxias sampling events were pooled across both EMLR and WMLR regions, so that the assessment here reflects broader regional trends.

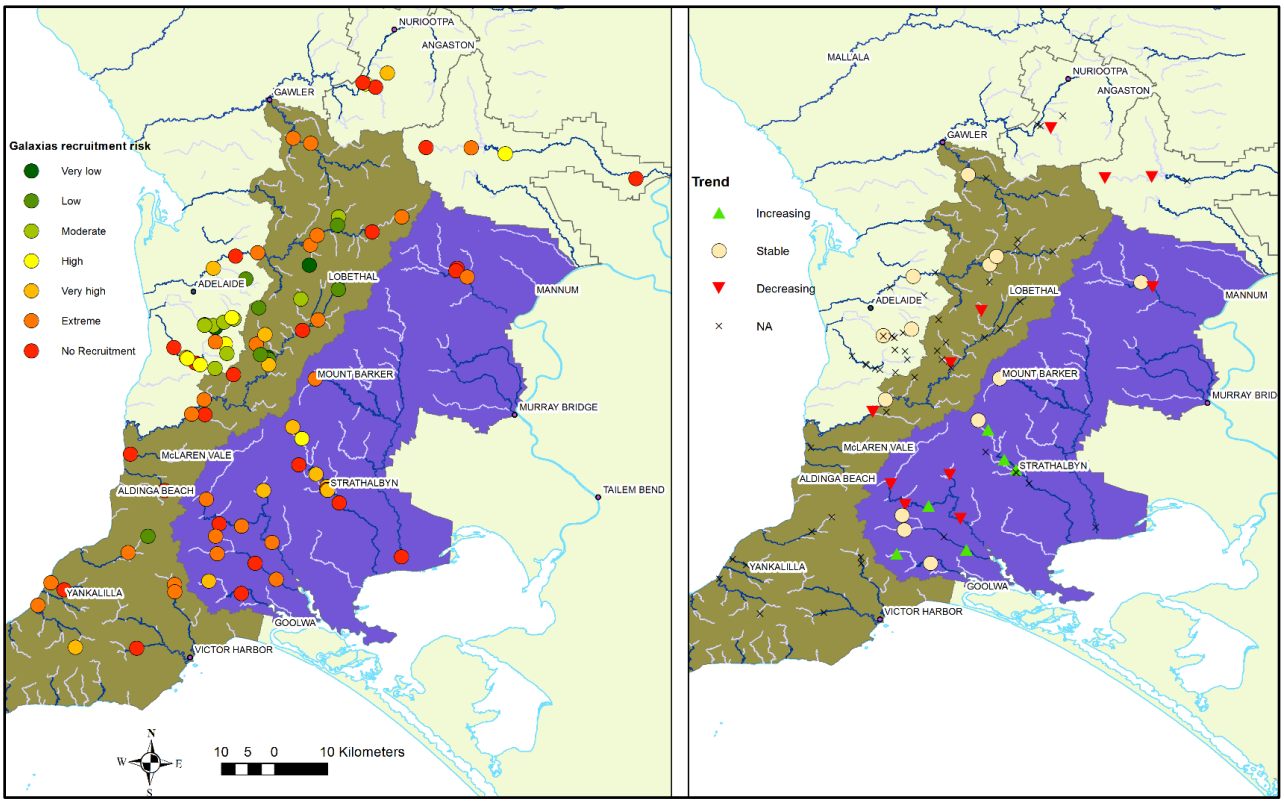


Figure 4 Risk to the Mountain/Obscure Galaxias population based on the level of recruitment the last time Mountain/Obscure Galaxias population were caught at the site and the trend in the recruitment levels of Mountain/Obscure Galaxias population between 2012 and 2021 for all sites that had Mountain/Obscure Galaxias population recorded during the assessment period (DEW, 2024c).

5.3.2 Macroinvertebrates (water bugs) – condition and trend

Macroinvertebrates, also referred to as water bugs, include creatures such as yabbies, native shrimp and insect larvae (such as the mayfly or dragonfly). The abundance and species richness of waterbugs and the diversity in species found at a particular site is an excellent indicator of waterway health, with some waterbugs being very tolerant and others being more sensitive to changing conditions.

There were a total of 609 macroinvertebrate samples collected from 50 sites between 2016 and 2022 used for the combined assessment of condition and trend for both the WMLR and EMLR (DEW, 2023). This data was sourced from the BioBlitz Program (267 samples), the F4F program[19] (174 samples) and the Securing Low Flows Program (168 samples).

The data collected from each site and sampling event from 2016 to 2022 was given a Contemporary Macroinvertebrate Condition Model (CMCM) score[20] between one (very poor) to six (excellent). The average CMCM condition score across all samples assessed was 2.64, compared to an average condition score of 2.57 for the most recent year of sampling alone.

[19] Samples gathered as part of the F4F program are from sites located within the EMLR only.
[20] The CMCM scoring takes into consideration multiple 'attributes' relating to macroinvertebrate community condition and habitat condition to arrive at an overall score for each site.

The WAP sets a target of 'moderate or better community condition' for macroinvertebrates, which is considered to be achieved if a site scores a CMCM score of three (fair) or greater. At the most recent year of sampling (limited to 2019-2022), 40 (80%) of sites failed to meet this target, whilst ten (20%) of sites were considered to pass the target.

The CMCM score given to sites in their most recent year of sampling is shown on the left-hand-side of Figure 5, below, with a pink halo appearing for sites which passed the WAP target.

Trend over time was assessed for 25 sites that had been visited five or more times, shown in the map on the right hand side of Figure 5. Of the 25 sites assessed for trend, 11 (44%) showed some form of decreasing trend, eight (32%) showed a stable result and six (24%) sites showed an increasing trend in condition over time.

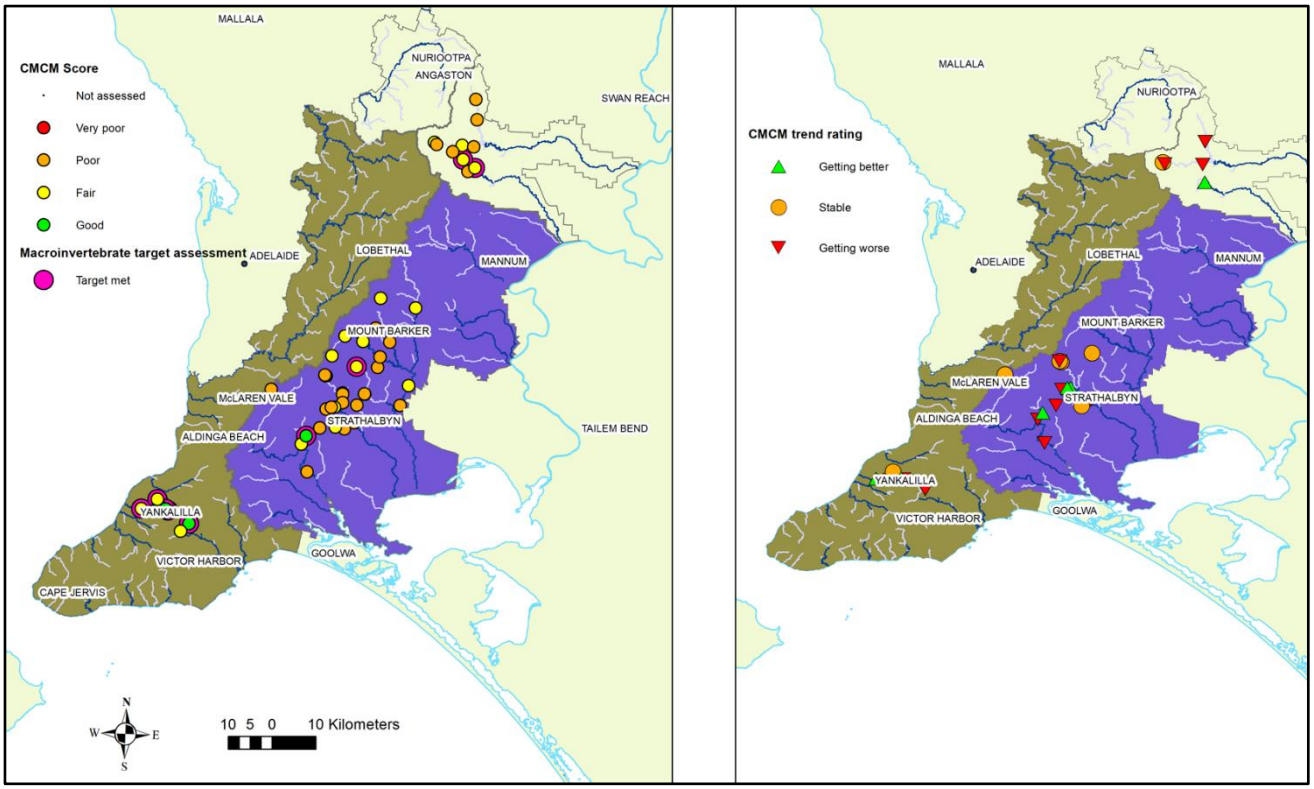


Figure 5 Macroinvertebrate community condition for the most recent sampled year (left) and the trend in community condition across all years of sampling (right). Sites where the condition target has been met are haloed in purple on the left hand map (DEW, 2024c).

5.4 Status of groundwater resources

Summary

- A detailed assessment was undertaken for long-term trends in aquifer water levels and salinity levels for 10 underground water management zones (UWMZs) with the greatest level of demand.
- A declining trend in aquifer water levels was evident for many zones between the mid 1990's to 2010, corresponding with the lower rainfall received during the Millennium drought.
- From 2010 onwards, recorded aquifer levels generally recover and stabilise.
- Salinity monitoring is limited to areas with historically higher levels of salinity, and long-term data for these areas show generally stable long-term trends.
- Overall, the groundwater resources of the WMLR were not found to have any concerning trends in aquifer level or salinity level monitoring data.

A state-wide network of observation wells ('obs wells') allow for ongoing monitoring of groundwater levels and salinity trends so that any potential risks can be identified. The groundwater monitoring network is focussed on areas with higher demand for groundwater.

There are 45 underground water management zones (UWMZs) across the whole of the WMLR. To inform the 2023 WMLR WAP Review, DEW's Groundwater Science Unit undertook a detailed assessment of 10 underground water management zones (UWMZs) which had the following attributes;

- Allocation volumes in excess of the extraction limit.
- Metered extraction levels approaching the extraction limit[21].
- Adequate monitoring data.

The location of these 10 zones are shown on Figure 6 on the following page. The assessment used the longest term data available for each of the 10 zones, where 1975 is the earliest starting year for a zone and 2009 is the more recent starting year for a zone. Multiple data points (typically three to four observation wells) were used to assess trends in each zone. The full report is publicly available as the: *Western Mount Lofty Ranges Prescribed Water Resources Area - Groundwater Resource Assessment* (DEW 2024d).

[21] Although these zones had levels of metered extraction 'approaching' the respective zone limit, they are each well within those limits.

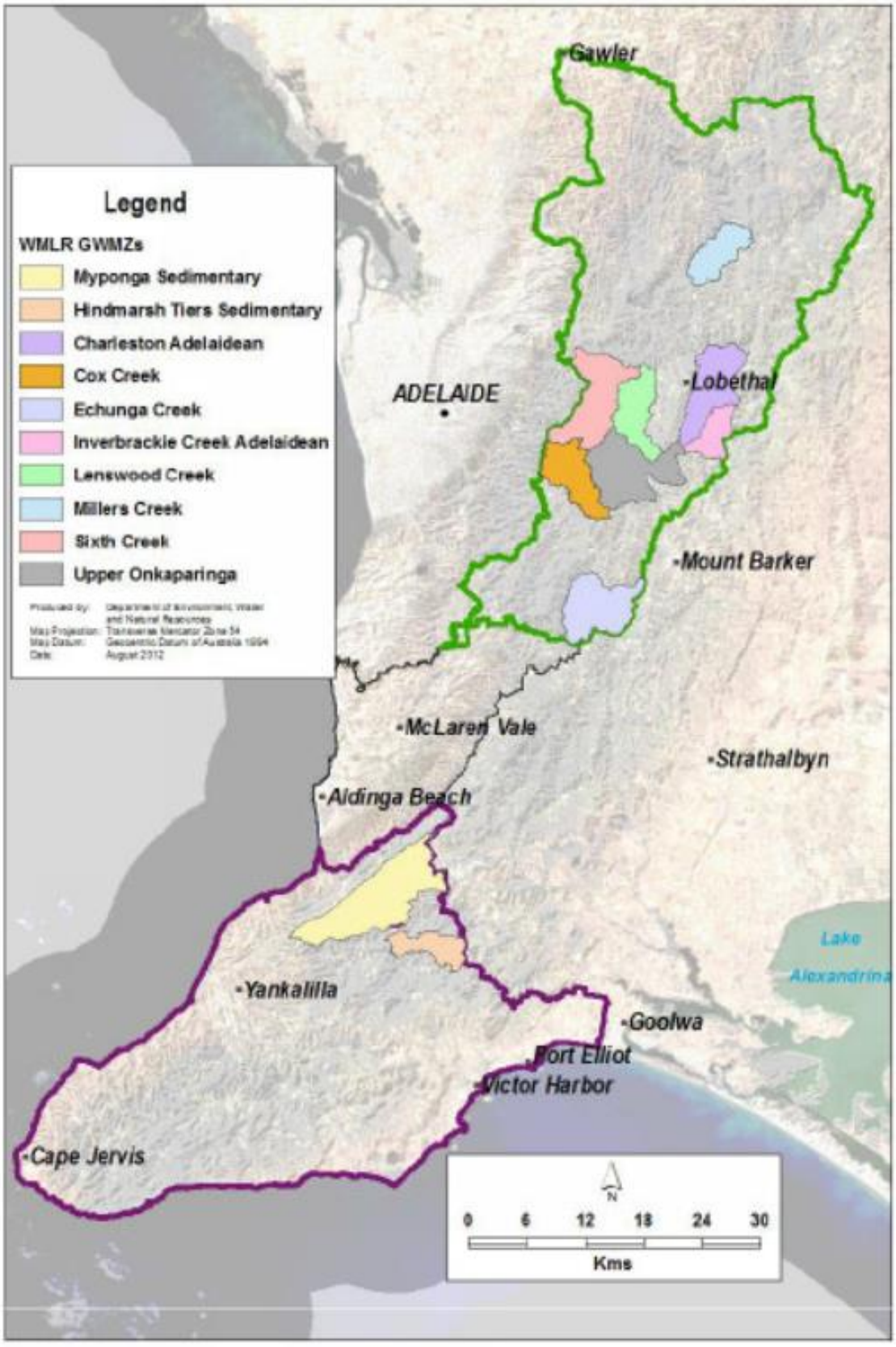


Figure 6 Groundwater Management Zones (GWMZs) with highest demand selected for analysis (DEW, 2024d)

For many of the zones assessed, a declining trend in aquifer water levels was evident between the mid 1990s to 2010, after which time recorded levels generally recover and stabilise. This trend reflects a period of lower rainfall experienced during the Millennium drought. Underground water level monitoring for most aquifers highlights a close relationship between rainfall and recharge, though the degree of connection varies across the different aquifer formations with some being more reactive and others muted.

Overall, the assessment found long-term trends in groundwater levels and salinity across all 10 of the high demand UWMZs investigated for the WMLR to be stable, despite annual fluctuations in recorded groundwater levels.

An example is displayed below, in Figure 7,for the Inverbrackie Creek Adelaidean zone's recorded groundwater levels at four observation wells from 2002 to 2023.

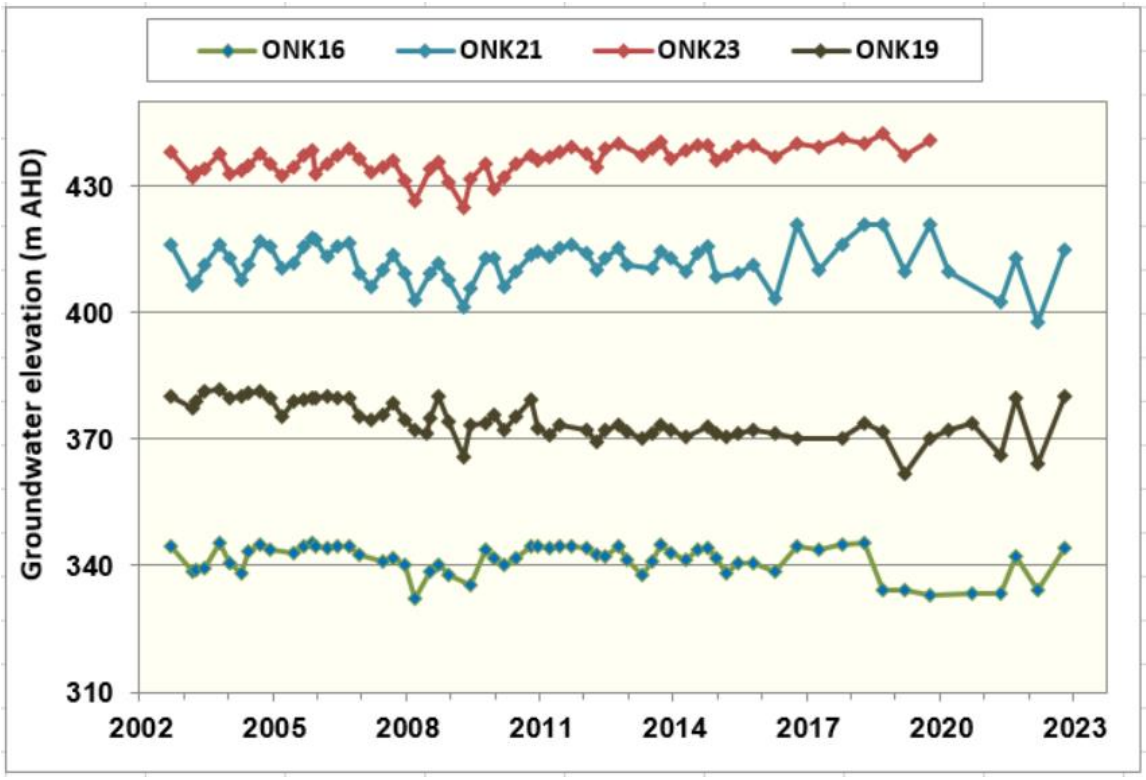


Figure 7 Groundwater levels recorded at four observation wells in Inverbrackie Creek Adelaidean UWMZ (DEW, 2023)

6 Allocation and use of water resources

6.1 Surface water

Summary

- The WAP defines a *sustainable extraction limit* for surface water resources to be 25% of total *resource capacity* at the surface water management zone (SWMZ) scale.
- The original modelling underpinning the WAP found that the 25% limit was only sustainable if low flows were passed by all in-scope dams and watercourse diversions.
- 14.7% of all 14,479 farm dams across the WMLR (n=2,126) are considered 'in-scope' and anticipated by the WAP to pass low flows in order for the 25% extraction limit to be sustainable.
- To date, implementation of low flow releases in the WMLR is limited to 26 dams in the Carrickalinga area, with a further four dams in the Inman Valley area participating in an 'environmental flows' trial.
- Without low flow releases, the WAP states the extraction limit would need to be five times less (5% of resource capacity) to maintain ecosystems at the same level of risk.
- Allocation volumes issued to surface water licence holders were based on existing levels of use and exceed the 25% limit set by the WAP for many zones.
- The public water supply reservoirs account for a significant proportion (85.5%) of all licensed use. Their location towards the 'bottom end' of catchments means they do not directly affect the sustainable allocation and use of surface water for the spatial majority of catchments.
- Of the 8 catchments, five have 'total allowable use' volumes which exceed the 25% take limit, by as much as 529% for Little Para River Catchment.
- Even with public water supply removed, comparing 'total allowable use' of catchments to the 5% extraction limit shows most double that limit.
- It is difficult to accurately know how much surface water is actually used year to year by licence holders or by non-licenced users, as there is very limited metering data.

The allocation and use data presented in this section has been collated as part of a 'stocktake' project for water demand and use in the Mount Lofty Ranges (van der Wielen, 2023 unpublished). Unless otherwise stated, the data is current up to the 2021-2022 water use year. The data presented here may have small differences to similar data in other reports, such as water resource assessments prepared by DEW or reporting for Water Act compliance purposes. The reasons for data discrepancies include; accessing source data at different times, inclusion or exclusion of different types of data (i.e. 'deemed licence use' compared to metered licence use), or different assumptions made when analysing or collating data. Despite these differences this data is considered fit for purpose for informing this review. It is important to note than an exceedance of an extraction limit set in the WAP does not necessarily correlate to non-compliance with Basin Plan Sustainable Diversion Limits.

The eight catchment areas of the WMLR PWRA (shown in Figure 8 below) are further divided into Surface Water Management Zones (SWMZs) which are the scale at which rules and limits are set. The Fleurieu Peninsula is an exception to this, where catchments are the scale of management adopted.

.Figure 8 Map of the WMLR region, the SWMZs, and the watercourses across the plains

A breakdown of allocation and use figures compared to the extraction limit (or, take limit) for each of the eight catchments across the WMLR PWRA is provided in Table 5, with definitions for key terms provided on page 9. The figures provided include allocation volumes issued to licence holders, estimated volumes of non-licensed water use (for stock and domestic and commercial forestry), 'total allowable use' that combines licenced and non-licenced volumes, and 'total estimated use' for the 2021-2022 water use year which draws on available metering data and estimated figures. A summary of the key points from Table 5 is given below:

- Of the eight catchments, five have 'total allowable use' volumes which exceed the 25% take limit set in the WAP, with volumes equating to 130%-529% of respective catchment limits.
- Estimated surface water use by commercial forestry is highest in the South Para, Myponga River and Fleurieu Coastal catchments. The estimated forestry use in Fleurieu Coastal Catchment is equivalent to the volume allocated to licence holders in that catchment.
- By comparing 'total estimated use' figures to 'total allowable use' figures it is clear that licence holders in all catchments used less than their full allocation for the 2021-2022 water use year.
- SA Water's allocation, associated with the public water supply reservoirs, accounts for a significant proportion (85.5%) of all licensed use in the WMLR PWRA.
- If SA Water's allocation volume is removed from the 'total allowable use' for each catchment, then the remaining volumes equate to 27%-76% of the current 25% take limits set out in the WAP.
- The 25% take limit assumes low flows will be passed by all dams over 5ML in size, and without these flows passed the sustainable limit drops to 5% of total resource capacity.
- Even with SA Water's allocation removed, comparing 'total allowable use' of catchments to a 5% take limit shows all are well in excess of this limit (see Table 4 below).

Table 4 Comparison of total allowable use (ex SA Water) in each catchment to the 25% and 5% take limits, with total allowable use expressed as a % of those limits.

Catchment	Total allowable use (ex SA Water) ML	Compared to 25% take limit	Compared to 5% take limit
Little Para River	658	27%	133%
South Para River	13,571	67%	334%
River Torrens	9,876	33%	164%
Onkaparinga River	10,423	52%	261%
Willunga Basin	1,707	76%	382%
Myponga River	2029	52%	259%
Hindmarsh & Inman River	3,872	55%	274%
Fleurieu Coastal	7,452	56%	280%

Table 5 Volumes of allocation and use for surface water for 2021-22, summed for each catchment in the WMLR PWRA.

Catchment	No. licences	Measure	25% Take limit	Allocations (ex SA Water)	Allocations (inc SA Water)	Stock and domestic	Forestry	Total allowable use	Est. total use (2021-22)
Little Para River	39	Volume (ML)	2,471	455	12,879	170	33	13,082	2,998
		as % limit		18%	521%	7%	1%	529%	121%
South Para River	55	Volume (ML)	20,308	4,353	25,964	770	8,448	35,182	16,620
		as % limit		21%	128%	4%	42%	173%	82%
River Torrens	221	Volume (ML)	30,157	6,006	35,662	1,274	2,596	39,532	24,184
		as % limit		20%	118%	4%	9%	131%	80%
Onkaparinga River	478	Volume (ML)	19,979	6,488	78,383	2,438	1,497	82,318	55,469
		as % limit		32%	392%	12%	7%	412%	278%
Willunga Basin	81	Volume (ML)	2,234	1,183	1,183	358	166	1,707	1,127
		as % limit		53%	53%	16%	7%	76%	50%
Myponga River	35	Volume (ML)	3,912	537	7995	357	1,135	9,487	7,076
		as % limit		14%	204%	9%	29%	243%	181%
Hindmarsh & Inman River	76	Volume (ML)	7,071	2,131	2,131	1,214	527	3,872	2,882
		as % limit		30%	30%	17%	7%	55%	41%
Fleurieu Coastal	98	Volume (ML)	13,319	3,091	3,091	1,321	3,040	7,452	6,450
		as % limit		23%	23%	10%	23%	56%	48%
Whole of WMLR	1,084	Volume (ML)	99,451	24,249	167,294	7,901	17,441	192,636	116,812
		as % limit		24%	168%	8%	18%	194%	117%

Important notes about the data in Table 5:

- Only a small proportion of all licenced surface water users are metered in the WMLR, so estimates have been developed to provide 'assumed use' figures for those who are not metered, and these figures stay the same each year. These estimates could be higher or lower than the 'actual use' by individual licence holders each year.
- Estimates were developed as part of WAP for volumes of non-licenced surface water use by stock and domestic purposes and commercial forestry. These estimates are based on information current to 2005.
- Extraction from watercourses for stock and domestic purposes is not included in the estimates given in Table 5, and the WAP is also silent on estimates for what this use may equate to across the PWRA.
- Figure 9 is provided below to help highlight the spatial distribution of surface water management zones where 'total allowable use' exceeds the 25% extraction limit set in the WMLR WAP. The figure illustrates that although some catchment areas are not in excess of limits as a whole, they do contain zones where total allowable use exceeds take limits.

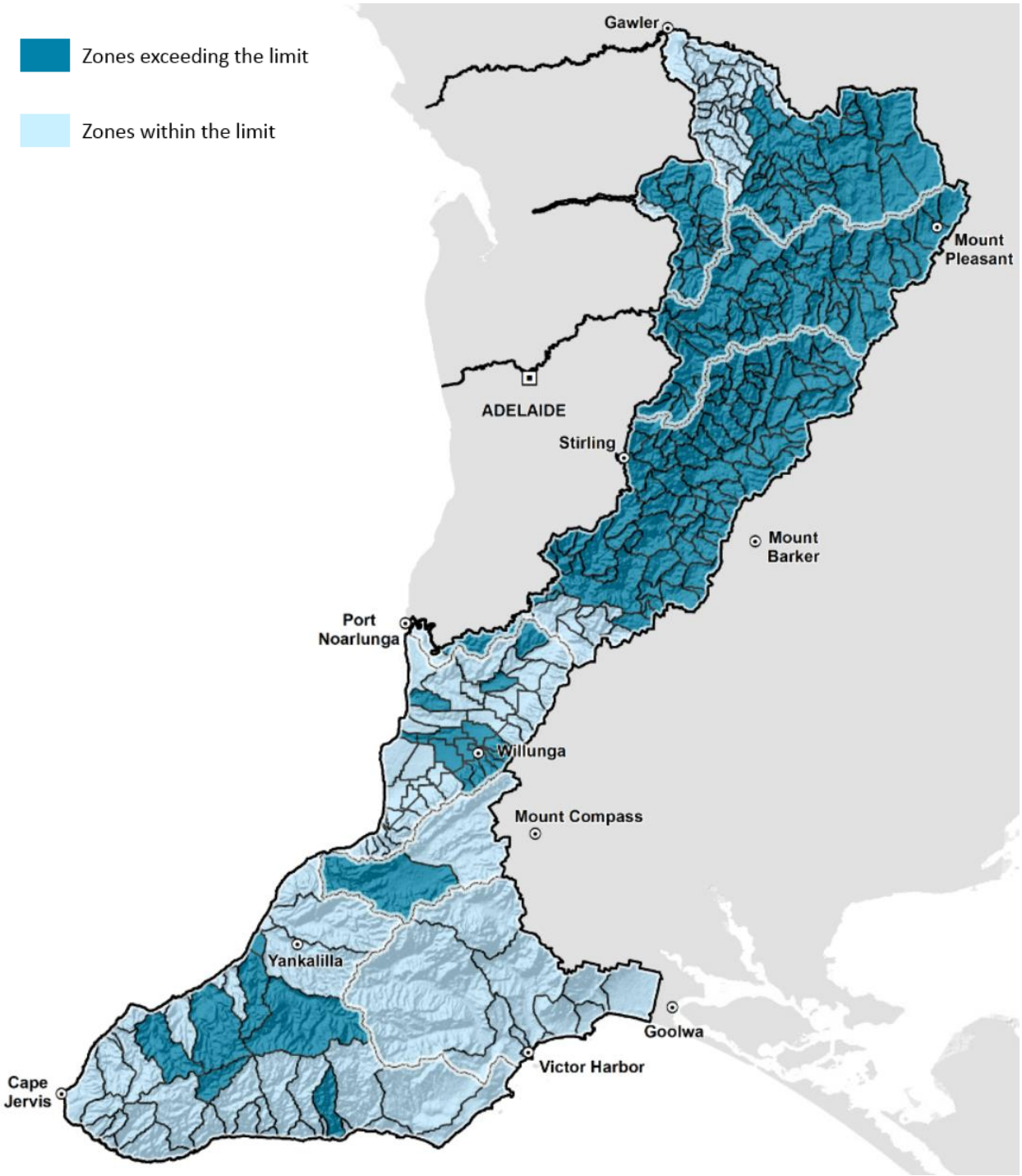


Figure 9 Map of the spatial distribution of SWMZs where 'total allowable use' exceeds the 25% extraction limit set in the WMLR WAP.

6.1.1 Farm Dams

The Western Mount Lofty Ranges encompasses some of the highest rainfall areas in the state and supports some of the most productive agricultural landscapes. In addition to its productive merits, the WMLR region is also an area of strong appeal to 'lifestyle' farmers and supports a growing visitor economy. Factors such as water availability, water quality, suitability of land and climate for water-using industries (agriculture), aesthetic qualities of hills living coupled with limited 'mains' water supply outside of townships, have resulted in a very high concentration of farm dams in the region.

Collectively, farm dams have a significant impact upon water dependent ecosystems, because they reduce the net amount of water available to downstream environments and alter the timing and duration of flows in watercourses (see section 2.2.1 for more details). These impacts also have the potential to affect the security of surface water supply to downstream dams and watercourse extractions.

A breakdown of key dam statistics for the WMLR PWRA is provided below, collated from data current up to the 2021 to 2022 water use year:

- There are 14,479 farm dams across the WMLR, having an estimated total volume of 40,329 ML.
- 90% of farm dams are used for stock and domestic purposes and 10% are used for irrigation.
- In the WMLR, dams used for stock and domestic purposes that are 5 ML or greater in size are 'licensed' and subject to similar provisions of the Act and the WAP as other licensed dams.
- 90.5% (n=13,103) of all WMLR dams are 5ML or less in size and these hold 12,769ML, or a 31.7% share of all dam volume.
- 1.8% (n=264) of all WMLR dams are 25ML or greater in size and these hold 15,766 ML, or a 39.1% share of all volume.
- 14.7% (n=2,126) of all dams are considered 'in-scope' and anticipated by the WAP to pass low flows in order for the 25% extraction limit to be sustainable.
- As of 2023, a total of 26 dams (mostly in the Carrickalinga catchment) are providing LFRs and a further four dams in the Inman River catchment have participated in a trial to release flows using existing outlets. (see section 2.2.1 for more details)

The volume of water held in farm dams is not evenly distributed across the WMLR PWRA. Mapping of farm dam densities help to understand the spatial distribution of volumes held, and where areas of greatest concentration exist. Figure 10 on the following page displays farm dam densities for each SWMZ, expressed as the volume of dams (ML) per square kilometre.

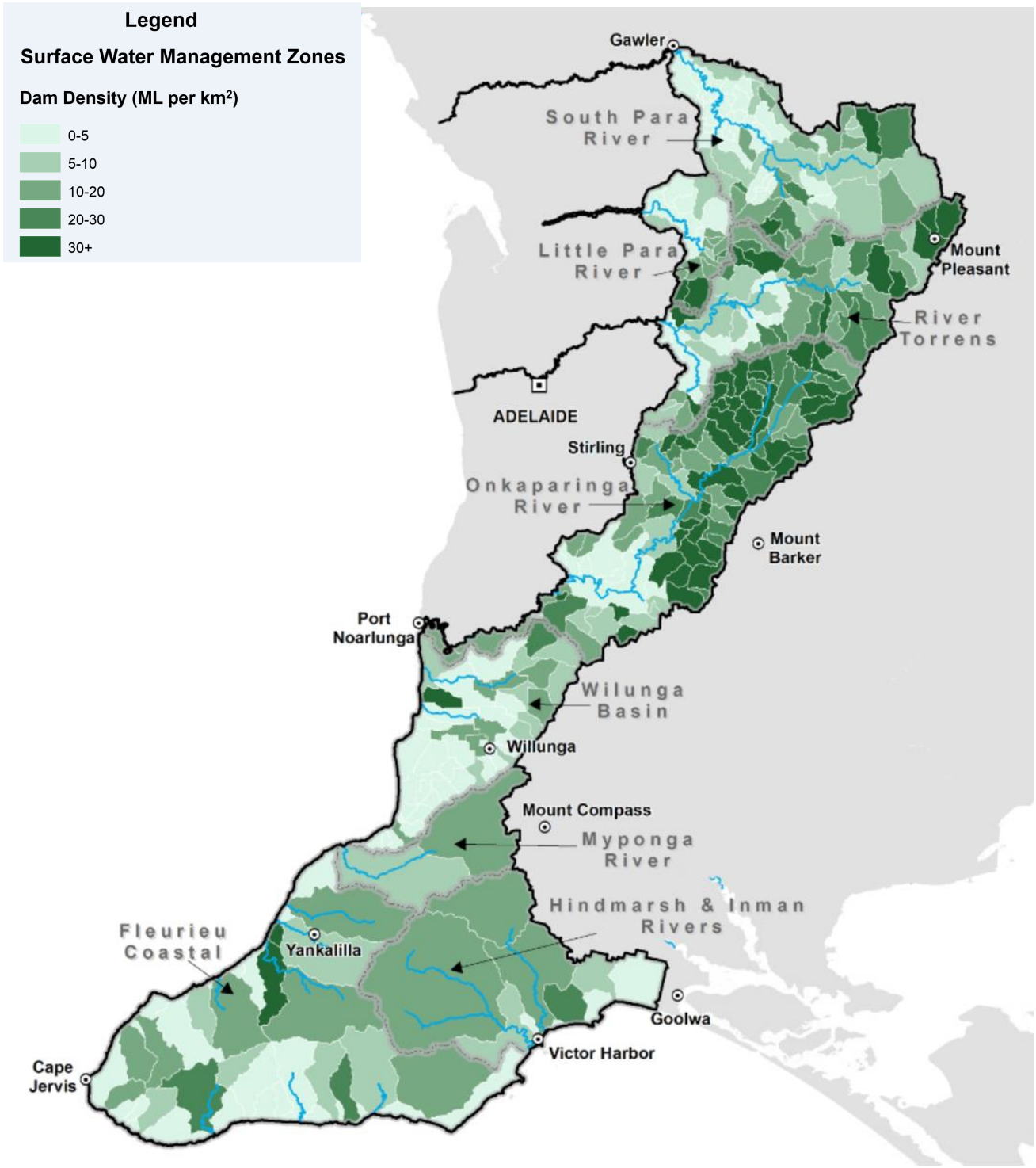


Figure 10 Farm dam density in the WMLR PWRA.

6.1.2 Environmental Water Provisions from SA Water reservoirs

Surface water flows from the WMLR are captured within eight reservoirs managed by SA Water. The reservoirs are located within five catchments: the South Para, Warren and Barossa Reservoirs (South Para Catchment), Little Para Reservoir (Little Para Catchment), Millbrook and Kangaroo Creek Reservoirs (River Torrens Catchment), Mount Bold Reservoir (Onkaparinga River Catchment) and Myponga Reservoir (Myponga River Catchment). On average, the flows from the Mount Lofty Ranges that are harvested by the reservoirs supply 60% of metropolitan Adelaide's water needs, with the rest pumped from the River Murray or the Adelaide Desalination Plant.

Section 2.5.1 of the WAP requires that SA Water "*supply up to 16.5 GL annually to be released from its reservoirs for environmental flow purposes, subject to the outcomes of trial investigations of the required flow regime.*" The delivery of environmental flows under this provision is a condition of SA Water's metropolitan water licence.

The HFLB works with Green Adelaide and SA Water to implement an environmental water provisions program (the SA Water Eflows Program) aimed at delivering these environmental water flows to four identified reaches of the South Para, Torrens and Onkaparinga Rivers. The program commenced implementation in 2012, initially on a trial basis.

Changes made to the program over time have reflected SA Water's obligations regarding metropolitan water supply, and challenges imposed by climate variability. The original program was developed in consideration of clearly identified ecological objectives, however the current program has been modified without a clear understanding of the impacts on those objectives, or with reference to new objectives.

The most recent review of the SA Water Eflows Program was completed in 2022 and was undertaken by an independent panel of ecologists and hydrologists, who considered data collected on the last five years of program operation (2017 – 2021). The review addressed a number of questions relating to the impact of the Eflows program on river hydrology, water quality, and on fish, macroinvertebrates and instream and riparian vegetation. It also addressed whether the program impacted SA Water's ability to provide a secure water source for Adelaide.

The review highlighted the challenge of maintaining even the minimum baseflow in times of low rainfall and when minimum water security levels are reached in SA Water reservoirs. Monitoring suggests that the cancellation of planned baseflow events has had a compounding negative impact on fish abundance.

A contributing factor to the challenges of finalising a program of environmental releases that meet clearly defined environmental objectives is the lack of clarity or detail in the current WAP principles. This highlights a need for the relevant provision to be reviewed and rewritten to more clearly articulate environmental objectives and minimum environmental outcomes that need to be met.

6.2 Groundwater

Summary

- Of the 1,458 groundwater licences held across the WMLR, about 1,012 licences (70%) did not have any metered extraction, or used less than 20% of their allocation for the 2021-2022 water use year.
- Total allocation volumes granted to licence holders exceed the extraction limit set by the WAP for 13 of the 45 WMLR zones.
- Almost all groundwater licence holders are metered, which allows us to know that despite some zones being over-allocated, the volumes of actual use are below the extraction limit in all zones.
- The estimated volumes of stock and domestic groundwater use equate to 2% or less of the respective zone take limits and estimated use for forestry purposes is generally 5% or less of the respective zone take limit.
- For South Para, Southern Fleurieu North and Southern Fleurieu South zones, the volume of estimated groundwater use by forestry and stock and domestic purposes is quite significant compared to the volume of groundwater allocated to licence holders.
- In order to have up-to-date estimates for non-licensed use, more recent data should be incorporated.
- Groundwater allocation and use figure are presented for the 2021-2022 water use year, a relatively wet year, which should be kept in mind when interpreting this sections data.

The allocation and use data presented in this section has been collated as part of a 'stocktake' project for water demand and use in the Mount Lofty Ranges (van der Wielen, 2023 unpublished). Unless otherwise stated, the data is current up to the 2021-2022 water use year. The data presented here may have small differences to similar data in other reports, such as water resource assessments prepared by DEW or reporting for Basin Plan purposes. The reasons for data discrepancies include; accessing source data at different times, inclusion or exclusion of different types of data (i.e. 'deemed licence use' compared to metered licence use), or different assumptions made when analysing or collating data. Despite these differences this data is considered fit for purpose for informing this review. It is important to note than an exceedance of an extraction limit set in the WAP does not necessarily correlate to non-compliance with Basin Plan Sustainable Diversion Limits.

The WMLR PWRA is divided into 45 individual underground water management zones (UWMZ's) to enable the rules and limits of the water allocation plan to be set at the local scale (Figure 11). The boundaries of the UWMZ's are based on surface water sub-catchment boundaries and hydrogeology (AMLR NRM Board, 2013). These 45 UWMZs do not include the groundwater resources of the McLaren Vale Prescribed Wells Area, which are managed under a separate water allocation plan and not discussed here.

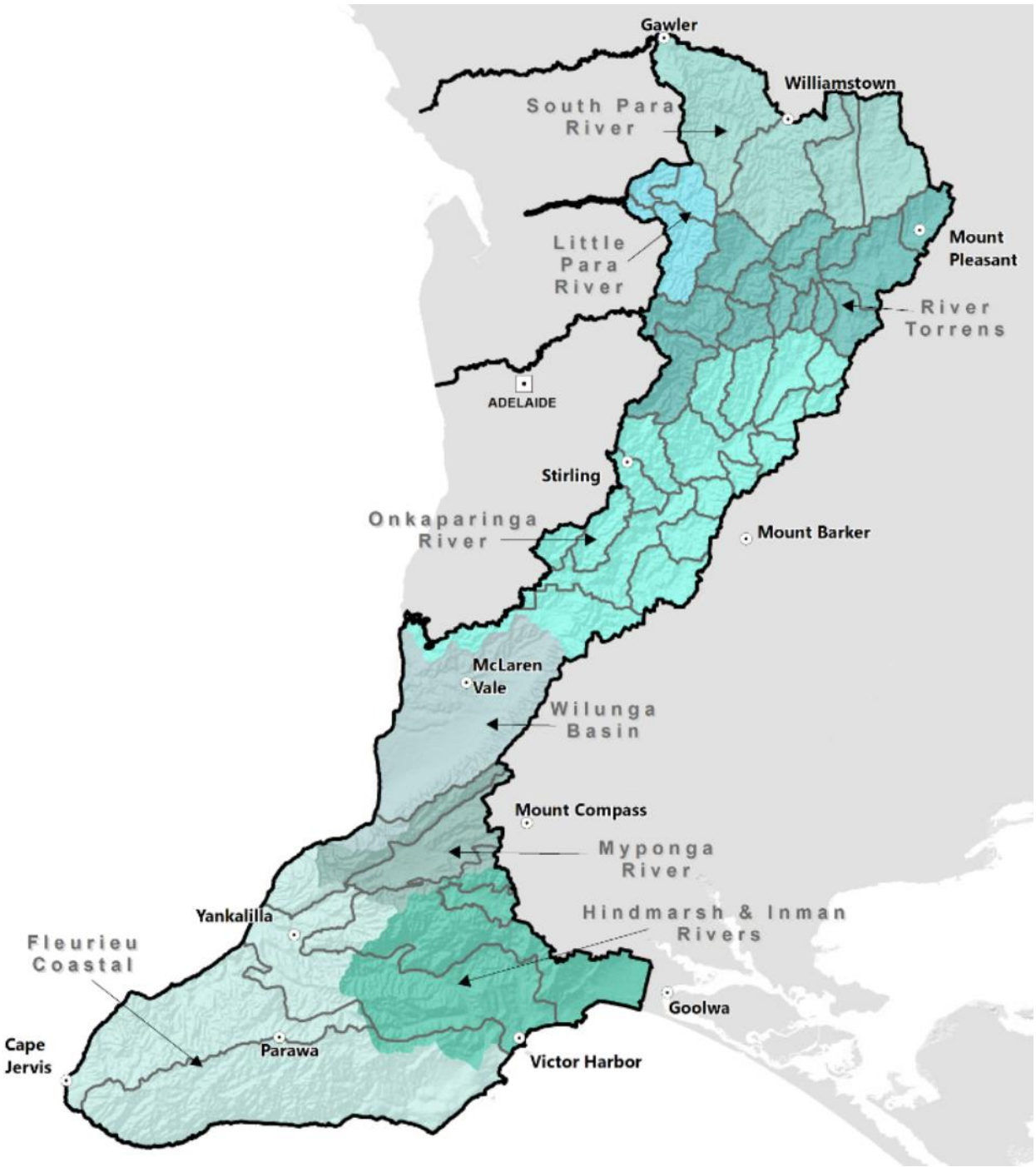


Figure 12 The 16 grouped underground water management zones (UWMZs) of the EMLR, shown with light grey boundary outlines. The overlying catchment areas are shown with blue and green shading

6.2.1 Licenced groundwater use

Across the WMLR PWRA there are a total of 1,458 groundwater licences, equating to a total volume of 52,421 ML in allocations. The volume of groundwater extraction by licence holders is not evenly distributed across the 45 underground water management zones (UWMZs) of the WMLR. Figure presents a 3D visualisation of the spatial distribution of metered extraction in the 2021-2022 water use year (red vertical columns) across the central hills and Fleurieu regions. The boundaries of UWMZs are shown in dark blue outline.

It is important to note that only licenced groundwater extraction is metered, and so the volumes extracted for non-licensed purposes (forestry, stock and domestic) are not reflected here in Figure 12. Discussion on the estimated use of groundwater by non-licensed purposes is given in Section 6.2.2.

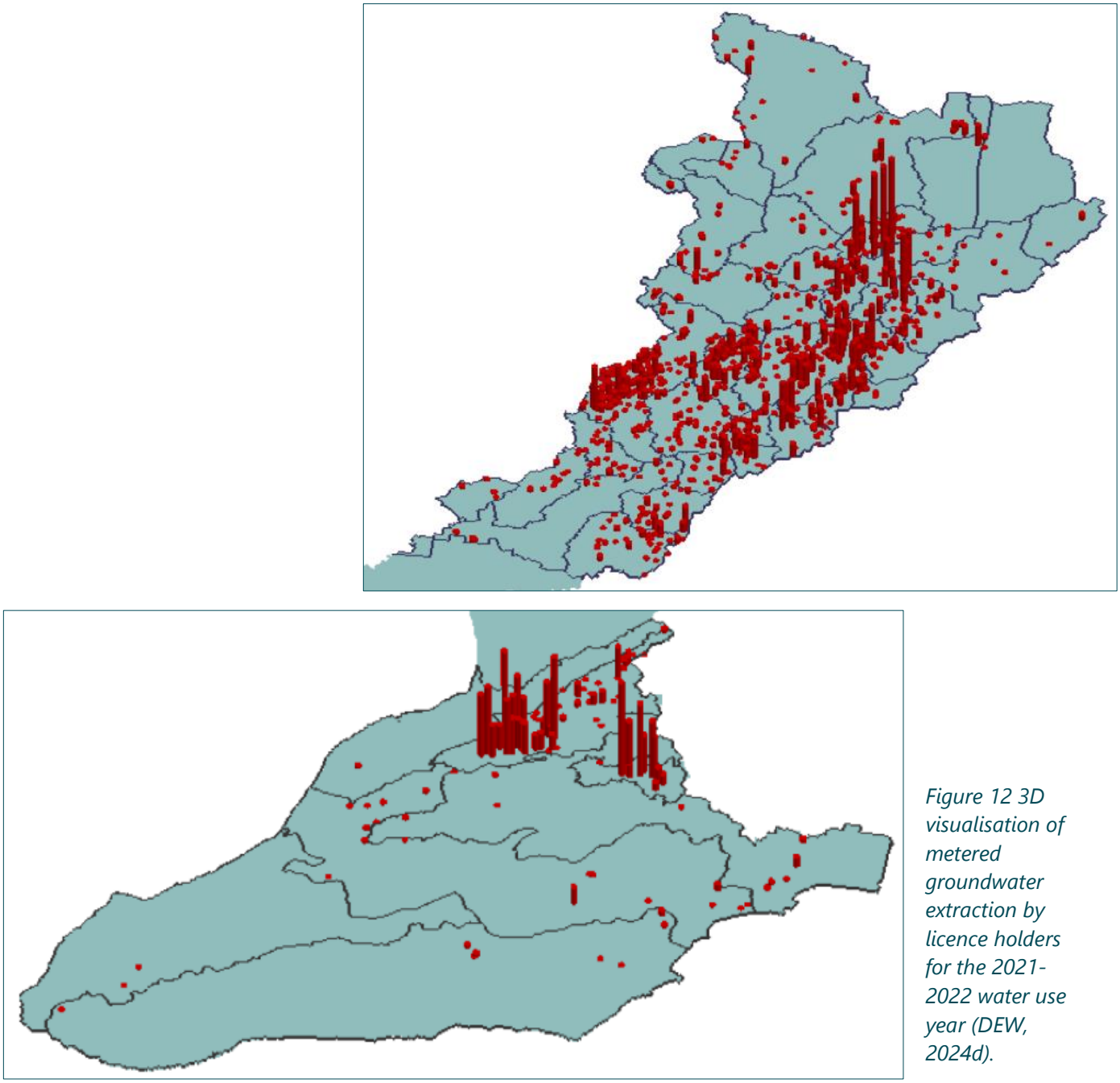


Figure 12 3D visualisation of metered groundwater extraction by licence holders for the 2021-2022 water use year (DEW, 2024d).

Analysis of metered extraction as a percentage of the individual licenced allocations for the WMLR PWRA in 2020-21 shows that many groundwater licences are presently not being used, or have limited use. Of the 1,458 licences, about 1,012 licences (70%) do not have any metered extraction, or used less than 20% of their allocation for the 2021-2022 water use year.

Total allocation volumes exceed the zone extraction limit set in the WMLR WAP in 13 of the 45 zones. Although allocations exceed the extraction limits, the volumes of actual metered use by licence holders are below the extraction limit in all zones. The relationship between zone extraction limit, allocation volumes and metered use for the Charleston Adelaidean UWMZ is presented in the graph below (Figure 13) and is typical of most the high demand zones.

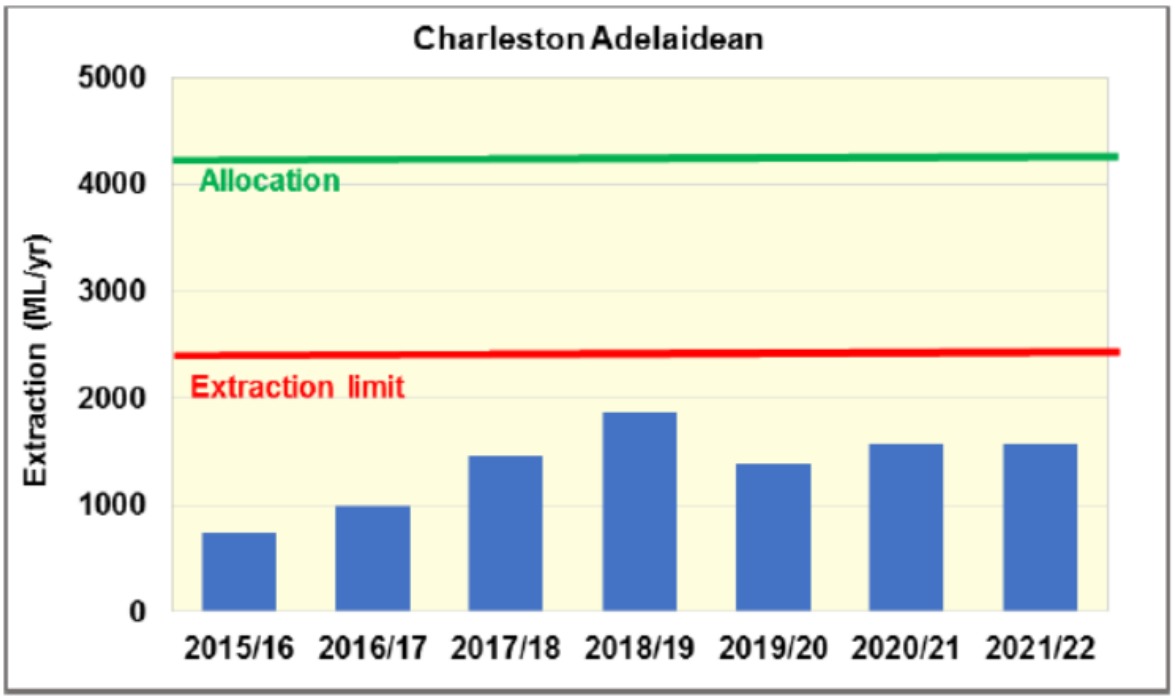


Figure 13 Zone extraction limit, total allocation volume and metered use for the Charleston Adelaidean UWMZ (DEW, 2024d)

Table 6, overleaf, presents the metered use data for each UWMZ in the WMLR PWRA for the 2021-22 water year together with the level of allocation and the extraction limit. In 13 of the UWMZs (shaded in green in Table 6), levels of allocation are higher than the extraction limits set in the water allocation plan for that zone, with eight of these having significant levels of over-allocation where the volume of allocations is at least 120% of the extraction limit.

Table 6 *WMLR groundwater extraction limits, allocation volumes and metered use for 2021-2022*

Catchment	UWMZ	Extraction limit	Volume allocated	% of extraction limit	Metered Use	% of extraction limit
South Para River	Lower South Para River	5,293	729	14	96	2
	Middle South Para River	3,142	951	30	118	4
	Upper South Para Adelaidean	486	332	68	8	12
	Upper South Para Kanmantoo	596	83	14	50	2
Little Para River	Gould Creek	1,096	296	27	15	1
	Little Para Reservoir	178	169	95	7	4
	Lower Little Para River	286	94	33	18	6
	Upper Little Para River	1,611	877	54	133	8
River Torrens	Kersbrook Creek	601	434	72	48	8
	Mount Pleasant	290	45	15	15	5
	Birdwood	1,450	277	19	129	9
	Hannaford Creek	900	935	104	14	2
	Angas Creek	1,652	957	58	229	14
	Millers Creek	2,390	1,393	58	986	41
	Gumeracha	1,843	2,121	115	481	26
	McCormick Creek	813	779	96	196	24
	Footes Creek	1,016	905	89	355	35
	Kenton Valley	1,603	1,327	83	362	23
	Cudlee Creek	550	292	53	60	11
	Kangaroo Creek Reservoir	957	403	42	81	8
	Sixth Creek	2,535	3,055	120	563	22
Onkaparinga River	Charleston Kanmantoo	672	439	65	79	12
	Charleston Adelaidean	2,550	4,420	173	1,575	62
	Inverbrackie Creek Adelaidean	940	1,767	188	567	60
	Inverbrackie Creek Kanmantoo	395	325	82	66	17
	Mitchell Creek	754	713	94	193	26
	Western Branch	1,950	1,191	61	377	19
	Lenswood Creek	3,286	5,575	170	1,015	31
	Upper Onkaparinga	2,034	2,433	120	455	22
	Balhannah	779	745	96	233	30
	Hahndorf	701	657	94	134	19
	Cox Creek	1,350	2,158	160	718	53
	Aldgate Creek	200	221	110	51	26
	Scott Creek	977	182	19	30	3
	Chandlers Hill	180	186	103	11	6
	Mount Bold Reservoir	1,334	388	29	29	2
	Biggs Flat	1,102	765	69	214	19
	Echunga Creek	1,270	1,429	113	163	13
Southern Fleurieu	Hindmarsh Tiers Sedimentary	1,988	3,596	181	1,015	51
	Hindmarsh Fractured Rock	2,040	638	31	44	2
	Myponga Sedimentary	4,330	6,051	140	2,215	51
	Myponga Adelaidean	1,619	290	18	6	0
	Fleurieu Permian	7,614	1,537	20	76	1
	Southern Fleurieu North	1,815	126	7	2	8
	Southern Fleurieu South	1,197	399	33	31	3
	Total	**70,365**	**52,421**		**13,263**	

6.2.2 Non-Licenced Groundwater Use

The use of groundwater for stock and domestic purposes and for commercial forestry does not require a licence in the WMLR PWRA and these forms of use are also not metered. Estimates were developed for the volumes of groundwater used by these non-licenced forms of demand at the time of developing the current WAP.

Section 4 of the 2013 WMLR WAP provides an *Assessment of Demand on Water Resources*, including estimates for current (at that time) water use for licensed and non-licensed purposes. The WAP estimates a total of 11,500 wells across the PWRA, with 2,860 of these recorded as stock and domestic wells. The estimated total volume attributed to stock and domestic groundwater uses is 4,956 ML per year, which equates to 0.5ML of use per year by each of the 2,860 wells.

Commercial forestry plantations are estimated in the 2013 WMLR WAP to comprise a total area of 12,400 ha. This includes 8,900 ha of softwood (pine), 1,500 ha of hardwood (Tasmanian blue gum etc.) and 2000 ha of farm forestry (various species). Forestry plantations present a demand on groundwater resources in two main ways; they intercept surface water runoff, reducing the volume of recharge to aquifers, and in areas of shallow groundwater storage the root systems directly extract groundwater from aquifers. Methods for calculating volumes of groundwater use by commercial forestry were developed as part of the 2013 WMLR WAP, and involve the application of a ML/ha/year figure for either hardwood or softwood plantations.

A breakdown of estimated groundwater use by stock and domestic and commercial forestry is given in Table 7 on the following page. Figures are provided for each GWMZ 'group' (refer to Figure 11 for their spatial boundaries) and the volumes allocated to licence holders are provided for comparison. Percentage figures are given to illustrate what proportion each use category represents against the overall take limit for each GWMZ group area.

From Table 7 it is clear that:

- For most GWMZ groups, the estimated volumes of stock and domestic groundwater use equate to 2% or less of the respective take limit and estimated use for forestry purposes is generally 5% or less of the respective take limit.
- Three GWMZ groups have higher stock and domestic estimated use; Hindmarsh Fractured Rock and Southern Fleurieu North GWMZs, where estimates equate to 8% of the take limit for both these areas, and in the Southern Fleurieu South area the estimated use represents 17% of the take limit.
- For the four GWMZ groups where estimated forestry use is higher, the volumes equate to;
    - 11% of the take limit in the Myponga Sedimentary
    - 14% of the take limit at Southern Fleurieu South
    - 22% at South Para
    - 27% in Southern Fleurieu North
- For South Para, Southern Fleurieu North and Southern Fleurieu South GWMZ groups the volume of estimated groundwater use by forestry and stock and domestic purposes is quite significant compared to the volume of groundwater allocated to licence holders. For all three GWMZ groups, the combined take by forestry and stock and domestic purposes exceeds licensed allocations.

Table 7 Estimated volumes of groundwater use by non-licensed purposes compared to licensed allocation volumes. Volumes also expressed as % of the take limit for each GWMZ group.

GWMZ Group	Measure	Take Limit	Stock and domestic	Forestry	Allocations
South Para	Volume (ML)	12,431	156	2,758	1,911
	as % limit		1%	22%	15%
Little Para	Volume (ML)	3,218	33	14	1,529
	as % limit		1%	0%	48%
Torrens	Volume (ML)	17,683	271	812	13,244
	as % limit		2%	5%	75%
Onkaparinga	Volume (ML)	21,404	413	556	23,899
	as % limit		2%	3%	112%
Myponga Adelaidean	Volume (ML)	1,627	4	4	290
	as % limit		0%	0%	18%
Myponga Sedimentary	Volume (ML)	4,969	135	560	6,057
	as % limit		2%	11%	122%
Hindmarsh Fractured Rock	Volume (ML)	2,291	174	78	812
	as % limit		8%	3%	35%
Hindmarsh Tiers Sedimentary	Volume (ML)	2,023	12	23	3,600
	as % limit		1%	1%	178%
Fleurieu Permian	Volume (ML)	8,031	87	330	1,369
	as % limit		1%	4%	17%
Southern Fleurieu North	Volume (ML)	2,794	237	742	126
	as % limit		8%	27%	5%
Southern Fleurieu South	Volume (ML)	1,739	302	240	399
	as % limit		17%	14%	23%

7 Economic context

Summary

- In the WMLR*, the two main industry sectors where water is an essential input ([agriculture, forestry, fishing], and mining) provide $1.17 billion in economic output and provide 3,400 jobs.
- SA Water reservoirs in the WMLR supply around 60% of the water supply for metropolitan Adelaide and the regional centres connected to that network, and consequently underpins the great majority of the State's economic output and jobs through the urban environment.
- Excluding economic output supported by public water supply, **irrigated agriculture** accounted for 81% of the economic value directly generated by water use.
- Data availability limited the analysis of economic context and it may be useful to consider re-introducing a simplified annual water use return process.

*Including McLaren Vale and the watercourses across the plains

A water allocation plan needs to balance environmental, consumptive, social and cultural needs for water, therefore it is important to understand the economic context. The Board engaged Aither, a consultant company experienced in economic analysis of water resources, to undertake a project titled *Economic significance of water resources in the Mount Lofty Ranges*. The scope of this project was to quantify the direct and indirect value of water for consumptive use across the two Mount Lofty Ranges prescribed water resource areas. The scope included the McLaren Vale Prescribed Groundwater Area and the 'watercourses across the plains' that are part of the Western Mount Lofty WAP region; Gawler River, Little Para River, River Torrens, and Onkaparinga River.

7.1 Results

Quantifying the economic significance of water use across different types of consumptive use (e.g. public water supply, irrigated agriculture or mining) is challenging as the degree to which the economic activity generated arises from water use is quite variable. The methodology adopted was to use 'gross margin' multiplied by the volume of water use. Gross margin is the gross financial return to an enterprise. For the purpose of the analysis in this report, a gross margin is defined as annual farm income (revenue) less variable costs. This figure is much less than the total income generated by the activity, so it is not a measure of the economic size of the activity but is a more appropriate way to compare relative significance of different types of use.

Due to the difficulty of developing a defensible gross margin figure for public water supply, the water used by SA Water has been excluded from the comparison. In addition to this SA Water reservoirs in the WMLR supply around 60% of the water supply for metropolitan Adelaide and the regional centres connected to that network. Consequently much of the surface water captured in the WMLR is used outside the region and underpins the great majority of the State's economic output and jobs through the urban environment.

Table 8 presents the relative economic significance measured by gross margin of water split across each region. Excluding economic output supported by public water supply, irrigated agriculture accounted for 81% of the economic value directly generated by water use.

Table 8 Economic significance, measured as gross margin of water, split across regions ($million/annum)

$2022/23 (millions)	Stock and Domestic	Forestry	Irrigated agriculture*	Industrial	Mining	Total
WMLR	1.63	1.87	21.47	4.90	0.43	**30.30**
McLaren Vale	0.06	0.01	20.88	0.77	0.07	**21.79**
4 WCAP*s	0.05	0.04	0.77	0.00	0.00	**0.86**

**Watercourses across the plains

7.2 Wider Economic Benefits

- The two regions (EMLR and WMLR) generate an estimated $20.5 billion per year in total income across all types of economic activity and industry sectors (not just water supported industries), which represents 7.7 per cent of the total income generated across South Australia.
- The productive capacity of the agricultural sector and the flow on jobs this creates in the manufacturing sector and the wealth it brings to both the region and more broadly across the State is substantial.
- Whilst the mining sector does not contribute many jobs, its contribution to the construction industry across the region is significant, due to the important feedstocks (via many small-scale quarrying operations) it provides for this industry to operate.
- There is significant flow on effects from these three major water essential industries that provide economic stimulus via output and employment to many other sectors of the regional economy including construction, electricity, gas, water and waste services, accommodation and food services, retail trade, transport, postal and warehousing, and the professional, scientific and technical services sectors.

Table 9 shows the economic output and number of jobs provided for the two main industry sectors where water is an essential input.

Table 9 The main industry sectors that use water as an essential input, and their outputs.

	Mining		Agriculture, forestry & fishing		Total	
Region	Output ($m)	Jobs	Output ($m)	Jobs	Output ($m)	Jobs
WMLR*	176	162	755	2,529	1,173	3,408

*Including McLaren Vale and the watercourses across the plains

7.3 Data Availability

Data availability limited the analysis of economic context and it may be useful to consider re-introducing a simplified annual water use return process.

8 Engagement

This section provides an overview of the engagement undertaken during the WMLR WAP review process and the feedback received, with more information provided in Appendix 2.

A joint engagement process was undertaken for the EMLR and WMLR WAP reviews to better facilitate conversations about the challenges and opportunities facing the two WAPs. It was recognised that many individuals and organisations hold interests and views spanning both regions, supporting the use of a joint process. Feedback summarised below is generally reflective of combined EMLR and WMLR views, however, there are some particular matters relating to specific regions within the WMLR, and these are highlighted below.

Summary

Six forms of engagement were undertaken during the review.

- Local leaders discussions - **7** meetings
- Survey - **485** responses
- Drop-in sessions - **131** people attended **6** sessions
- Agency engagement - **8** local and state agency meetings
- Formal submissions - **11** formal submissions from individuals and organisations
- Targeted stakeholder discussions - **15** meetings

The key topics raised across all forms of engagement are listed below, with a range of perspectives and views heard on each of these topics:

- Low flows
- Stock and domestic
- Concern about allocation cuts
- Ecosystem health
- Climate change
- Changing land use in region
- Information transparency and accessibility
- Water trading and transfer rules
- Water efficiency
- Water security
- Water quality
- Fire water
- First Nations water needs
- Forestry
- Fleurieu Peninsula focussed topics

8.1 Engagement approach

Engagement undertaken in the review used a 'broad reach' approach that allowed us to hear from a wide range of stakeholders and community members, with emphasis placed upon creating opportunities for in-depth conversations. The selected engagement approach supported the overarching objective of the evaluation phase (Figure 14) by providing valuable insights into how the ten years of WMLR WAP policy implementation has been perceived, whether the policies are seen to be effective or not, and what the primary challenges, limitations and opportunities have been for the community. The discussions had during the evaluation phase played an additional role of informing the priorities and the approaches to be considered in the subsequent amendment process.

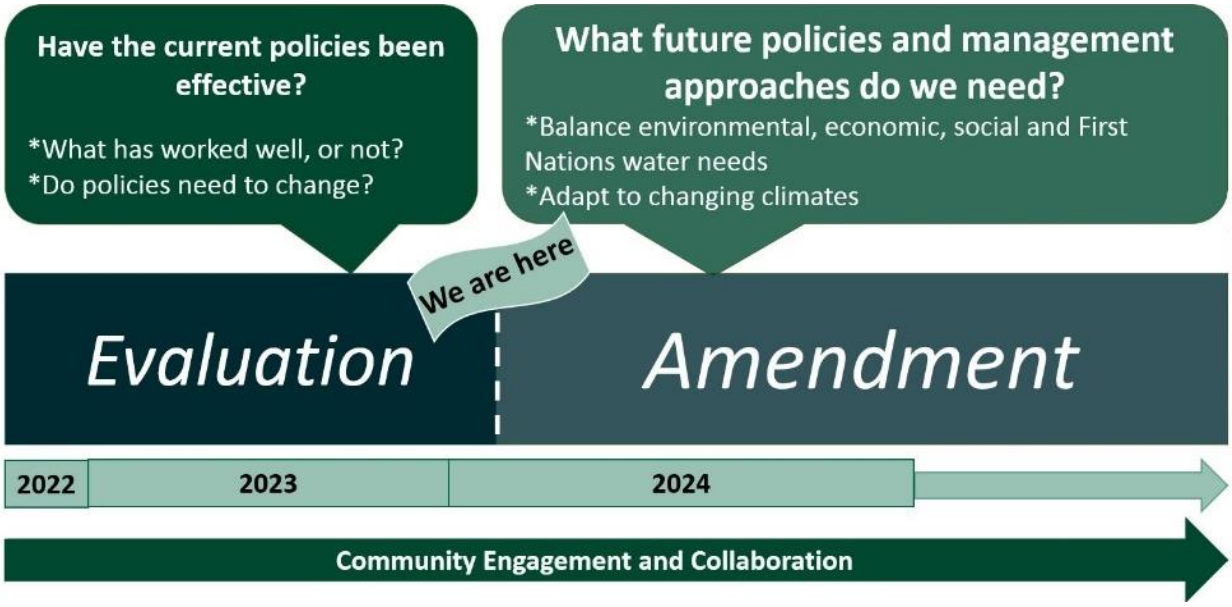


Figure 14 MLR WAP Evaluations and Amendment diagram highlighting the role of of the two phases.

The feedback received from each of our core engagement activities is outlined below. A separate process has been undertaken for First Nations engagement (see Section 9).

8.2 Summary of stakeholder and community views

Table 10 Summary table of topics and key points from all engagement activities (including drop-in sessions, formal submissions, surveys, targeted stakeholder discussions, local leader discussions and agency engagement).

Topic	Key points raised during engagement
Low flows	• Discussion on low flows was one of the most commonly raised topics across all the engagement. • There were mixed views expressed, some in support and others concerned. • Concerns surrounding low flows included; - Risks to water security. - Costs and maintenance involved. • Supporting points included; - Addresses the impact of farm dams and supports ecosystem health. - Passing low flows could maintain allocations at a higher volume.
Stock and domestic	• Similar to the low flows topic, discussion on stock and domestic water use was commonly raised across all the engagement. • Mixed views were expressed, including; o Some felt stock and domestic use should be licensed, and others felt it is a 'right' that should not be licensed. o Concern that 'stock and domestic' includes large dams • More information needed about the volume of stock and domestic water use, some felt metering should be considered.

Allocations	• There was large concern heard over the potential for allocation cuts, namely from licence holders and industry groups. • By contrast, allocation reductions were seen by some as necessary on the basis of fish monitoring results. • Questions raised about management options for over-allocated/ high demand zones. • Many people use much less than their full allocation volume. Not necessarily the volumes being used by people, but the full allocation volumes, that present a risk. • Allocations need to be evidence based and based on the most locally relevant data possible, and not based on generalised data.
Ecosystem health	• Community members and environmental groups raised that more priority should be given to the health of the environment in future WAP policies. • Without a healthy environment, you can't have a good economy.
Climate change	• Concern about how climate change will affect the water resource into the future. • Climate change resilience and readiness is the responsibility of the government. • The WAP should be reviewed more than every 10 years to keep up with the changing climate. • An adaptive system that responds to yearly fluctuations and a changing climate should replace the current use of a 'set number' for allocations.
Changing land use in the region	• Land uses are changing across the region and this may affect the water resources in different ways. • Some pastoralists and graziers have switched to deeper rooted species that retain more water in the soil and reduce surface run-off. • Higher intensity water using industries such as potato growing, dairy and some horticulture were observed to be less prevalent now than previous years. • There was a strong desire for more information about the impacts of these changes to water resources. For example; o Is overall water use lower in some areas now? o Is surface runoff reduced at landscape scale? o Is there more water available in some areas? o Is there a lower risk of depletion to water resources?
Buy-backs	• Buy-backs should be considered for wholly or partly unused allocations to address over-allocated zones. • Some felt buy-backs were necessary so that any reduction to allocations were fair for licence holders.
Information accessibility	• Many raised the importance of making it as easy as possible to access information and support. • The information about status and trends shared during the engagement was generally well received.

	• Information about the status and trends of water resources should be readily available on an ongoing basis.
Trade and transfer rules	• There were opposing views on the current trade and transfer rules: o Current rules are too restrictive and limit the ability for licence holders to successfully undertake trades or transfers. The current limitations are seen to reduce the value of water. o The current restrictions should not be eased, as it presents risks to the resource and the environment.
Water for economy	• Some landholders and business owners highlighted existing difficulties in covering all costs and growing expenses, with water related costs just one of many. • Suggested that annual levy fees should be based on water usage, rather than a fixed amount based on full allocation volume. • Frustrations raised about the present 'blanket ban' on new dam capacity for all parts of the region. Seen as a limitation on economic growth for farms. • Calls for 'case-by-case' consideration of additional dam capacity, particularly for areas that have not exceeded zone limits.
Water efficiency	• Water efficiency needs to be better promoted, or even made a requirement of future policies. • Market access and other financial incentives could be explored, to improve motivation.
Water security	• Water security concerns were raised across industry groups, environmental groups, and community members. The concerns varied, but largely spoke to uncertainty about the future. • Some landholders raised that the water held in dams is not just for one year but for multiple years, and this is important to farm planning for multiple seasons ahead.
Water quality	• Water quality was raised throughout the engagement and was a particularly common topic through responses to the survey. • Water quality felt to be very important and needs more consideration than in the current WAP to protect water resources from pollution and contamination.
Fire risk	• Some landholders raised the importance of having access to water for firefighting purposes.
First Nations	• The concept of First Nations water values was not well understood across many groups engaged with.
Forestry	• The current WAP prevents the expansion of commercial forestry plantations and this was acknowledged by industry representatives to present a barrier to industry growth. • Another limitation raised by organisations and individuals is that the current definition of *commercial forestry* applies to carbon plantings and poses a barrier to establishing carbon sequestration projects.

	• Some members of the community felt that the same water licensing requirements should be applied to commercial forestry as for other water using industries.
Fleurieu Peninsula	Groups and individuals engaged with in the Fleurieu Peninsula region raised a number of regionally-specific questions and points, including: o What are the water requirements of Fleurieu Peninsula Swamps, and are these different from flow-based habitats like creeks and streams? o Are low flow releases as important for Fleurieu Peninsula Swamps as they are for streams, creeks, rivers? o The data underpinning allocations and other policies should be more locally specific. o There should be more on-ground data collected to understand the swamps and rainfall run-off relationships in this area. o The scale used to manage surface water resources is too large across the Southern Fleurieu. The surface water management zone (SWMZ) is the adopted scale elsewhere across the WMLR region, but a catchment scale is used in the Southern Fleurieu.

9 First Nations

The lands and waters of the Western Mount Lofty Ranges Prescribed Water Resources Area (WMLR PWRA) encompasses parts of the traditional Country of the Kaurna, Peramangk, Ngarrindjeri and Ngadjuri nations. The map provided in Appendix 3 indicates the Native Title areas in the WMLR area - cultural areas are recognised but not indicated on the map.

9.1 Background

The term 'First Nations' is used throughout this chapter to refer to Aboriginal, Indigenous or Aboriginal and Torres Strait Islander peoples. The preference for the term First Nations was established at 'roundtable' meetings. It is acknowledged that there are many different preferences in how Aboriginal or Indigenous people like to be referred to.

9.2 Legislative and policy context for the WMLR

The current WMLR WAP does not recognise First Nations' interests in water resources. Since the WMLR was adopted, there has been some progress nationally to recognise First Nations people and actions that realise First Nations' objectives in water management and planning policy.

The Inquiry into Water Reform (Productivity Commission, 2021) focused on the renewal of the National Water Initiative. The recommendations in the Report include the co-design of a First Nation people's interests in water and involvement in water management with specific improvements to cultural outcomes and access to water for economic development. Water plans are identified as an existing framework for "*clear, measurable and well-informed cultural outcomes in water plans, and monitoring and reporting arrangements that promote accountability and foster learning about what works should also be put in place*" (Productivity Commission 2020, p121).

In addition, the 2021 National Agreement on Closing the Gap target 15 has a commitment to the target '*People maintain a distinctive cultural, spiritual, physical and economic relationship with their land and waters*'.

9.3 Engagement

First Nations engagement for the review process included:

- An invitation to participate. Each nation was contacted directly and invited to participate in the review via their appropriate registered Prescribed Body Corporate (PBC) or representative body. All First Nation groups with interests in the water resources of the WMLR WAP region will have the opportunity to engage in activities to further develop their interests during any amendments. To date, Ngarrindjeri and Ngadjuri nations have indicated that they would like to participate in developing co-design methods to integrate First Nations interests in the WAP through strategic and practical activities.
- Three 'roundtable' meetings that were held at the request of Kaurna Yerta Aboriginal Corporation (KYAC) on 22 June 2023, 26 July 2023, and 14 September 2023. The meetings were attended by representatives of Kaurna, Ngadjuri, Peramangk and Ngarrindjeri nations and organised in collaboration with South Australian government agencies to discuss the First Nation interests in water across the Greater Adelaide region.
- Including the Kaurna contribution to the McLaren Vale WAP review into the WMLR WAP review. The next WMLR WAP will manage the MV PWRA. The MV WAP Review determined that the MVWAP required amendment because it did not recognise Kaurna interests in the resource.

9.4 Findings

First Peoples have a connection to water which values generations of cultural, spiritual and customary knowledge. This connection is enduring despite the disruption and impacts caused by colonisation.

The findings draw on the consistent views held by First Nations people concerning water and the deep cultural, spiritual, environmental, social and economic significance it holds for them. The engagement process with First Nations groups is emergent therefore for the purposes of this document, the findings from the 'roundtable' meetings are aggregated in the list below. However, it is acknowledged that First Nations' water needs differ between groups and regions due to a complex web of socio economic and cultural factors.

The Kaurna Statement for the MV WAP is attached in full and further nation-specific and localised preferences will be explored as appropriate during any amendments.

The WMLR WAP should contain mechanisms to:

- Re-introduce cultural flows. Leverage cultural flow synergies with environmental flows to enable multiple benefits including cultural water maintenance
- Facilitate First Nations peoples' access to water sources, particularly on private property, for the purposes of practising and sustaining culture and learning more about Country
- Assist processes for First Nations peoples to implement water planning, management and evaluation processes that assess multiple scientific and cultural indicators.
- Implement adaptive management regimes that can integrate cultural water with additional measurable objectives to enable holistic outcomes.
- Integrate First Nation representation in future advisory groups.
- Enable First Nations people to participate fully in water planning and management processes.
- Support First Nations peoples to increase control of water entitlements.
- Require all staff working with First Nations people to fulfil cultural competency training.

Kaurna Statement for McLaren Vale WAP

Kaurna's unwavering relationship with water is a vital factor in maintaining cultural heritage and spirituality. The absence of cultural flow considerations and lack of documentation associated with surface water and groundwater dismisses the cultural relationship between these core aspects of Kaurna being. Additionally, the capacity to develop and access water for cultural flows and practices is of paramount importance in sustaining Kaurna's connection to water, country and sky.

Working in a partnership built on reciprocity with the Hills and Fleurieu Landscape Board, Kaurna aspires to integrate cultural knowledge into the Department of Environment and Water legislative processes. Water features prominently in our Dreaming, our Stories and our Songlines, and unsustainable water usage/consumption impacts our ancient history, culture and sites of significance, while continuing to alter our landscape today. The knowledge of our Old People informing all works around surface and groundwater will ensure government practices are culturally safe as well as environmentally sustainable.

Despite a lack of historic consultation and effective engagement with Kaurna on previous Water Allocation plans, Kaurna has a strong desire to work in collaboration with the Landscape Board for the benefit of all residing on Kaurna land. Integrating ancient Kaurna knowledge of sustainable land management within the Water Allocation Plan will ensure we act in the best interest of the environment and future generations. Kaurna lived sustainably on this landscape for many thousands of years before European people arrived and damage to our environment could have been avoided if our Old People were listened to.

Kaurna makes the following recommendations for the MVWAP amendment process:

- Inclusion of a statement within the MVWAP recognising the water rights held by Kaurna as Native Title holders and the importance of cultural flows when discussing surface water and ground water distribution.
- Compulsory cultural competency training for the MV WAPAC and key Hills and Fleurieu Staff.
- Continual cultural development for all stakeholders working with and utilising McLaren Vale water allocations.
- Review data trends and projections to assess current sustainability threshold and projected impacts of climate change on groundwater requirements.
- Assess sustainability threshold against the functioning status of groundwater fed cultural springs
- Review of license recipients for identification of industry bias.
- Review of instances of systematic, institutional, and intergenerational privilege and racism that has led to Kaurna having no rights to water as a traditional resource.
- Develop a partnership approach to MVWAP data collection, evaluation, and analysis programs (that includes Kaurna), with monitoring around identified cultural resources, values and interests.
- Explore opportunities to support Kaurna led cultural flow restoration within the MVWAP.
- Requirement for all MVWAP reporting to be supplied to both Warpulai Kumangka (WK) and the Kaurna Yerta Aboriginal Corporation (KYAC).
- Undertake annual assessment of culturally significant waterways within the MVWAP region in partnership with Kaurna.

Additionally, the committee notes that the MV WAPAC has requested a Kaurna representative to sit on the sub-committee. It is our recommendation that a male and female Kaurna representative be appointed to this sub-committee to align with cultural protocols.

10 References

Aither 2023, (unpublished), *Economic significance of water resources in the Mount Lofty Ranges,* internal report for HGovernment of South Australia, Adelaide.

Adelaide and Mount Lofty Ranges Natural Resources Management Board (AMLR NRM) 2013, Water Allocation Plan for the Western Mount Lofty Ranges Prescribed Water Resources Area, Government of South Australia, Adelaide.

DCCEEW 2023, Discussion Paper: Update to Climate Change Considerations chapter in Australian Rainfall and Runoff: A Guide to Flood Estimation Discussion Paper, Department of Climate Change, Energy, the Environment and Water, Canberra,

DEW 2022, *Modelling the impacts of current water use, urban development and climate projections on surface water resources in the Barossa Prescribed Water Resources Area*, DEW-TR-2022-13, Government of South Australia, Department for Environment and Water, Adelaide (https://www.waterconnect.sa.gov.au).

DEW 2022a, (unpublished). *Guideline for Review of Water Allocation Plans – A risk based approach.* Government of South Australia, Department for Environment and Water, Adelaide.

DEW 2022b, *McLaren Vale Prescribed Wells Area groundwater resource assessment.* DEW Technical Note 2022/08, Government of South Australia, Department for Environment and Water, Adelaide

DEW 2023, Savadamuthu, K., McCullough, D. P., Green D., 2022. *Changing climate and the uncertainties in allocating water for consumptive and environmental needs in highly developed catchments*, 25th International Congress on Modelling and Simulation, Darwin, NT, Australia, 9 to 14 July 2023, (https://doi.org/10.36336/modsim2023.savadamuthu).

DEW 2024a, Savadamuthu K and McCullough DP (2024). Impacts of changing rainfall patterns on the hydrology of the Mt Lofty Ranges, DEW Technical report DEW-TR-2024-8, Government of South Australia, Department for Environment and Water, Adelaide.

DEW 2024b in prep, Penney D., Savadamuthu K., & van der Wielen M. (2024). *Hydro-ecological investigations to inform Water Allocation Plan reviews of the Eastern and Western Mount Lofty Ranges Prescribed Water Resource Areas*, DEW Technical note 2024/XX, Government of South Australia, Department for Environment and Water, Adelaide.

DEW 2024c in prep. *Hills and Fleurieu Landscape Region PWRA ecological condition assessment 2022*, DEW Technical report 2024/XX, Government of South Australia, Department for Environment and Water, Adelaide.

DEW 2024d in prep. *Western Mount Lofty Ranges Prescribed Water Resources Area - Groundwater Resource Assessment*, DEW Technical Note 2024/XX, Government of South Australia, Adelaide.

Hills and Fleurieu Landscape Board (HFLB) 2022, Review of the Water Allocation Plan for the McLaren Vale Prescribed Wells Area, Government of South Australia, Adelaide.

Muller KL, Whiterod N, & Whiting J. unpublished, *Western Mount Lofty Ranges Environmental Water Provision Performance Evaluation Report.* Internal Draft for Comment – Steering Committee, Department for Environment and Water. Jointly prepared by Kerri Muller NRM, Aquasave-NGT and Nelly Group Engineering with inputs from SA Water.

McNeil D. G., Hammer M. 2007, Biological review of the freshwater fishes of the Mount Lofty Ranges. South Australian Research and Development Institute (aquatic sciences), Adelaide. 104pp., No. Publication number: F2006/000335

Productivity Commission 2021, *National Water Reform 2020, Supporting Paper D,* Inquiry Report no. 96, Canberra. Inquiry report - National Water Reform 2020 - Productivity Commission (pc.gov.au)

Productivity Commission 2023, Murray–Darling Basin Plan: Implementation review 2023, Inquiry report no. 103, Canberra https://www.pc.gov.au/inquiries/completed/basin-plan-2023#report

SA Government 2021, South Australia's Implementation Plan for the National Agreement on Closing the Gap, South-Australias-Implementation-Plan-for-Closing-the-Gap.pdf (agd.sa.gov.au)

Schmarr D, Thwaites LA & Peters K 2022, *Biological Review of the Freshwater Fishes of the Western Mount Lofty Ranges.* Report to Green Adelaide, Department for Environment and Water. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2022/000250-1. SARDI Research Report Series No. 1148.

Van der Wielen M 2023, (unpublished), Mount Lofty Ranges water demand and use, internal report for HGovernment of South Australia, Adelaide.VanLaarhoven, J & van der Wielen, M 2009, Environmental water requirements for the Mount Lofty Ranges
prescribed water resources areas, Report DWLBC 2009/29, Department of Water, Land and Biodiversity Conservation & South Australian Murray-Darling Basin Natural Resource Management Board, Adelaide.

VanLaarhoven, J & van der Wielen, M 2012, Assessment of the needs of water dependent ecosystems for the Eastern Mount Lofty Ranges Prescribed Water Resources Area, Government of South Australia through Department for Water, Adelaide.

11 Appendix 1 – Success of the WAP in achieving its objectives

The review of the WAP's success focussed on three aspects:

- The stated outcomes
- The supporting programs
- The policies themselves

The findings related to the first point (stated outcomes) are outlined in Section 2.1 of the main report body. The findings relating to the remaining two points (the supporting programs, the policies themselves) are given here in Appendix 1.

11.1 Review of supporting programs

Water allocation plans operate within a context of supporting programs which collectively constitute the water management arrangements. When reviewing the success of a WAP in achieving its stated outcomes, it is important to examine both the policies within the WAP, and the implementation of supporting programs that were intended to enable the stated outcomes of the WAP to be achieved. The key supporting programs are discussed below.

Issuing of allocation to existing users

After a water resource is prescribed, one of the main processes is to issue water licences to existing water users. The process of determining what allocation volumes are to be granted to existing users is independent to the WAP itself, and consequently WAP policies relating to new allocations do not apply to existing users. In the WMLR, allocations were granted to existing users on the basis of calculations for theoretical enterprise requirements. This has resulted in over-allocation in a large number of management zones.

LFRs

The surface water limits in the WAP are set at 25% of resource capacity, and these limits assumed full implementation of LFRs. There has been very low levels of LFR implementation in the WMLR to date due to a lack of funding and prioritisation. As of 2023, a total of 26 sites (mostly in the Carrickalinga catchment) are passing LFRs.

Modelling undertaken during WAP development showed that achieving the same level of ecological sustainability without implementing LFRs would require surface water extraction limits to be set at 5% of resource capacity (five times lower than present limits). The very limited degree of LFR implementation means that for most surface water management zones, the current extraction limits are five times greater than the level considered sustainable by the WAP.

Managing high demand

High demand zones are those where the volume of total allowable use exceeds the extraction limits set out in the WAP. Strategies were developed to address the issue of high demand at the time of WAP adoption. The stated strategy included increasing the frequency of monitoring within high demand zones, to review the monitoring data and determine the risk to the resource with current levels of use, and if necessary consider reductions to allocations.

Total allowable use in 217 out of 377 (58%) of WMLR surface water zones exceeds WAP limits.

Total allowable use in 16 out of 45 (36%) of WMLR groundwater zones exceeds WAP limits.

No reductions have been implemented.

The combined impact of not managing high demand zones and lower than anticipated levels of low flow implementation has resulted in a situation where in many surface water management zones, not only is the

WAP extraction limit five times greater than what is considered sustainable, but total allowable use also exceeds that limit.

Reservation of excess water / Medium Term Arrangements

The outcome of the reservation placed on excess water has been that allocation volumes have not increased beyond that issued to existing users, and legally constructed dam capacity has not increased. These arrangements have limited the ability for some landholders and business owners to expand operations or establish new developments reliant upon access to prescribed water resources. However, it should be noted that in many zones there are significant volumes of allocation that are owned by licence holders but are unused, with the water trading market (discussed below) intended to allow needs to be met within overall limits. It should also be noted that in relation to surface water, the reservation together with the Medium Term Arrangements has prevented the situation created by limited implementation of LFRs from being further exacerbated.

Licensing

The water licensing system limits the volume of water extracted from water resources for licensable purposes by ensuring that the volume of water used by individual licensees does not exceed their allocated volume. The DEW Water Licensing Branch also administers permanent and temporary transfers of allocations within the rules set out in the WAP. The review has found that the licensing system is operating consistent with the WAP rules and the Act.

Implementation of water affecting activities policies

The assessment of permits for Water Affecting Activities (WAA), such as for construction or modification of dams, construction of structures that affect a watercourse (e.g. culverts and bridges), and drilling of wells, is shared between DEW and landscape boards and utilises the principles as set out in the WAP, as well as the WAA Control policy. This program is operating consistent with WAP rules and the Act.

Monitoring

While there are a number of improvements identified for future monitoring priorities and approaches, the level of information able to be provided for this review demonstrates that considerable monitoring has been undertaken over the WAP implementation period. During the Technical Assessment of WAP Objectives workshops, it was noted that a formal monitoring, evaluation review and improvement (MERI) plan had not been developed to support WAP implementation and that there was not a clear line of sight between WAP objectives and monitoring undertaken to date.

11.2 Review of principles in the WAP

The rules, or 'principles' of the WAP are set out in four chapters: allocations, transfers, permits (for water affecting activities), and monitoring. These four chapter groupings are used as the sub-headings for this section. At the Technical Assessment of WAP Objectives workshops, discussion was structured around each chapter. Further feedback on the operation of the principles was received from DEW and HFL assessment officers who work with the principles on a daily basis. The following summary outlines the key outcomes of the review of WAP principles.

Allocations

The reservation and Medium Term Arrangements prohibited the allocation of any 'spare' water from those zones where spare water existed, once allocations were granted through the existing user process. While no applications for new allocations were assessed, transfer applications must also satisfy the allocation principles in the WAP in order to protect the zone into which the allocation is being transferred. Only very small numbers of transfer applications have been received during the WAP implementation period, so the principles have not been well tested across a broad range of situations, however, feedback from DEW Water Licensing Branch confirmed no concerns with these principles.

Transfers

Transfer principles in the WAP have been effective in protecting resources from the impacts of inappropriate transfer (and trade) of allocations. Feedback received from community members during the engagement highlighted that the transfer principles are complex and it is difficult for water users to know whether a proposal is likely to be approved. Feedback from DEW Water Licensing Branch also confirmed these principles are technically difficult to assess and advise upon. It has been suggested that the complexity of the transfer principles are an impediment to trade, and more information and support is needed for those wanting to undertake transfers or trades.

Permits for Water Affecting Activities

The review found that the principles have largely been working well, but there is a need to examine:

Forestry Principles:

- The reservation and Medium Term Arrangements have prevented the expansion of new forestry plantings (not including replacement plantings) during the WAP implementation period. An expanded carbon credit scheme and better market conditions for forest products has resulted in pressure to expand the area of forestry plantings within the prescribed area.
- Forestry intercepts substantial volumes of surface water and groundwater and consequently needs to be accounted for in the management of water resources. Any expansion of forestry will reduce water availability for the environment and other consumptive uses, which is why it is carefully considered as part of the existing permitting process.
- The definition of forestry in the Act includes plantings which intend to claim carbon credits. Consequently, this currently limits revegetation projects for biodiversity purposes that also intend to claim carbon credits (if the planting density is greater than >250 trees/ha).

Monitoring

Aquatic ecosystem health relies less on the annual volume of flow and more on the pattern of that flow throughout the year. The development of flow metrics within the WAP has enabled the flow regime to be assessed. However, it is complex and a proposed simpler set of measures are in development. A MERI plan was never comprehensively developed to support the implementation of the WAP. However, routine monitoring of surface and groundwater resources and ecological condition by DEW and Landscape Board (and previously NRM Board) programs has resulted in good data sets.

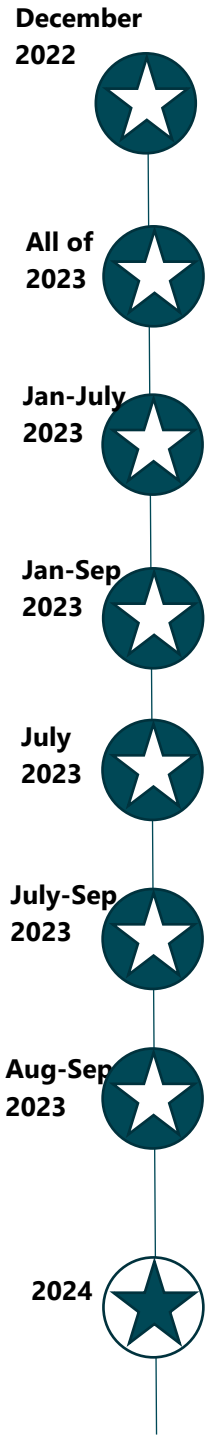
12 Appendix 2 WMLR Median Spring Rainfall

Table 11 Median Spring rainfall for drought related periods (WMLR)

Station	ID	Catchment	Period median			Change from Pre-drought median			
			Pre-	Drought	Post-	Drought		Post-	
			(mm)	(mm)	(mm)	(mm)	(%)	(mm)	(%)
CUDLEE CREEK	23731	Torrens	204	216	168	11	6	-37	-18
GUMERACHA	23719	Torrens	203	193	145	-10	-5	-58	-28
BIRDWOOD	23705	Torrens	192	168	158	-24	-12	-34	-18
Mt PLEASANT	23737	Torrens	174	135	132	-39	-22	-42	-24
URAIDLA	23750	Onkaparinga	250	248	220	-1	-1	-30	-12
BRIDGEWATER PO	23707	Onkaparinga	247	236	199	-11	-5	-48	-19
CHERRY GARDENS	23709	Onkaparinga	220	206	190	-14	-6	-30	-14
LOBETHAL	23726	Onkaparinga	220	200	166	-20	-9	-54	-24
HAHNDORF PO	23720	Onkaparinga	210	172	190	-38	-18	-20	-9
ECHUNGA GC	23713	Onkaparinga	197	183	159	-14	-7	-38	-19
VICTOR HARBOR	23743	Fleurieu	160	155	138	-5	-3	-23	-14
WILLUNGA	23753	Fleurieu	151	126	128	-25	-17	-23	-15
SECOND VALLEY	23744	Fleurieu	129	154	105	25	20	-24	-18
YANKALILLA	23754	Fleurieu	132	139	103	7	5	-29	-22
NORMANVILLE	23741	Fleurieu	119	124	101	5	4	-18	-15
PORT ELLIOT C.P.	23742	Fleurieu	121	134	94	13	11	-27	-22

13 Appendix 2. Community and Stakeholder Engagement

Timeline of key engagement activities:



First Notification
Notified community and stakeholders that the MLR WAPs are being reviewed throughout 2023, with brief information on the process, where to find more information and how to get involved. Letters and emails to all licencee's and stakeholder groups.

Ongoing media and comms
Media releases to Local Councils, newspapers and Facebook posts, with the aim to inform the community that the WAP reviews were occurring, and promoting the drop-in sessions and

Local Leader discussions
Met with persons involved in original WAP development to understand perspectives/concerns and shape review approach and amendment focus areas, as well as to inform our engagement

Targeted stakeholder discussions
In-person and online discussions with identified key industry bodies, community groups, and other stakeholder groups. Presentations/attendance by DEW Science teams at some discussions.

Second Notification
Provided further information (FAQs/Catchment Summaries) and dates + locations of Drop-In Sessions. Opening of online survey/submissions.

Survey
Hardcopy surveys posted to all licence holders, and available at all in-person events. Online survey promoted through media.

Drop-in sessions
In-person sessions held in town halls across the region, using open plan display format and broad timing (2-7pm). Community members could also book a one-on-one discussion with a staff member if they wanted a more in-depth conversation.

Planned: Third Notification
A 'loop back' communique will confirm what the review work found and what the next steps are.

13.1 Local leader discussions

One of the earliest engagement activities undertaken for the WAP reviews were the Local Leader discussions. Three meetings were organised with people in the WMLR region who are well known and respected within their communities, and who have knowledge surrounding water planning, to discuss the WAP review. Local leaders included farmers and landholders, those in the agricultural industry, and people who have previously sat on water planning and/or natural resource management committees. The local leader discussions helped to identify the most effective ways of communicating with community and industry stakeholders throughout the WAP reviews.

The below table presents a selection of key points against the most commonly raised topics by participants across the three WMLR local leader discussions.

Topic	Key points raised by local leader participants
Allocations	• When allocations were granted to existing users the volumes were based on crop types at that time. As a result, apple and cherry orchardists received higher volumes per hectare than wine grape growers. - There remains some feeling of inequity about this for some wine grape growers. • Some growers feel there should be more flexibility in allocations year-to-year. • There was general disagreement heard about where the 'limits' are currently set, and that this should not be based on generalised data.
Information sharing	• The importance of sharing information (science, policy, and about the process) with farmers was raised, but need to keep this accessible .
Low flows	• Strong disagreement was heard with the original thinking on low flows, where big expensive devices were seen as the only way to do it. - Stated there are simpler, low cost solutions. • The bypass device design is as likely to 'do more harm than good' because of the amount of trenching, vegetation clearance or other disturbance required to install them. • Important to see farmers as part of the solution, not automatically as part of the problem.
Metering	• There was some discussion around the rollout of metering requirements, they fought hard against the requirement for all licence holders to be metered, because of the cost to install them which was seen as unreasonable. • It was understood why having data on how much water is being used each year would be useful, but local leaders disagreed that installing expensive meters was the only way to get that information. - you could simply call up licensee's each year and ask for their best estimate.
Fleurieu Peninsula-specific points raised	• The current level of regulation/ limitations on how water can be used should be reduced. • Strong belief that there is more water available in the Fleurieu than is currently allowed to be used. • Water regulations are seen as the key limiting factor to expanding agriculture on the Fleurieu. • It was raised how a 'big deal' was made about Fleurieu Swamps around the time of the WMLR WAP being brought in, and when they were first listed as nationally protected (EPBC).

	• Since then, there has been very little attention, and funding, for the swamps. '*if the swamps are so important to the government, why aren't farmers supported (paid) to undertake fencing or weeding?*'
Forestry	• Commercial forestry should be licensed and have the same regulations as everyone else, especially if there is to be reductions made, so that it is fair. • local leaders have observed a reduction in the volume of run-off to the lower creek line in areas neighbouring commercial pine plantations.

13.2 Targeted Stakeholder Discussions

Throughout the review phase engagement process there were 15 targeted stakeholder discussions held across both EMLR and WMLR regions from January through to October 2023. The groups that were met with as part of the targeted stakeholder discussions are listed below.

Angas Bremer Water Management Committee (two meetings held)

Victor Harbor Agri-Business Reference Group

How to make your farm dam DAM GOOD Field Day participants

Bremer Water Watch Group

Fruit Producers SA Board Members

Hills Environment Centre

SA Dairy Association

Second Nature Conservancy Inc (formerly GWLAP)

McLaren Vale Water Discussion

Parawa Ag Bureau (and local landholders)

Meadows Ag Bureau

Southern Fleurieu Regen Ag Farm Walk participants

Mount Barker Ag Bureau

Fleurieu Environment Centre Committee and Nursery Volunteers

Some discussions were attended by both WMLR and EMLR community members (for example, at the Meadows or Mount Barker Ag Bureau meetings), and other discussions were focussed to either the WMLR or EMLR region (for example, at the Fruit Producers Association meeting in the WMLR).

A selection of the key points raised across the targeted stakeholder discussions are listed below, grouped into the most commonly raised topics. The below selection is intended to provide an insight into the diversity of views expressed, and it is important to note that these views were not unanimously held across all the discussions or participants.

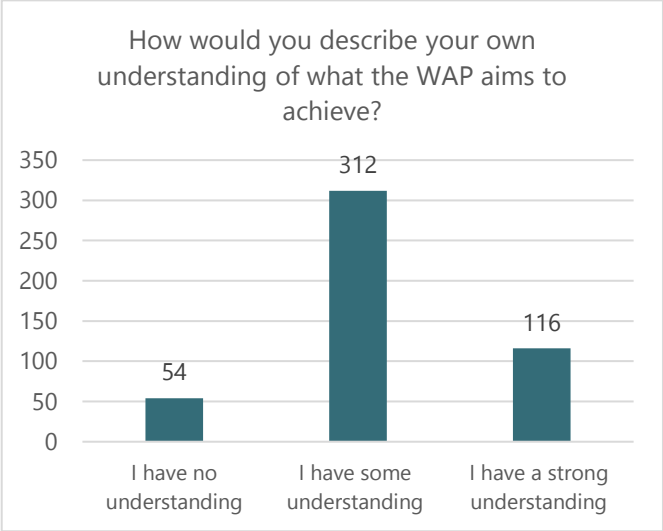
Topic	Key points raised by targeted stakeholder discussion participants
Low flows	• Common concerns raised about low flows included: - Risk to water security - Seen as taking landholders' water away • In support of low flows the below points were raised: - Important for ecosystem health - If passing low flows is the way to maintain allocations at a higher volume, then it needs to happen • Instead of expensive physical 'low flow devices', other cheaper or more high tech solutions should be considered.
Allocations	• Concerns expressed for the potential of allocation changes. • Concern that if allocations are cut, even if people aren't using their full allocation they will lose their flexibility and 'spare water'. • Scale used to manage surface water resources is too large - Generalises across landscapes that are very different - Makes allocations too generalised • Allocations originally granted were too generous - The 'actual use' in areas is generally below the allocated volume - Not necessarily the volumes being used by people, but the full allocation volumes, that present a risk
Environment	• Permanent pools should be given greater priority in future WAP policies • How do we adapt to changing climate; climate change resilience and readiness - WAP needs to be reviewed more than every 10 years to keep up • Without a healthy environment, you can't have a good economy
Information accessibility	• Lack of awareness of what the WAP is trying to achieve and how • There should be more information shared about water resources, and the information should be presented in a form people can understand
Flexibility of WAP	• Transferring and trading of allocations and/or licences is a difficult process • Transfer rules are too restrictive • Why are we using a set number for allocations and not an adaptive system that responds to yearly fluctuations and a changing climate
Land use and practice changes	• Urbanisation occurring throughout region what does this means for the balance of water supply, run off, and demand? • Impacts of deeper rooted crop and pasture species that retain more water in the soil and reduce surface run-off • High water use industries in the region have reduced significantly e.g. potato growing, some horticulture, dairy industry
Stock and domestic	• Shouldn't be licenced, but should be metered - Can then know impact of all use not just licenced use • Inherent risks and uncertainties in not having the same level of 'actual use' data for non-licenced water users

Monitoring	• Allocations should be based on the most locally relevant data possible, and decisions should not be based on generalised data or without sufficient data • Should be mandatory monitoring of bore levels as a requirement on the licences
Economic	• Growing costs to farmers, and the Board need to keep in mind what any additional costs will mean for those already at their limit • Levies should be based on water usage rather than a fixed amount to encourage water efficiency • The current reservations don't allow for business growth
Water efficiency	• On-farm water efficiency could be improved and needs to be better promoted, or even be a requirement of future policies. • Use market access/financial incentive for farmers to demonstrate they are as water efficient as possible
Water security	• Being able to plan multiple season ahead important for farm planning - Farm dams play large role in this
Water quality	• Doesn't strictly fall within the policies of the WAP, but is of interest for many people in the community
Fleurieu Peninsula	Groups and individuals engaged with in the Fleurieu Peninsula region raised a number of regionally-specific questions and points, including: • 'Low flows' are based on environmental water requirements of 'typical' creeks, streams and rivers. Are they applicable in the same way for Fleurieu Peninsula Swamps? • There is a need for more on-ground data collection about Fleurieu Peninsula Swamps and streamflows in the Fleurieu Peninsula area. • The scale used to manage surface water resources is too large across the Fleurieu Peninsula. The use of the larger catchment scale is a problem because it generalises across landscapes that are very different, in terms of rainfall, run-off and other water factors.

13.3 Survey

The survey consisted of 10 questions and was available online (via 'SurveyMonkey' platform) and as hard copy versions. There were a large number of 'bot' responses received through the online SurveyMonkey platform. After analysing the dataset and removing responses deemed to be from bots, a total of 485 legitimate survey responses were received.

The survey was completed for both WMLR and EMLR regions as a whole, so the following summary is for all survey respondents, regardless of region.



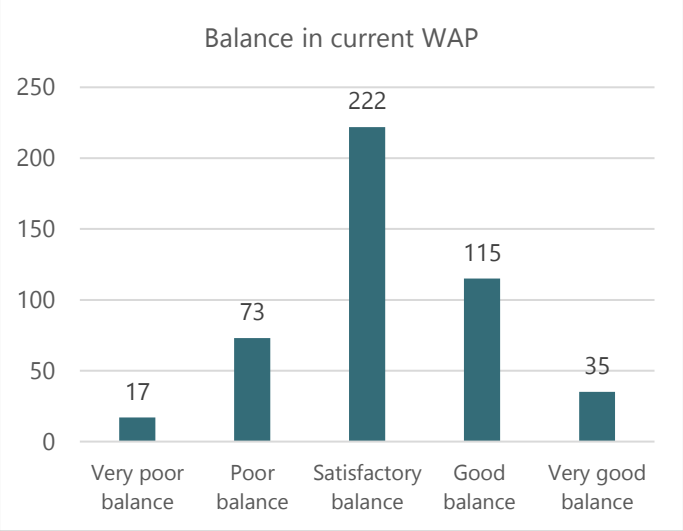


Figure 15 (left) Bar graph of answers to question "How would you describe your own understanding of what the WAP aims to achieve?"

Figure 16 (right) Bar graph of answers to question "How well do you feel the current Water Allocation Plan achieves an equitable balance between different water needs?"

The majority of respondents stated they have some understanding of what the WAP aims to achieve, and that the WAP has a satisfactory balance.

There were 315 people who provided answers to the open-ended surveys questions. Some of the key themes raised in the free-text responses included:

- Concern about urbanisation/development and what this means for water resources.
- The current water trading system is difficult.
- Water users should not pay a levy for their allocation but rather what water they use.
- Water efficiency needs to be prioritised and incentivised.
- The resources fluctuates on a year to year basis and this needs to be considered going forward.
- Primary producers need stability and the chance to plan ahead.
- The economy relies on the environment.
- Split opinions over the current ban on new dam capacity.
- Primary production for commercial food production should be prioritised. Consideration should be given to the suitability and water use of certain crops.
- Efforts in regards to water management should not impose extra cost to farmers.
- Over-allocation could be addressed through buy-back schemes.
- Concerns about the environment getting enough water.

- Mixed views for whether current restrictions and regulations should be reduced or increased.
- 'One size fits all' approach to allocations and other water management issues doesn't work.

There were also 73 people who provided comments on other areas of water management that fall outside of the direct control of the WAPs (noting that some of the 73 people also provided comments based on the WAPs). The key themes were:

- Importance of preventing erosion to watercourses/bodies.
- Requests for more priority and resources to assist with weed/vegetation management in watercourses/bodies.
- Water quality is very important and needs to be taken in to consideration.
- Water resources need to be protected from pollution and contamination.

Question 7 in the survey provided a list of 13 'challenge statements' related to the existing WAPs. These were issues that had been indentified during early consultation, such as in discussions with local leaders. The question asked respondents to rate how important it was to them that a new WAP addressed each of the issues listed (*Figure 18, overleaf*). The challenge statement which received the highest number of "very important" ratings (n = 308) was '*Commercial forestry plantations are a large water user in some parts of the region but do not require a water licence*'. The challenge statement relating to whether First Nations water interests are meaningfully represented in the current WAP received the most "not at all important" responses (n = 245).

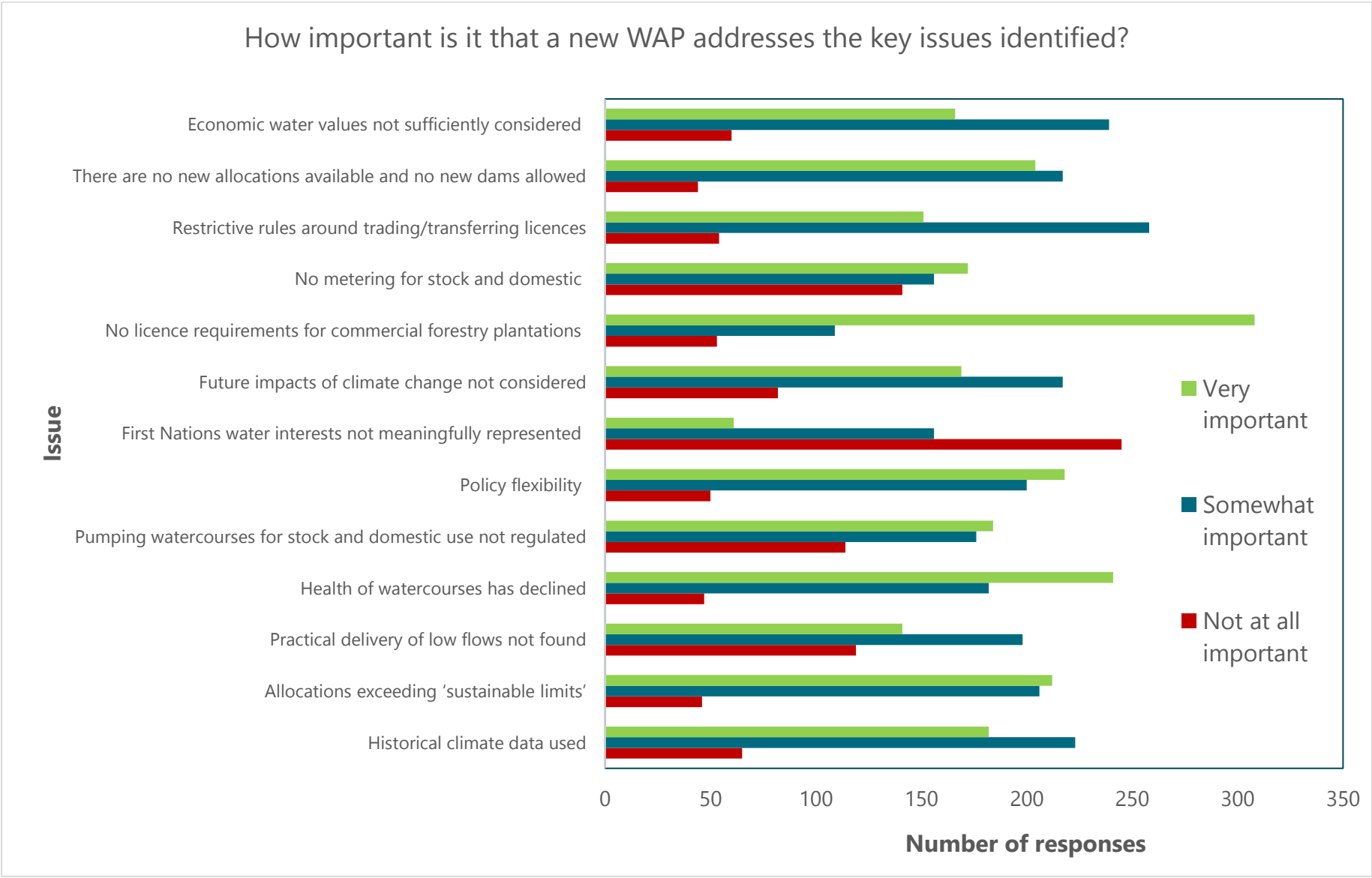


Figure 17 Key issues identified in the WAP were presented to respondents for ranking. The survey asked "How important is it to you that a new WAP addresses each of these?"

13.4 Drop-in sessions

Six drop-in sessions were held during three weeks across the WMLR and EMLR regions. These sessions were run at;

- Mount Compass Memorial Hall (21 August 2023),
- Inman Valley Community and Memory Hall (24 August 2023),
- Macclesfield Institute (29 August 2023),
- Woodside Hall (1 September 2023),
- Gumeracha Town Hall (6 September 2023); and,
- Mount Barker Town Hall (8 September 2023).

The drop-in sessions were used as a method of engagement that were open to anyone from the community, so that there were opportunities to hear broader perspectives not captured during the targeted stakeholder discussions. A long format (2pm-7pm) was used for all the drop-in sessions so that they were as accessible as possible for those with various commitments. Information about the status of water resources and ecosystems, key trends and allocation and use data was displayed on large posters that were positioned with lots of space for people to move around and talk to staff on hand. This format was a really effective way of providing information that supported conversations, whilst still having the flexibility of talking to whatever was of interest to each attendee.

As well as being able to walk through and browse the display information and speak to any available team member at the drop-in session, people were also encouraged to pre-book a timeslot with a dedicated team member staffing the one-on-one discussion desk off to the side of the main hall set up. The one-on-one pre-bookings were well attended and proved to be a useful way to explore specific questions and concerns in a focussed conversation.

A selection of the key points raised by participants attending the drop-on sessions are listed below, grouped into the most commonly raised topics. The below selection is intended to provide an insight into the diversity of views expressed, and it is important to note that these views were not unanimously held across all the discussions or participants..

Topic	Key points raised by drop-in session participants
Fire risk	• Need for access to water for firefighting purposes
Low flows	• Against low flows • Agree with principles of low flows but concerned about the effects on summer water use • Low flows are a good part of the plan • Look for alternatives to low flow devices for more flexibility
Surface water dams and allocation reservation	• Issue is not dams, it is irrigators • Dams are good for biodiversity and providing habitat • Farmers have entitlement to store water on their property • Blanket restrictions don't allow for future planning
Stock and domestic	• Concerns about high use of S&D use • Should be metered so you know how much is being used • No need to licence S&D

Water efficiency	• In SA, about 20% of berry growers are looking into being more water efficient, but the capacity of berries group to help drive change is limited • Crops are being irrigated during the daytime because electricity is cheaper than at night, but this isn't water efficient
Information accessibility	• Improve communications beyond social media • Need to better communicate trends in water resources • Not clear what the WAPs or any of the current water regulations are really trying to achieve
Water trading	• Complicated process, difficult to find information on trading, need better information • reduce restrictions for trading and transfers
Climate change	• Concern for what any changes might mean for water availability • Climate change needs to be better reflected in the WAP
Land use and management changes	• Impact of future urban development on aquifers, run off, streamflow • Less land being intensively irrigated • Many more 'hobby farms' seen throughout area, these put different pressures on water resources
Water for the environment	• Environment needs to be represented in these discussions • Most farmers want to look after the environment • Dams provide habitat • Support for biodiversity protection and having a fair balance of water
Water allocation	• Spare allocation gives flexibility. May need to use full allocation in future – need to have that option • Have to pay for whole allocation even if whole allocation is not used • In support of allocations being brought in line with extraction limit • Fear of losing allocation. Don't cut allocations if there is no reason to
First Nations	• First Nations representation should be included within existing social or environmental representation, not as a separate 'category'. • More information needed on what Indigenous/cultural water is
Economy	• Cost too high, fear this is going to increase • To be able to continue primary production, WAP needs more flexibility • A landholder shouldn't have to pay for their own water meter • Water is an asset
Suggested changes to WAP	• Buy backs should be used for 'unused' portion of allocations to protect those who do use all of their allocation • Trading un-used allocations to people who are using most of their allocation could be problematic, lead to price-gouging • If the levy was paid on use there'd be more incentive • Commercial forestry should be licenced

Figure 18 Set up of the information display at the Inman Valley drop-in session.

13.5 Agency Engagement

In addition to community engagement, the review also sought to hear from agencies involved in water planning and management. The intent of these conversations was to provide an opportunity for feedback about the effectiveness of the WAP, and the areas that require focus during amendment. The organisations engaged with through this process included; ForestrySA, SA Water, DEW Water Licensing Branch, neighbouring Landscape Boards, PIRSA/SARDI, Local Councils and the Flows for the Future program.

13.6 Formal Submissions

Formal submissions were received from both individuals and organisations who have an interest in how water resources are managed across the EMLR and WMLR regions. A list of those who provided formal submissions is given below. Submissions received from individuals are labelled below with the drop-in session that they attended (i.e. Woodside Drop-In Session Attendee #1) to protect an individuals privacy.

Fleurieu Environment Centre

Inman Valley Drop-in Session Attendee

Fruit Producers SA

Canopy/ Greening Australia

Koolah Beef

Woodside Drop-in Session Attendee #1

Woodside Drop-in Session Attendee #2

SA Forest Products Association

Amdena Nominees Pty Ltd.

Parawa Ag Bureau

SA Dairyfarmers Association

14 Appendix 3 Native Title Areas of the WMLR WAP

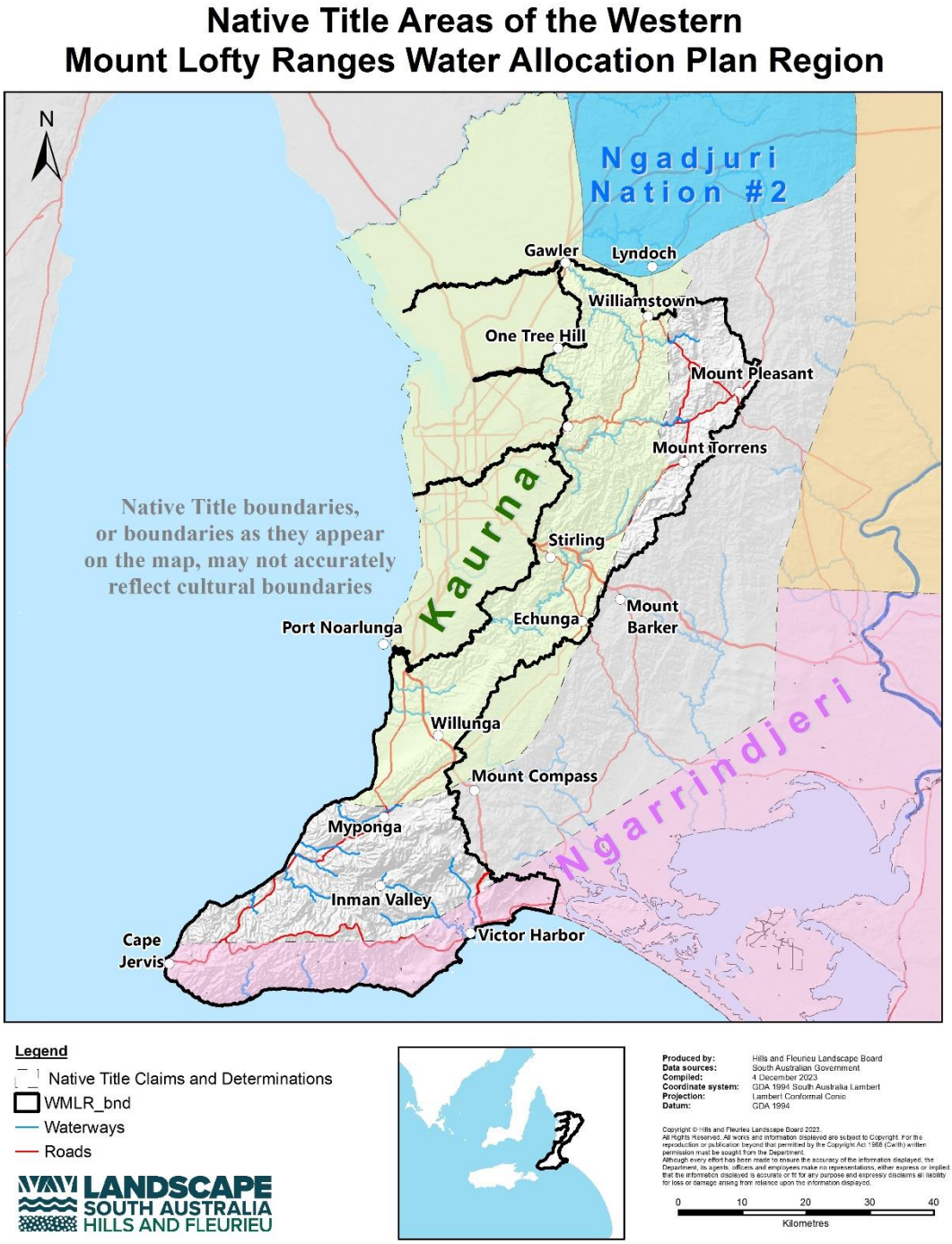


Figure 19 Native title Areas of the Western Mount Lofty Ranges Water Allocation Plan Region

LANDSCAPE
SOUTH AUSTRALIA
HILLS AND FLEURIEU