

LAKE WELLINGTON LAND AND WATER MANAGEMENT PLAN
2018-28 MID-TERM EVALUATION
AND
WEST GIPPSLAND SUSTAINABLE IRRIGATION PROGRAM END-OF-
EC5 EVALUATION

FINAL
14 JUNE 2024

Authors: Campbell Fitzpatrick and Mark Wood

Acknowledgement of Country

In the spirit of reconciliation, Woodwater acknowledges the Traditional Custodians of country throughout Australia and their connections to land, sea and community. We pay our respects to their elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today. Woodwater also acknowledge and pay our respects to the Gunaikurnai peoples, the Traditional Owners of the Lake Wellington catchment area.

Acknowledgements

The authors extend their gratitude to representatives from the following organisations and groups for sharing their experience, expertise and information in relation to the Lake Wellington catchment and funding and delivery of the Lake Wellington Land and Water Management Plan:

- West Gippsland Catchment Management Authority
- Agriculture Victoria
- Southern Rural Water
- Lake Wellington Irrigator Reference Group
- Department of Energy, Environment and Climate Action
- Environment Protection Authority
- Food and Fibre Gippsland
- Gippsland Water
- GippsDairy
- Lake Wellington Shire.

Disclaimer

This publication may be of assistance to you but the authors do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaim all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

The views presented in the report are based on Woodwater's assessment and are not a West Gippsland Catchment Management Authority position.

TABLE OF CONTENTS

ACRONYMS	IV
EXECUTIVE SUMMARY	V
1 INTRODUCTION.....	1
1.1 Purpose	1
1.2 Problem.....	1
1.3 Response	1
1.4 Investment programs	2
1.5 Method	3
2 SIP, GOVERNANCE AND INVESTMENT	5
2.1 SIP	5
2.2 Governance	6
2.3 Investment	8
3 RESOURCE CONDITION TARGETS (RCTs)	11
3.1 RCT 1 – Phosphorus target.....	13
3.2 RCT 2 – Salinity target.....	16
3.3 Secondary targets.....	19
4 FARM PLANNING PROGRAM.....	20
4.1 Background	20
4.2 Discussion.....	20
4.3 Achievement of MATs	25
4.4 Lessons and advice	25
5 ON-FARM IRRIGATION AND DRAINAGE PROGRAM	26
5.1 Background	27
5.2 Discussion.....	27
5.3 Achievement of MATs	36
5.4 Lessons and advice	37
6 ON-FARM NUTRIENT MANAGEMENT PROGRAM.....	37
6.1 Background	38
6.2 Discussion.....	38
6.3 Achievement of MATs	42
6.4 Lessons and advice	43
7 GROUNDWATER AND SALINITY PROGRAM	43
7.1 Background	43
7.2 Discussion.....	44
7.3 Achievement of MATs	50
7.4 Lessons and advice	51
8 FLOODPLAIN AND OFF-FARM DRAINAGE PROGRAM	51
8.1 Background	52
8.2 Discussion.....	52
8.3 Achievement of MATs	54

8.4 Lessons and advice54

9 INNOVATIVE AND CONNECTED IRRIGATION COMMUNITIES PROGRAM 55

9.1 Background55

9.2 Discussion.....56

9.3 Achievement of MATs58

9.4 Lessons and advice59

10 LWMP AND EC5 EVALUATION 60

10.1 Impact60

10.2 Effectiveness62

10.3 Efficiency64

10.4 Appropriateness65

10.5 Legacy66

11 CONCLUSIONS AND RECOMMENDATIONS 67

11.1 Conclusions67

11.2 Recommendations.....68

REFERENCES 74

ATTACHMENT 1 – IRRIGATION AND DRAINAGE DEVELOPMENT IN THE MID 75

Acronyms

ABS	Australian Bureau of Statistics
AgVic	Agriculture Victoria
ARC	Australian Research Council
BOM	Bureau of Meteorology
BPSI	Best Practice Surface Irrigation
CMA	Catchment Management Authority
DEECA	Department of Energy, Environment and Climate Action
EC4, EC5, EC6	Environmental Contribution Tranche 4, 5 or 6
EPA	Environment Protection Authority
ERS	Environment Reference Standard
ESC	Essential Services Commission
ETo	Reference Evapotranspiration
GLaWAC	Gunaikurnai Land and Waters Aboriginal Council
GL	gigalitre
GMA	Groundwater Management Area
GVIAP	Gross Value of Irrigated Agricultural Production
IDG	Irrigation Development Guidelines
IRG	Irrigator Reference Group
LWMP	Land and Water Management Plan
LW LWMP	Lake Wellington Land and Water Management Plan
LW-SIG	Lake Wellington Sustainable Irrigation Group
MAT	Management Action Targets
MID	Macalister Irrigation District
ML	megalitre
MOU	Memorandum of Understanding
MSMZ	Macalister Salinity Management Zone
RCT	Resource Condition Target
SEPP	State Environment Protection Policy
SIP	Sustainable Irrigation Program
SSD	Subsurface Drainage
SRW	Southern Rural Water
TO	Traditional Owners
TP	Total phosphorus

Executive Summary

The operating environment for the first six years (2018-19 to 2023-24) of implementation of the Lake Wellington Land and Water Management Plan (LWMP) was beset with challenges and ongoing change. These included:

- changing land use, enterprise type, ownership (new entrants) and increasing farm size and corporatisation
- extreme climate variability with episodic wet and dry extremes (drought in 2018-19 and floods in 2021-22, 2022-23 and 2023-24)
- COVID-19 pandemic between early-2020 to mid to late-2022)
- continuous technological developments
- increasing role of Traditional Owners in water planning, management and ownership.

The EC5 investment period (2020-21 to 2023-24) experienced a similar environment, except for drought which preceded the investment period.

Constant program adaptation was a major reason for successful program delivery.

Public and private investment through the LWMP, including through EC5, was directed through a well-structured and governed program which has, and will continue to, deliver positive outcomes for communities and the environment in the Lake Wellington catchment.

The cooperative, constructive, regional partnership approach of government working with irrigators and private service providers used EC4 and EC5 public investment to effectively leverage private investment and government investment from other sources.

The mixed model of regulatory and non-regulatory approaches continues to provide a positive environment to achieve change on and off farms. It consists of:

- extension (advice, knowledge and capability building) and financial incentives to get best practice change on existing farms
- a mix of advice and regulation to get best practice new irrigation developments
- a purely regulatory approach to management of dairy shed effluent management systems
- publicly funded research and development to support evidence-based decision making
- strong monitoring, reporting, evaluation and improvement culture.

The evaluation finds after six years of implementation, including four years of EC5 funding:

1. Impact – LWMP outcomes funded through EC4 and EC5 are addressing identified problems by increasing farm water use efficiency and resilience to drought and climate change, contributing to decreased phosphorus exports to Lake Wellington and protecting land from salinity and waterlogging.
2. Effectiveness – funded LWMP activities have been implemented effectively with all MATs delivered or expected to be delivered by the end of 2024. The effectiveness of some plan activities funded by partner agencies could be improved and there are opportunities to fund additional activities in the plan to increase plan effectiveness.

3. Efficiency – LWMP implementation has been efficient in delivering the funded activities within the six programs, including EC5 funded activities. A readiness to adapt program focus and delivery methods in response to ‘shocks’ in the operating environment and advice from irrigators and partners contributed to efficient delivery.
4. Appropriateness – EC4 and EC5 investment in the LWMP has been appropriate in promoting and delivering EC and State SIP objectives and priorities including building the cultural competency of staff and partners to develop a culturally safe environment to enable them to work together with Traditional Owners.
5. Legacy – LWMP implementation has enhanced outcomes from previous plans and is building a lasting legacy of:
 - i. increased irrigator knowledge and capability
 - ii. recognition that irrigation can be improved and farm business and irrigation planning are essential for business success
 - iii. best practice irrigation management and infrastructure
 - iv. increased resilience of irrigation businesses to drought and climate change
 - v. retention of water and nutrients on farm rather than exporting them to the Gippsland Lakes
 - vi. understanding the need for continuous technological and management improvements and the essential role of research and extension in providing this
 - vii. sustainable irrigation requiring effective and affordable regional drainage systems.

Recommendations on the following matters are made to improve the program:

- Extending irrigation farm planning to irrigation farms in catchments outside the MID and investigating options to remove bottlenecks in the farm planning process.
- Increasing the limit on irrigation reuse dam size.
- Developing a program to proactively encourage best practice dairy shed effluent management and nutrient management in and outside the MID – improved nutrient training and management were identified as important by the IRG and a district agronomist who advised they would deliver public and private benefits.
- Developing a plan with SRW to optimise groundwater pumping in the MID focussing on the public pumps.
- Developing a plan with SRW to optimise the surface drainage system in the MID.

The drainage plans are particularly important given the reemergence of salinity and waterlogging across many parts of the MID.

- Continuing to build awareness of social and cultural values and knowledge of actions to maintain and improve them.
- Simplifying program reporting.
- Reviewing and updating SRW’s nutrient monitoring network and modelling approach.
- Investigating the appropriateness of Resource Condition Target 2 for salinity and revising it if appropriate.

OFFICIAL

Public investment is warranted in the MID and across the Lake Wellington catchment because of the public benefits generated by controlling water table levels and by reducing phosphorus loads to Lake Wellington to meet Australia's obligations under the Ramsar convention.

Recommendations on the following matters are made to inform EC6 investment priorities. They include the need for:

- Continued public investment into farm programs in the MID.
- Public investment into the Lake Wellington Catchment outside the MID.
- Public investment into surface and subsurface drainage planning in the MID and into maintenance and upgrading of the public groundwater monitoring bore network.
- Public investment into dairy effluent management and nutrient reduction advisory services and plans to reduce phosphorus exports to Lake Wellington.
- An assessment of the quantum of an ongoing program to support farm planning and infrastructure works in preparation for renewal of the LWMP in 2028.

1 Introduction

1.1 Purpose

This report:

1. presents progress in implementing the Lake Wellington Land and Water Management Plan 2018 - 2028 (LWMP) at its mid-point considering the resources that were available, seasonal conditions and underlying assumptions, and new knowledge
2. reviews opportunities to refine delivery approaches and outcomes
3. recommends updates to the Plan based on the findings of the evaluation
4. provides an independent evaluation of the fifth tranche of the Environmental Contribution (EC5) in accordance with the West Gippsland Sustainable Irrigation Program (SIP) Monitoring, Evaluation, Reporting and Improvement Plan EC5 (2020-2024)
5. provides advice for developing the EC6 business case and agreed updates to the LWMP using the findings of the two evaluations.

Evaluation of delivery of Southern Rural Water's (SRW's) MID2030 project where it interfaces with the LWMP and the Department of Energy, Environment and Climate Action (DEECA) standard output data were not part of the scope of this report.

1.2 Problem

Irrigation in the Lake Wellington catchment, including the Macalister Irrigation District (MID), can:

- export nutrients from farms into the Ramsar listed Gippsland Lakes increasing the likelihood and severity of algal blooms and decreasing tourism's contribution to the regional economy
- increase water table levels which results in salinity and waterlogging, decreasing farm productivity and the health of waterways and flora and fauna dependent on them.

Both of these issues cause costs to individual irrigators and the broader public. Farm resilience and profitability and regional economic development in the Lake Wellington catchment are being constrained by:

- drought and climate change reducing the volume and increasing the variability in water availability
- farm and distribution system irrigation management and infrastructure not being best practice.

1.3 Response

The LMWP is designed to address the potential impacts of irrigation in the catchment. Its vision is:

A highly productive and sustainable irrigation community that values and protects its natural and cultural assets.

Over the years the themes have broadened from a narrow focus on waterlogging and salinity to salinity, waterlogging and nutrient management and at the broadest level sustainable irrigation communities. The current plan seeks to involve the catchment's irrigators in programs which save water, increase production and retain nutrients and soil on farms; initially focussing in the MID and eventually extending to all irrigation in the Lake Wellington catchment.

Irrigation is the focus because of its economic importance, its reliance on high levels of inputs, including water and nutrients, and because of its potential for significant off farm effects.

The LWMP is also designed to:

- maximise the value generated by the use of water in irrigated agriculture
- develop robust business cases to support government investment
- respond to climate change by seeking to develop more climate resilient farming systems and reducing the greenhouse gas emissions intensity of irrigation
- improve water quality and the health of local waterways and Lake Wellington
- recognise Indigenous cultural values and social values associated with the catchment's waterways and the uses of water.

The LMWP includes the following inter-related programs:

- Farm planning program
- On-farm irrigation and drainage program
- On-farm nutrient management program
- Groundwater and salinity program
- Floodplain and off-farm irrigation drainage program
- Innovative and connected irrigation communities program.

The LWMP is part of broader programs across West Gippsland to improve the health of the environment and improve farm productivity.

It is an integral component of the West Gippsland Regional Catchment Strategy 2021-27 which provides a vision for integrated catchment management in the West Gippsland region and sets a blueprint for catchment health and stewardship.

The LWMP also contributes to meeting phosphorus load targets in the Gippsland Lakes Ramsar Site Management Plan.

1.4 Investment programs

LWMP outcomes directly align with state and commonwealth government investment programs.

Since 2004 Victoria's environmental contributions have been collected from Victoria's water corporations to fund initiatives that:

- seek to promote the sustainable management of water or
- address adverse water-related environmental impacts.

Contributions payable by water corporations are collected under an Order made by the Minister for Water for a maximum period of four years.

The LWMP received funding from two years of the four year EC4 (2018-19 and 2019-20) and EC5 (2020-21 to 2023-24). Funding recipients are required to report on and evaluate funded projects consistent with the Strategic Framework and Evaluation Guidelines prepared by DEECA. EC4 reporting was completed in 2020. This project is undertaking an evaluation of the first six years of LWMP implementation and EC5 funding.

A total of 13 initiatives have been allocated funding under EC5, allocating a total of \$679.8 million. The remaining \$14.05 million of EC5 will be allocated in future State budgets.

Environmental contribution funds are administered by DEECA with the West Gippsland SIP receiving funds for implementation of the LWMP through the Sustainable Irrigation stream of the Water Wise Rural Communities Initiative. The initiative seeks to protect the environment and adapt to the impacts of climate change, while promoting productive and sustainable agriculture that is supported by modern infrastructure and policy. It is delivered through two distinct but interdependent program streams¹:

- Rural Water Infrastructure
- Sustainable Irrigation.

The programs continue to support:

- modernised infrastructure
- improved water efficiency
- increased resilience to changes to water availability
- achieving our shared responsibility for environmental health across Victoria's irrigation sector.

Furthermore, sustainable and productive irrigation contributes significantly to the social fabric of the regional community.

1.5 Method

1.5.1 General

Woodwater's basic framework to complete the LWMP and EC5 evaluations are to **(Figure 1)**:

1. gather and analyse available information on implementation of the LWMP and EC5 Program and changing influences on irrigation land and water management
2. use the outputs and outcomes from step 1 to evaluate the LWMP and EC5 Program separately against the five EC evaluation criteria (Appropriateness, Efficiency, Effectiveness, Impact and Legacy) noting that:
 - a. Impact and Legacy outcomes for the LWMP evaluation must account for it being a mid-term evaluation
 - b. the overlap in timeframes of the LMWP and EC5 Program

¹ <https://www.water.vic.gov.au/about-us/environmental-contributions/fifth-tranche-of-the-environmental-contribution/water-wise-rural-communities>

3. consult with the Lake Wellington Sustainable Irrigation Group and other agency experts and selected irrigators to collect information about the delivery of the LWMP's six programs to supplement reported data
4. use relevant information from steps 1, 2 and 3 to shape advice for the development of the EC6 bid and recommend improvements for LWMP implementation during the second half of its life.

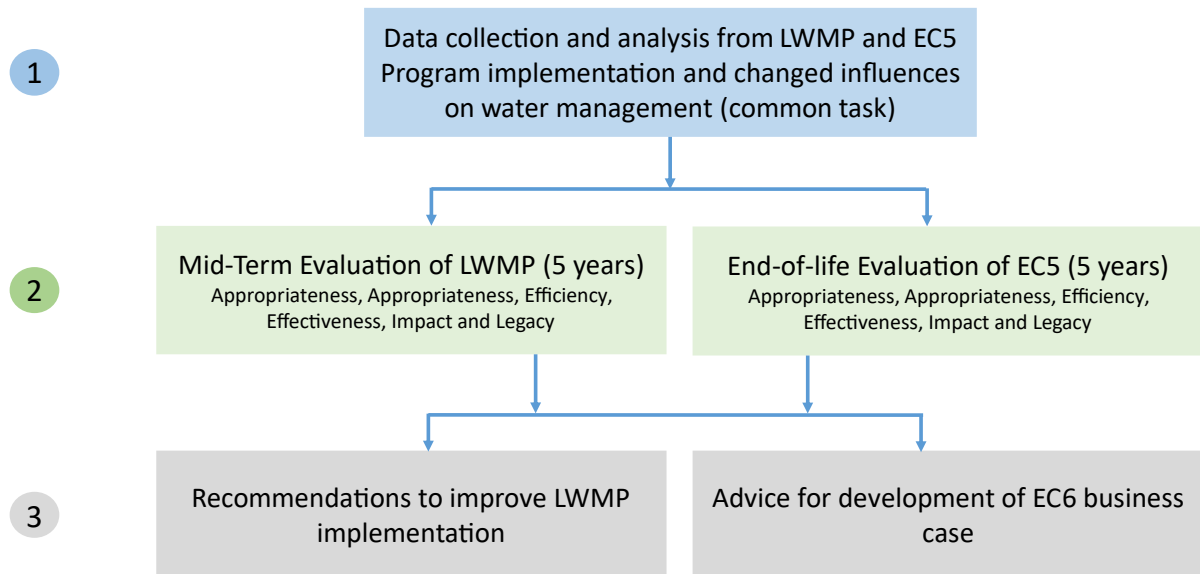


Figure 1 – Basic approach to the LWMP review and EC5 evaluation. The different coloured shading simply represents the major steps in the evaluations.

1.5.2 Evaluation

LWMP (2018-19 to 2023-24) implementation and EC5 investment (2020-21 to 2023-24) are evaluated using the following five key components of the EC evaluation framework:

1. Impact
 - Is the program making a difference?
 - Measure(s) – i) Extent to which LWMP outcomes have addressed the problems; and ii) contribution of plan implementation to resource condition targets (RCTs)
2. Appropriateness
 - Is LWMP design aligned with local, state and national priorities and are governance arrangements working well?
 - Measure(s) – Alignment with EC and state SIP priorities and conclusions from governance reviews
3. Effectiveness
 - Is the program delivering the activities/management actions it said it would?
 - Measure(s) – Progress against funded activities and management action targets
4. Efficiency
 - Are resources being used efficiently?
 - Measure(s) – Delivering expected activities on budget and time; prioritising investment and adapting implementation to changing circumstances; co-investment

5. Legacy
 - Will the benefits last?
 - Measure(s) – Level of confidence that RCTs and long-term outcomes will be achieved and sustained over time.

2 SIP, governance and investment

2.1 SIP

The evaluation finds: that LWMP partners actively contribute to and influence statewide and regional processes, programs and events and have made a significant contribution to Victoria's statewide SIP and helped to achieve a consistent approach to implementation. These efforts delivered on output targets in funding agreements.

Since the early 1990s Victoria's SIP has worked with regional communities and irrigators to deliver sustainability and productivity outcomes across Victoria's major irrigation districts. It has a strong history of improving the condition of land and water resources within or connected to irrigation areas, whilst increasing water use efficiency and productivity.

The SIP operates within Federal and State legislation, policies and strategies, as well as regional plans and strategies. Development and implementation of land and water management plans for Victoria's major irrigation regions is the primary avenue through which the SIP achieves on-ground change. Effective operation of the SIP relies on a strong partnership approach between program partners across Victoria – key partners being DEECA state SIP, Agriculture Victoria (AgVic), catchment management authorities (CMAs) and rural water corporations.

West Gippsland CMA and AgVic representatives have dedicated significant resources to supporting and influencing a consistent statewide approach to land and water management plan implementation across Victoria by:

- attending and contributing to quarterly SIP forums and sub-groups including the Incentives Working Group, Victorian Irrigation Drainage Program, SIP Monitoring Evaluation and Reporting Working Group, Regional Irrigated Land and Water Use Mapping (RILWUM) reference group and Irrigation Development Guidelines (IDGs) Working Group
- reviewing SEPP clauses including the Salinity and Irrigation Drainage clauses and Pollutant Load Reduction clauses
- inputting to strategy and policy development including for the implementation of Water for Victoria and the SIP Strategic Directions
- participating in the review of statewide LWMP Guidelines and providing feedback on draft guidelines
- providing feedback on the SIP EC4 Program Review
- actively supporting thinking and strategy planning in preparation for EC5 and EC6
- being a member of the Southwest IDG Working Group

- liaising closely with the East Gippsland CMA during the updating of the Gippsland IDGs that cover both West and East Gippsland
- being a member of Water for Agriculture working group which contributed to the Central and Gippsland Sustainable Water Strategy.

2.2 Governance

The evaluation finds: that LWMP implementation is well governed and effectively oversees the use of EC5 funding. No significant areas were identified for improvement by this review.

Lake Wellington Sustainable Irrigation Group (LW-SIG)

Implementation of the LWMP is overseen by the LW- SIG. Membership of the group includes representatives from the West Gippsland CMA, DEECA SIP, DEECA AgVic, SRW, EPA, Wellington Shire, Gippsland Water, Gippsland Lakes Coordinating Committee (represented by the West Gippsland CMA), GippsDairy and Food and Fibre Gippsland. Five of the nine member organisations have a direct role in LWMP implementation.

The four main roles of the LW-SIG are:

- overseeing implementation of the LW LWMP
- providing a forum for knowledge sharing on irrigation and land and water management issues
- providing a forum for consultation and collaboration on projects and broader issues
- contributing to Monitoring, Evaluation, Reporting and Improvement.

The Group meets quarterly, and members are expected to report back to their own organisations on program implementation, including to higher level groups as required. The Group is expected to seek input from the Irrigator Reference Group (IRG) and other community committees such as SRW's Macalister Customer Consultative Committee (MCCC).

An evaluation of the LW-SIG in 2020 (Blue Sense Consulting, 2020) found that it *...performed effectively in the role of supporting collaboration between agencies to support the implementation of the LWMP and supporting knowledge sharing about irrigation programs... and ...that without the LW-SIG there would be a reduced impact in terms of relationship building and networks, connecting with industry and the community and keeping the LWMP 'on the agenda'.*

The evaluation found that there was generally good attendance at meetings, especially from organisations directly involved in implementation. The top three participant suggestions about how the LW-SIG could be improved to better meet the needs of their organisation were:

- evolve the LW-SIG from information sharing and updates to discussion and collaboration across the range of agencies and industries
- include another representative from my organisation to ensure other business areas are involved in the discussions
- broaden the topics beyond the Sustainable Irrigation Program to other irrigation land and water management issues incorporating all industries.

The review was advised that efforts to enact these improvements are continuing.

LWMP – Irrigation Reference Group (IRG)

The IRG is an advisory group established in December 2018 to provide an irrigator perspective and advice on LWMP programs. Establishment of the IRG meant that for the first time in the program's 20-year history it had a dedicated forum for engaging with irrigators. There has been strong interest from irrigators to be involved in the group.

The IRG's terms of reference states that their responsibilities include to:

- contribute relevant local/technical knowledge on the MID
- provide input on implementation of the LWMP and delivery of the SIP and in particular:
 - the MID Incentives Program by providing recommendations to the Incentives Governance Group on matters such as eligibility criteria, prioritisation, rebate structures, etc
 - act as an advisory body to the LW-SIG
 - drive ownership and implementation of CMA and SIP activities through the irrigation community.

An evaluation of the IRG in 2020 (Hayman, 2020) found that most irrigator members thought the group:

- was well governed and supported
- functioned well
- was able to contribute relevant local and technical knowledge
- was able to provide recommendations regarding the incentives program.

Members viewed their main achievements as input to the incentives and drought programs and communication links between farmers and government. Members were less sure of how the LW-SIG used the information they provided. The most suggested ways to improve the support and function of the group were:

- provide clear feedback on where the group's contribution has been adopted
- the pub setting worked well (continue when possible)
- tighten up the meeting, keep it orderly, upskill meeting facilitation skills.

A discussion session was held with the IRG as part of this evaluation. There was a strong attendance with most group members present. The group was relatively young, with several new entrants into the area or enterprises. They were enthusiastic and were straight forward and honest in their responses – with the usual mix of some contributing throughout the session and some on one or two topics. They had a desire for knowledge to improve farm productivity and environment. Members were keen to discuss issues and appeared to be willing to change. Most were already on a pathway to improve their irrigation infrastructure and management. Overall, the session indicated that the IRG functioned well and offered a valuable avenue through which to seek direct input from irrigators on how to improve program implementation.

Incentives program

The Central Gippsland Irrigation Efficiency Incentives Program is a major component of the Farm planning and On-farm irrigation and drainage programs. It seeks to support development of modern irrigation farm plans to guide on-farm decision making and support government investment and adoption of improved irrigation and drainage infrastructure to increase water use efficiency and retain nutrients on farm.

Payment of financial incentives is directed by the Central Gippsland Irrigation Efficiency Incentives Program Governance paper (WG CMA, 2022) which sets out clear guidance on governance, incentives being offered, application processes, eligibility, prioritisation and requirements to avoid fraud, corruption and conflicts of interest.

Implementation is overseen by an Oversight Committee which is responsible for endorsing work group decisions. Membership consists of the West Gippsland CMA Manager of Land and Biodiversity and AgVic Manager of Irrigation Southeast. They meet monthly. The Operational Working Group provides the central governance role for the program and undertakes all operational activities involved in the administration of the incentives program. Various roles are split between nominated officers.

The Governance Paper, Landholder Booklet and Incentives Application Form were all updated in 2022-23 following completion of the new DEECA Incentives Governance Guideline.

No concerns were raised about governance and implementation arrangements during this evaluation. Governance is appropriate for the management of the significant sums of public money being invested into improving irrigation planning and practices.

2.3 Investment

The LWMP recognised that it was unlikely that government would be able to fully fund its portion of the \$51.8 million plan. Therefore, the LWMP included governance arrangements to decide on how funds received from the government each year were to be allocated to the highest priority programs and activities within programs.

This process ensured that available funds were allocated to high priority activities but also meant that implementation of programs was slower than anticipated and that some activities were not implemented at all.

Therefore, a key focus of this review was to assess whether available funding has been effectively prioritised and expended.

Total government and agency investment in the LWMP over the first six years of implementation was \$12.025 million (2018-19 to 2023-24) (**Table 1**). This included \$3.752 million from EC4, \$6.7 million from EC5², \$0.822 million from the Australian Research Council (ARC) and \$0.750 million from the Victorian Government and agencies for the ARC research project.

In addition, it is estimated that over the six-year period (excluding March to June 2024):

² \$4 million to the West Gippsland CMA and \$2.7 million to AgVic.

- irrigators provided co-investment of approximately \$4.5 million through their contributions to farm plans, reuse systems, flood to spray conversions and best practice flood irrigation
- SRW and their customers provided \$1.2 million (estimate \$0.2 million/year) of co-investment in the LWMP for nutrient monitoring and operation and maintenance of public groundwater pumps. SRW also provided about \$0.075 for the Newry Irrigation Farm Planning Project.

The major government and agency investment came from EC through the Victorian Government’s Sustainable Irrigation Program (87 per cent). This investment supports activities across most of the six LWMP programs and typically supports 1.5 FTE CMA staff and 4 FTE AgVic extension officers.

Table 1 – Government investment to be considered in the LWMP mid-term evaluation and EC5 end-of-life evaluation (\$,000)

Year	EC4	EC5*	ARC Project C’wealth	ARC Project State and agencies	LWMP Total
2018-19	\$ 989				\$ 989
2019-20	\$ 1,812				\$ 1,812
2020-21	\$ 951	\$ 1,217	\$ 103	\$ 378	\$ 2,649
2021-22		\$ 1,777	\$ 250	\$ 130	\$ 2,158
2022-23		\$ 1,652	\$ 298	\$ 135	\$ 2,084
2023-24		\$ 2,054	\$ 172	\$ 107	\$ 2,333
TOTAL	\$ 3,752	\$ 6,700	\$ 822	\$ 750	\$ 12,025

* Includes investment through the West Gippsland CMA and AgVic. AgVic phasings of \$0.675 million per year are approximate.

Significantly, the \$6.7 million from EC5 between 2020-21 and 2023-24 secured approximately \$4 million in co-investment:

- \$1.573 million of co-investment in the LWMP from the *Untangling Nutrient Export Processes from Agricultural Catchments* ARC research project (this excludes \$0.251 million for 2024-25)
- \$1.500 million of co-investment in the LWMP from irrigators as part of their contribution to farm plans, reuse systems, flood to spray conversions and best practice flood irrigation (this figure is expected to increase considerably once all incentive cases are finalised).

Program staff advise that CMA records significantly understate the contribution of irrigators. Often irrigators only provide invoices for the amount required to satisfy program eligibility requirements. In some cases these invoices may only be a tenth of

the full cost of the project. Thus, the irrigator contributions discussed here are an extremely conservative estimate of irrigator contribution.

- \$0.875 million (estimated \$0.2 million/year) of co-investment in the LWMP from SRW and their customers as part of nutrient monitoring and operation and maintenance of public groundwater pumps; and \$0.075 for the Newry Irrigation Farm Planning Project.

The majority (66 per cent) of funding was invested in incentives and extension support for farm plans, reuse systems, flood to spray conversions, best practice surface irrigation and other general advisory activities (**Figure 2**). Similar levels of funding were invested into:

- Frameworks and irrigation development guidelines (14 per cent) – which provides funding for program management, management of and contributions to regional and state level partnerships and ensuring compliance with Water Act requirements for new irrigation developments and redevelopments through the irrigation development guidelines processes
- Research (13 per cent) – for the *Untangling Nutrient Export Processes from Agricultural Catchments* project which is using the Lake Wellington catchment as a case study as part of investigations to understand and model nutrient dynamics in agricultural catchments.

A smaller proportion of funding was provided to drainage activities (7 per cent) which include ongoing monitoring, evaluation and reporting of salinity risk in the Macalister Salinity Management Zone (MSMZ), e.g. water table monitoring, and maintenance of the groundwater bore network.

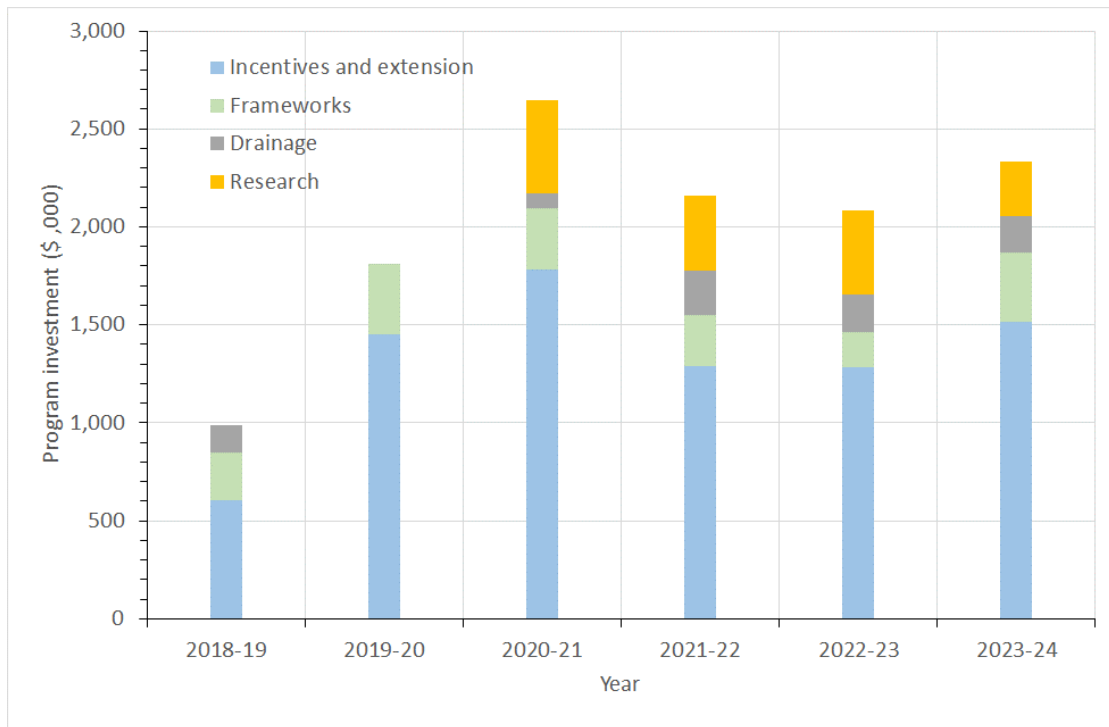


Figure 2 – Government and agency investment into Lake Wellington LWMP activities (Source: West Gippsland SIP annual reports)

The evaluation finds: that the processes to allocate available funds has been effective in prioritising investment. The focus has been on improving the management of farm water use efficiency to reduce groundwater recharge and surface drainage flows and to improve resilience to climate change. This focus aligns with the long-term outcomes of EC5.

Lower priority has been given to investing in:

- activities outside the MID which was foreshadowed in the LWMP
- refurbishing public groundwater pumps that have come to the end of their working life.
Note: The LWMP didn't recommend refurbishing groundwater pumps at the time and work is being done to assess the future of the pumps.
- farm nutrient management, instead relying on improved farm water management to reduce off farm drainage and the EPA to ensure dairy shed effluent is managed on farm.

3 Resource Condition Targets (RCTs)

Long term environmental management needs to build on human, social and cultural capital. Therefore, resource condition targets should acknowledge current and potential resource use patterns and reference historic states. They should represent practical outcomes and meet community expectations.

The resource condition targets should be used as part of an adaptive management framework to accommodate the uncertainty and complexity inevitable in landscape management. They should be used to track progress and if the targets are not being met, trigger more detailed investigations to determine whether programs need to be adjusted.

The LWMP has four RCTs, two primary targets related to water quality, salinity and water logging and two secondary targets related to agricultural productivity and knowledge and awareness of social and cultural values. The two primary resource condition targets are:

- RCT 1 – Phosphorus target
- RCT 2 – Salinity Target

The phosphorus target is set to improve the environmental condition of Lake Wellington and more generally the Ramsar listed Gippsland Lakes which are an important tourist destination and environment asset. Regional tourism contributes an estimated \$1.57 billion to the local economy from 5.63 million visitors annually (Kennedy, Thom, Gell, & Rosengren, 2024). Tourist visits fall during blue green algae blooms causing significant economic loss. For example, the Gippsland Lakes and Catchment Taskforce (Connolly & Hylands, 2009) estimated that the direct economic impact of the Algal Bloom in 2008 was approximately \$18.2 million. Including a multiplier effect (industry output) economic impact was estimated to be \$26.6 million with job losses of 306 full time and part time.

The Gippsland Lakes are a Ramsar site³. Nutrient and sediment inflows from the catchment to the main lakes were identified as one of the highest priority threats in the Ramsar Site Management Plan. Impact pathways from agricultural run-off and elevated nutrient and sediment loads following bushfires were identified as high risks for seagrass, fish and waterbirds (including the threatened fairy tern). The Gippsland Lakes Ramsar Site Management Plan includes a strategy to reduce nutrient and sediment loads to the Gippsland Lakes through riparian, in-stream and catchment works to improve water quality of river flows to the Gippsland Lakes to maintain their Ramsar values.

The obligation to protect the Ramsar values of the Lakes is reinforced by the Environmental Reference Standard (ERS) for Phosphorus loads to Lake Wellington. This specifies that the average annual load of phosphorus to the Lake should not exceed 100 tonnes/year. This compares to the assumed base load of 115 tonnes/year. The Environmental Reference Standard therefore requires a reduction in the phosphorus load to Lake Wellington of 15 tonnes/year.

The agreed share of the MID reduction in phosphorus load to Lake Wellington is 7.5 tonnes/year. This value has been adopted as a primary resource condition target for the LWMP, aligning with the Environmental Reference Standard and Australia's Ramsar obligations.

The Lake Wellington phosphorous target is also included in the Central and Gippsland Region Sustainable Water Strategy. Action 8-25 of the Central and Gippsland Sustainable Water Strategy commits the Government to developing and implementing plans to meet the 100 tonnes/year phosphorus load target for Lake Wellington including through the Lake Wellington land and water management plan and the Gippsland Lakes Ramsar site management plan.

The remaining 7.5 tonnes/year is to come from the rest of the Lake Wellington catchment.

The other primary resource condition target, RCT 2 – Salinity Target, aims to contain risks from irrigation induced salinity and shallow water tables by limiting the area of land in the Macalister Salinity Management Zone with high water tables to a 2012 benchmark of 33,000 ha during the life of the Plan (2018-2027).

It is noted that following completion of the LWMP a new supplier was engaged to undertake water table mapping. The new supplier adjusted the mapping approach which resulted in a decrease in the estimated area of shallow water tables across all years of the record. The area with water tables within two metres of the surface in the 2012 benchmark year decreased from 33,000 ha to 28,000 ha. It is recommended that RCT 2 be revised from 33,000 ha to ~28,000 ha. This revision has no broader implications for LWMP implementation. It simply resets the target to align with the new mapping approach.

³ The Gippsland Lakes Ramsar Site was designated as a wetland of international importance under the Ramsar Convention in 1982. As a signatory to the Convention, Australia has an obligation to manage the site to maintain its 'ecological character' and to have procedures in place to detect if any threatening processes are likely to, or have, altered the 'ecological character'.

Overall, during the high water table period of 2011-12 there were no reported widespread constraints on production or negative socio-environmental impacts. Some localised impacts were observed that were managed through direct extension services. Typically, remnant areas of high salinity risk are isolated to low lying areas historically prone to a high water table. Landholders within these areas are typically aware of the risks and manage their properties accordingly (Anonymous, 2023).

The Plan adopted a “care and maintenance” approach by seeking to contain the extent and impact of shallow water tables and irrigation-induced salinity, rather than eliminate high water tables. The target area was the upper range recorded since the end of the Millennium Drought and 2018.

Consultation on the Plan and the adoption of the target suggested that irrigators have adapted to manage salinity and waterlogging at 2012 levels.

The secondary targets reflect the LWMP’s vision and long-term outcomes. Achievement of secondary targets is more reliant on influences beyond plan activities.

Evaluation of the LWMP against the resource condition targets are provided in the following sections.

3.1 RCT 1 – Phosphorus target

RCT 1 (primary target) – Average annual phosphorus load entering Lake Wellington from irrigation areas will be reduced by 7.5 tonnes/year by 2030.

The evaluation findings for RCT1 are:

- LWMP implementation continues to make an important contribution towards managing the discharge of phosphorus from the MID to Lake Wellington and may, by 2030, achieve RCT 1.
- The target has been effective in triggering further phosphorus load investigations.

There are two avenues through which to assess the contribution of the LWMP to reducing phosphorus loads to Lake Wellington by 7.5 tonnes/year.

The first is by using estimates of phosphorus retention on farms associated with program activities. Completed works on farm – new or upgraded reuse systems, flood to spray conversions and best practice surface irrigation – are estimated to have generated 7,616 ML/year of water savings and retained 3.8 tonnes/year of phosphorus on farm⁴ since the LWMP commenced.

⁴ Assumes that works result in a 2 ML/year water saving and that each 1 ML/year of water saving retains 0.5 tonnes/year of phosphorus on farm.

Additional phosphorus was also retained on farm through the CORE 4 program. Although the program was funded prior to commencement of the LWMP, most nutrient reduction activities occurred during the life of the LWMP. CORE 4 modelling estimated that the program resulted in 19 tonnes/year of phosphorus being retained on farm. Investigations for water savings programs estimated that retention of 4 tonnes of phosphorus on farm resulted in a 0.5 tonne reduction in phosphorus entering Lake Wellington⁵. Assuming a similar relationship holds for the CORE 4 program, phosphorus load reductions to Lake Wellington may be in the order of 2 to 3 tonnes/year.

This bottom-up analysis indicates that over the first six years of the plan the targeted phosphorus reduction is likely to have been achieved, with an estimated total reduction of phosphorus reaching Lake Wellington in the order of 6 tonnes/year.

The second avenue is by using results from SRW's river monitoring program⁶.

The phosphorus load target is an annual average. Phosphorus exports in any year are influenced by many factors, particularly rainfall and streamflow. Achievement of the target should consider average annual loads over several years, not a single year.

The average annual phosphorus load from the MID to Lake Wellington over the first four years of the LWMP was 44 tonnes/year. This annual load is similar to the 42 tonnes/year annual average load recorded over the 10-year life of the previous Macalister LWMP (**Figure 3**).

The loads exported each year between 2018-19 and 2021-22 varied significantly in response to rainfall⁷ and stream flow. Average annual rainfall over the four years was 571 mm, just below the long-term average of 595 mm. Loads during 2018-19 and 2019-20 were well below the 42 tonnes/year average over the life of the Macalister LWMP. Rainfall in these two years was almost the lowest on record and in the lowest 25 per cent of years on record. Loads in the following two years were well above 42 tonnes/year when rainfall was above that recorded in 73 and 88 per cent of years.

Caution is required when analysing results from SRW's river monitoring program as there were issues in 2022-23 with autosampler intakes clogging with mud and sediments. The issues developed during very high flow events and meant that there was low confidence in the quality of 2022-23 phosphorus load data. As a result this data hasn't been included in **Figure 3**.

SRW are in the process of fixing instream autosamplers (as of March 2024). SRW have also engaged Monash University to undertake a review of the nutrient model used to derive loads for

⁵ Nutrient retention benefits from farm works were initially overestimated and revised downwards following the LWMP nutrient review.

⁶ The river monitoring program commenced in 2014-15 following a review of the existing drain monitoring program. It is described in Jacobs SKM (2014)

⁷ Rainfall percentiles were determined from annual (financial years) rainfall records at the East Sale BOM station between 1944/45 and 2022/23.

various parts of the Lake Wellington catchment from monitoring data. The review is scheduled for completion by late-2025.

Additional years of monitoring following the review of SRW’s nutrient monitoring program are required to understand if the estimated load reductions from LWMP works will be recorded in the river monitoring program.

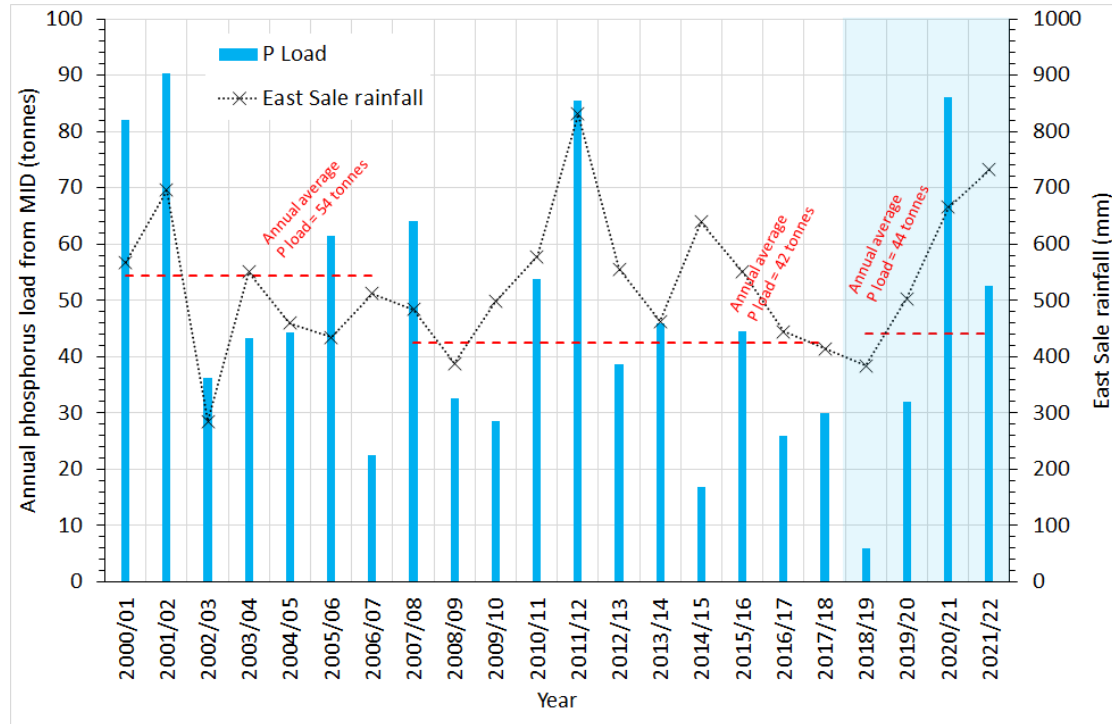


Figure 3 – Annual average phosphorus load exported from the MID, annual rainfall for the East Sale Bureau of Meteorology station and annual average phosphorus loads during the life of the: i) MID Nutrient Reduction Plan 1998 (2000/01 to 2006/07); ii) Macalister LWMP 2007 (2007/08 to 2017/18); iii) Lake Wellington LWMP 2018 (2018/19 to 2021/22). The blue shaded area corresponds to Lake Wellington LWMP implementation.

On average 54 tonnes/year of phosphorus were exported from the MID between 2000-01 and 2006-07 when the MID Nutrient Reduction Plan was in place. Annual average rainfall was 501 mm. The average annual phosphorus load exported over the life of the Macalister LWMP was 42 tonnes, with the average annual rainfall being 531 mm. These figures indicate that LWMP implementation is resulting in long-term decreases in phosphorus exports. Further evidence of these longer-term gains is the decrease in phosphorus load per gigalitre (GL) of flow in the Thomson River at Bundalaguah from the early 2000s to recent years (**Figure 4**). Exports appear to have stabilised at between 0.05 and 0.20 tonnes/GL when they had often been higher in earlier years. Flows in the Thomson River at Bundalaguah do not capture all stream flows through the MID, however all flows from the Thomson catchment to Lake Wellington show similar trends.

Since 2000 new or upgraded reuse systems, conversion from flood to spray irrigation and best practice surface irrigation systems supported by LWMP programs are estimated to have generated around 44,545 ML/year of water savings for irrigators and retained 22 tonnes/year of phosphorus on farms. These water savings and phosphorus load reductions don’t include farm infrastructure and management improvements completed independently of the program. Thus,

water savings and phosphorus load reductions are likely to be significantly higher, although estimates are not available. The continuing estimated decreasing trend in phosphorus exports to Lake Wellington is consistent the expected decrease in loads leaving farms because of ongoing farm irrigation infrastructure and management improvements across the MID.

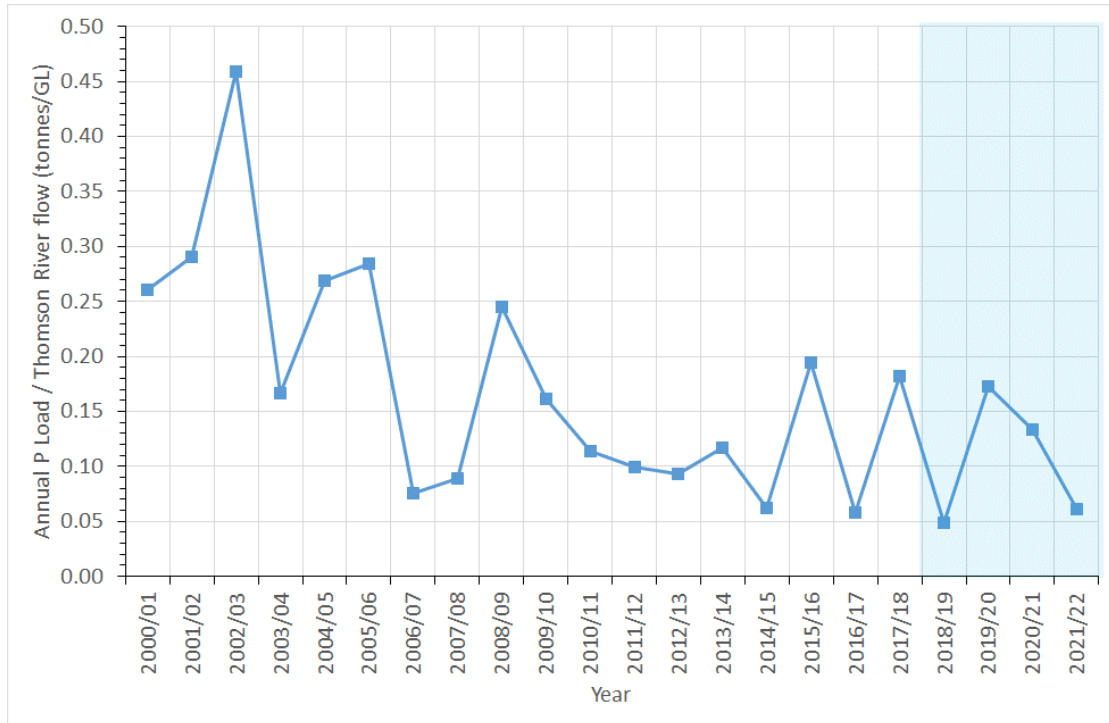


Figure 4 – Ratio of annual phosphorus load exports from the MID and median annual streamflow volume in the Thomson River at Bundalaguah. The blue shaded area corresponds to LWMP implementation.

3.2 RCT 2 – Salinity target

The evaluation findings for RCT2 are:

- That RCT2 performance is dominated by natural drought and flood events rather than by management intervention
- Further investigations are warranted to refine RCT2.

The RCT 2 – Salinity Target, aims to contain risks from irrigation-induced salinity and shallow water tables by limiting the area of land in the Macalister Salinity Management Zone (MSMZ) with high water tables to a 2012 benchmark of 33,000 ha⁸ during the life of the Plan (2018-2027).

Depth to water table has been mapped since 1996. **Figure 5** shows the annual area with a depth of water table of less than 2, 1 and 0.6 metres together with the previous year’s annual rainfall for the 27 years between 1996 and 2023.

⁸ Noting that this target should be revised to ~28,000 ha following the appointment of new supplier and adjustment to the mapping approach.

Points to note include that the annual area of water table within 2 metres of surface:

- is responsive to annual rainfall in the previous year, increasing in years with above average annual rainfall⁹
- was below the 2012 benchmark during the Millennium drought (1997 to 2009)
- increased during the flood years leading up to January 2007, 2012 and 2021
- was below the benchmark area for the nine years between 2012 and 2021
- exceeded the target in 2022 and 2023.

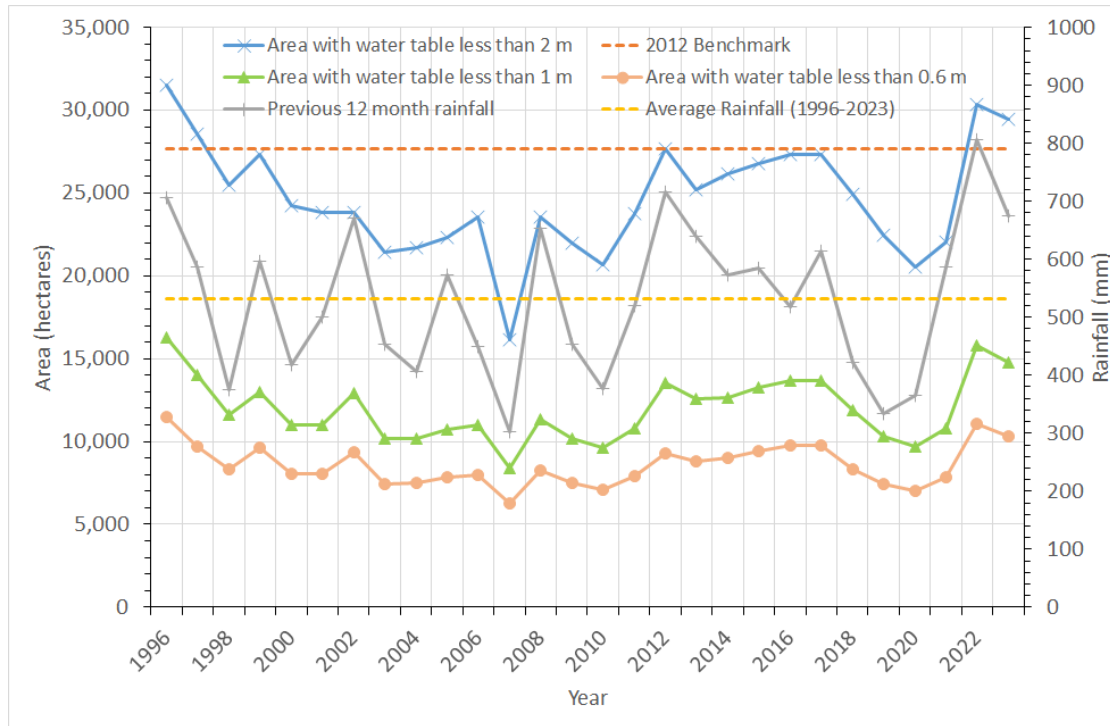


Figure 5 – Annual area of water table within 2, 1 and 0,6 metres of the soil surface compared with the previous year’s annual rainfall between 1996 and 2023. Note: the target is set as ~28,000 ha in the figure.

The target was not met in 2022 and 2023 because of well above average rainfall and flooding that occurred in this period. Some IRG members advised that salinity and waterlogging were affecting crop productivity on their farms. Local agency staff advised that there were likely to be salinity and waterlogging impacts occurring across the region but because it had been many years since previous occurrences many irrigators wouldn’t associate production losses with them. A local agronomist confirmed that salinity and waterlogging impacts were not just localised and were occurring across several areas – particularly in Nambrok, Denison and up the Latrobe River catchment, e.g. around Toongabbie.

Changes in the annual area of water tables within 2 metres of surface do not necessarily reflect the effectiveness of the six LWMP programs being implemented in the MID because of the large

⁹ Previous years rainfall is used because water table monitoring is typically undertaken in January each year.

effects of rainfall, river height and floods on water table levels. The influences of these factors overwhelm the effects of management actions on water table behaviour.

It is not clear if the target it is a good indicator of salinity risk. The target of limiting the area of water tables within 2 metres of the surface to less than 33,000 ha (should be reset to ~28,000 ha) during the life of the Plan (2018-2027) may still be valid if it:

- is acceptable to the community and they can live with the extent of salinity and high water tables present in 2012
- limits the growth in high water tables and salinity caused by management activities
- provides an acceptable balance between the costs of salinity and waterlogging and the costs of actions that would be required to further reduce the area of high water tables and salinity
- triggers further investigation when the target is exceeded.

It is known that:

- increasing farm water use efficiency and improving surface water drainage reduces recharge to the water table
- private groundwater pumping from shallow unconfined aquifers such as Denison and Wa De Lock lowers water tables within the draw down area of the pumps
- groundwater pumping from public bores lowers water tables and that only 11 of 19 pumps have been operating in recent years.

Given the target has been exceeded it is sensible to investigate whether RCT2 remains appropriate or whether:

- the use of water table depths shallower than 2 m (i.e. <1 m or 0.6 m) provide a more representative indication of salinity risk in the MSMZ
- areas close to waterways (i.e. within the 1 in 100 year flood extent) which have permanent water tables less than 2 m should be excluded from the target.

The investigation should include a small project to better identify/map the correlation of salinity and waterlogging impacts with water table depth. One option may be to measure groundwater salinity at each of the sites where water table depth is measured during the next survey. Another option may be to do inspections at representative sites to assess salinity and water table impacts. If there is good correlation between impacts and areas with water tables less than 2, 1 or 0.6 m then this depth is likely to be a better indicator of risk. It should also consider whether the target would have been met if the full suite of 19 public groundwater pumps were operating.

3.3 Secondary targets

The evaluation finds:

- The secondary targets are not particularly useful for assessing LWMP performance
- Surveys to track changes in knowledge and awareness would be useful data if they could be delivered cost effectively
- Targets for emission reduction should await the adoption of national/state methods and standards for irrigated farming.

The LWMP has three secondary targets:

- the gross value of production from irrigated agriculture will increase by an average of 5 per cent p.a. during the life of the Plan (2018-2027)
- by 2027, 70 per cent of participants report increased knowledge and awareness of the Indigenous and non-Indigenous social and cultural values associated with Lake Wellington catchment irrigation areas
- reduction in emissions or emissions intensity from irrigation land and water management.

The Plan states that its programs are only one of many influences that potentially drive or block progress towards the secondary targets.

Gross value of irrigation production

The Australian Bureau of Statistics (ABS) has released gross value of irrigated agricultural production (GVIAP) data for Australia which includes data for West Gippsland. Data is not released for the Lake Wellington Catchment.

In 2017-18 the GVIAP in West Gippsland was \$446 million¹⁰. Over the three years to 2020-21 the GVIAP increased by 17 per cent to \$522 million¹¹. These figures indicated that the GVIAP is increasing at just above the target rate of 5 per cent per year but, because of the many influences on the value of production, this can't be directly attributed to the LWMP.

Increased knowledge and awareness

LWMP partners have undertaken a range of activities to increase knowledge and awareness of Indigenous and non-indigenous social and cultural values. Activities related to Indigenous social and cultural values are discussed in **section 9**.

It is not possible to determine if the RCT was met as proposed surveys to inform the assessment were not funded.

¹⁰ <https://www.abs.gov.au/statistics/industry/agriculture/gross-value-irrigated-agricultural-production/2017-18>

¹¹ https://agriculture.vic.gov.au/data/assets/pdf_file/0007/921175/Irrigated-agriculture-fast-facts-Jan-2023.pdf

Reduction in emissions intensity

The Plan acknowledged that no emissions target has been set at this stage and that there are several key challenges, including: the lack of baseline information for production systems other than dairying and the absence of means to capture data to either set or monitor progress against such a target.

4 Farm planning program

Goals for the program are that:

- modern irrigation farm plans guide on-farm decision making and support government investment
- consistent statutory planning processes guide new irrigation development.

4.1 Background

In West Gippsland, support for farm planning began under the MID Nutrient Reduction Plan at the start of the century.

Farm planning helps irrigators consider their long-term objectives and drive infrastructure investments and the farm management activities that will help to achieve them. Farm plans help irrigators take full advantage of opportunities associated with the land and water available to them and the irrigation supply and drainage systems to which they may connect – including supply systems upgraded under MID2030. They lead to on-ground action which provides:

- private benefits for farm businesses by improving productivity, delivering water and labour savings and enabling more efficient use of fertilisers
- public benefits for public land and waterways and native flora and fauna by reducing nutrients exported from farms and groundwater recharge that exacerbates watering logging and salinity.

As part of an adaptive management approach a new farm planning framework was adopted as part of the Activity 1.1. It included the farm irrigation efficiency checks; setting clear goals and strategies for the business early in the process; an assessment of risks to irrigators values and goals and to waterways and native vegetation; development of the physical aspects of the farm plan (e.g. survey, pumps, pipes, channels and earthworks etc); and periodic review of the plan.

The incentives offered through the program are the same for a New or Upgraded Irrigation Farm Plan – 75% of project cost up to \$90/ha and up to a total value of \$10,000 (figures exclude GST).

A farm plan is a prerequisite for accessing financial incentives offered through the On-farm irrigation and drainage program (**section 5**).

As a rule of thumb farm plans that are over 10 years old should be updated.

4.2 Discussion

1.1 Irrigation farm plans

LWMP activity description – A flexible and holistic irrigation farm planning and extension program that will:

- Provide support to irrigators to undertake an “irrigation efficiency check” and implement practical, low cost actions as they develop their farm plan.
- Provide farm planning extension services.
- Support for farm survey and irrigation layout/design by farm planning consultant.
- Support irrigators developing farm plans that, where appropriate, include collaborative, cross-property environmental and/or infrastructure works.

Over the first six years of the plan \$0.59 million in incentives was paid to irrigators by the CMA and partners with irrigators contributing \$0.273 million resulting in the Farm planning program covering 68 per cent of the costs of new and modernised farm plans. Farm plans were prepared for 10,984 ha which is approximately 20 per cent of the 53,000 ha MID.

Since 2000-01 new irrigation farm plans have been prepared for 46,748 ha, most of the MID. Modernised farm plans have also been prepared for 6,262 ha.

Irrigators received \$0.45 million in incentives from EC5 investment and contributed \$0.114 million. Farm plans were prepared for 5,042 ha which is approximately 10 per cent of the MID.

Between 2018-19 and 2023-24 LWMP implementation met the original LWMP targets for farm plans and targets set through funding agreements for the LWMP (**Table 2**). The targets for EC5 funding were also met (**Table 3**).

Table 2 – Number and area of irrigation farm plans: i) originally targeted by the LWMP; ii) funded to be completed through the LWMP; and iii) delivered through the LWMP

Activity	LWMP Target (6 years)	LWMP Funded Target (6 years)	LWMP Actual* (6 years)	Comment
New or modernised irrigation farm plans	120 (6,000 ha)	117 (5,850 ha)	156 (10,984 ha)	Achieved under budget

*18 additional farm plans covering 1,395 ha are currently being case managed (February 2024)

Table 3 – Number and area of irrigation farm plans: i) originally targeted by the LWMP; ii) funded by EC5 to be completed through the LWMP; and iii) delivered through the LWMP by EC5 funding

Activity	LWMP Target (4 years)	LWMP EC5 Funded Target (4 years)	EC5 Actual* (4 years)	Comment
New or modernised irrigation farm plans	80 (4,000 ha)	65 (3,250 ha)	59 (5,042 ha)	Achieved targeted area under budget

*18 additional farm plans covering 1,395 ha are currently being case managed (February 2024)

Importantly, it is estimated that since support for farm planning commenced in 2000, just under half of the area covered by farm plans has been upgraded in accordance with the plans¹², i.e. the plans are leading to on-ground improvements.

Program adaptation and continuous improvement – Case Study 1

An Irrigator Reference Group (IRG) was formed in December 2018 to provide advice about program design, direction and implementation. It was the first time in the program’s 20-year history that it had a dedicated forum for engaging with irrigators. An early contribution made by the group in response to drought was to propose that an offer of one-on-one advice be made to irrigators across the MID.

Program staff made more than 200 calls to irrigators to offer support and talk about farm planning. Around 100 field visits resulted from these calls. Staff learnt a lot about how well farmers perceived farm plans in these discussions, including that 25 to 30 per cent of farmers implemented only parts of their irrigation farm plans because future personal and business objectives were not fully considered during plan development.

In response extension officers adapted their approach to farm planning by working more closely with farm planners and broadening discussions during early meetings to consider both personal and business objectives for farms. Anecdotal evidence suggests that the revised approach has led to increased implementation of farms plans.

Program adaptation and continuous improvement – Case Study 2

The Newry Irrigation Farm Planning Project is another example of successful program adaptation. The project, despite numerous challenges including COVID and delays in the rollout of the modernisation program:

- successfully supported and enhanced delivery of the distribution system modernisation program (including reducing costs)
- ensured farm plans complied with requirements of the MID irrigation farm planning program and relevant statutory requirements
- facilitated the development of five revegetation action plans which were incorporated into farm plans.

The project significantly enhanced farm business, regional environmental outcomes and modernisation program delivery by developing irrigation farm plans that align with farm business objectives, government statutory requirements, modernised irrigation infrastructure

¹² Bonnie Dawson and Anthony Goode (personal communication 5 March 2024)

and irrigation best practices across 20 per cent of the MID and around 30 per cent of irrigation businesses in the district¹³.

Blue Sense Consulting (2022) conducted a detailed evaluation of the project and found that *...Overall, the project was valued by participating irrigators and agencies/contractor representatives. There was an increase in irrigator knowledge of irrigation opportunities, most Newry irrigators intend to implement their IFP [Irrigation Farm Plans], and there is a level of confidence around the transition to the new irrigation delivery system.*

Irrigation efficiency checks – the LWMP proposed to do irrigation efficiency checks on 20 properties per year as part of the farm planning incentives program. The checks were conducted as part of implementing the Sustainable Irrigation Decision Support Tool checklists that are completed at the start of every farm plan. These checks included providing advice about how to implement practical, low-cost actions as part of the development of farm plans. This advice was a key element of extension work supporting irrigation farm plan development. In addition three more detailed irrigation system performance checks were funded with nine checks being completed.

High quality extension – all targeted extension activities funded under the LWMP relating to farm planning were met or exceeded, e.g. under EC5 224 advices were funded in relation to farm plans and 376 advices were provided. There were also significant additional activities relating to written material (governance papers, landholder booklets, application forms), virtual field days, governance group meetings and phone calls to farmers – calls to more than 200 farmers as part of the Newry Project (discussed above)

1.2 Lake Wellington farm business planning tool

LWMP activity description – Development or adaptation farm business planning tools to support irrigation farm planning. The tools will assist in the initial stages of farm planning engagement to help irrigators articulate and develop their business and farm management goals as a basis for effective farm planning. The tool will focus on defining objectives for farm business and family and understanding financial capacity for investing in IFP improvements.

The farm business planning tool is incorporated into the Sustainable Irrigation Decision Support Tool and is being implemented as part of the delivery of farm plans.

1.3 Upland irrigation farm planning guidelines

LWMP activity description – Adaptation of irrigation farm planning concepts to upland irrigation settings. Guidance on irrigation farm planning will be developed for irrigators in these areas, drawing on lowland irrigation experience and dryland whole farm planning processes.

¹³ There are an estimated 365 dairy farm businesses within the MID (CORE 4, 2018) of which over 100 participated in the farm planning program.

Budgets were insufficient to fund this activity. **Section 11.2** recommends expanding farm planning to irrigated farms outside the MID be considered to contribute to the target of reducing phosphorus loads to Lake Wellington by 7.5 tonnes/year from the rest of the catchment.

1.4 Best practice guide to irrigation and farm planning

LWMP activity description – Development of Lake Wellington best practice guidelines and standards for farm planning and irrigation, which draw on the insights and experiences of local farm planners, designers and extension staff and is consistent with the requirements of the Water Act 1989.

The Sustainable Irrigation Decision Support Tool was completed in 2019-20 and published in September 2020¹⁴.

The support tool is designed to be used by assist irrigators, extension officers and service providers in West Gippsland to understand the opportunities for improved irrigation management and provide guidance on issues for consideration in a new irrigation development, planning an upgrade to an existing development, or understanding options and issues relating to specific aspects of irrigation design or management.

The tool isn't intended to provide the 'right' answer to all questions that may arise in relation to improving irrigation infrastructure and management on a farm. Solutions will vary from farm to farm depending on circumstances. The tool assists in raising and answering a range of questions to consider and provides directions to agencies, industry bodies, service providers and other sources of information.

The tool was developed in response to feedback from irrigators who were contacted as part of drought response work that, at least for some irrigators, advice provided during the development of farms plans did not always suit their farm or their circumstances. Advice from AgVic and the West Gippsland CMA is that the revised approach to providing advice which is guided by the tool is leading to improved satisfaction from irrigators and increased implementation of works and management advice.

The support tool is being utilised by irrigators and extension staff to guide them through best practice irrigation management decision making.

1.5 Consistent statutory planning for new irrigation developments and works affecting floodplains

LWMP activity description – Engagement with local government to ensure that statutory planning processes for irrigation farm planning are risk-based, consistent across Lake Wellington catchment and ensure high quality new and modified irrigation developments.

¹⁴ See https://wgcm.vic.gov.au/wp-content/uploads/2023/03/WGCMA-SustainableIrrigation-Decision_Support_Tool.pdf

Irrigation farm planning assessments report that proposed activities in irrigation farm plans comply with relevant statutory requirements, e.g. the evaluation of the Newry Irrigation Farm Planning Project reported that 24 of the 26 irrigation farm plans were approved by the West Gippsland CMA with provisional approval for a 25th plan (also see **section 5.2**).

4.3 Achievement of MATs

The evaluation finds:

1.1 Irrigation farm plans

Delivery of farm plans: Targets in both the original LWMP and funding agreements for irrigation farm plans were met during the first six years of implementation and in the four years of EC5 funding. There is evidence that the irrigation farm plans developed complied with relevant statutory requirements.

Irrigation efficiency checks: All target related to irrigation efficiency checks were met.

High quality extension: Targets for extension activities funded through the LWMP were met.

1.2 Lake Wellington farm business planning tool

Implemented by incorporation into the Sustainable Irrigation Decision Support Tool

1.3 Upland irrigation farm planning guidelines

Budgets were insufficient to fund this activity.

1.4 Best practice guide to irrigation and farm planning

The best practice guide was completed and is being used effectively by AgVic, West Gippsland CMA staff and irrigators. It is called the Sustainable Irrigation Decision Support Tool.

1.5 Consistent statutory planning for new irrigation developments and works affecting floodplains

Farm plans prepared are consistent with regulatory requirements and appropriate referrals are occurring. Every farm plan has a cultural heritage overlay check done during the Concept Plan stage.

4.4 Lessons and advice

In the face of drought, COVID, floods, changing irrigator demographics, business type and structure the Farm planning program adapted to deliver quality advice and support to irrigators. Advice from the Irrigator Reference Group was important in helping to reshape the program to align it with changing irrigator needs.

Incentive payments are small compared to works incentives but larger compared to the overall cost of the service. They remain in demand by irrigators and provide a non-regulatory approach to achieving best practice irrigation on farm. They complement the regulatory based Irrigation

Development Guideline process. The one-on-one impartial advice provided by skilled extension staff through the program remains a mainstay of LWMP implementation.

A small team of extension staff who are trusted by irrigators can provide a coordinated government response to a crisis – in this case drought – and at the same time continue to deliver on longer term LWMP goals.

By co-ordinating closely with other agencies and private service providers the program was integral in delivery of MID2030 and in accelerating delivery of farm plans.

Irrigator surveys, as proposed in the EC5 MERI plan, would enhance program evaluation by providing clearer evidence on the value of irrigation farming planning to irrigators and the timing and extent of plan implementation. This evaluation was largely based on case studies and discussions with program staff and irrigators. Irrigator surveys were conducted as part of the Newry farm planning project.

Having a single local supplier of farm planning services in the area can limit the pace and responsiveness of delivery of farm plans and, in turn, other elements of the incentives program. Suppliers from northern Victoria were brought into support implementation of the Newry project and have been regularly used on other occasions. However, irrigators often prefer to use the local planner because of their knowledge of the region and because they often have existing farm information. The farm planning offer could be more flexible. Not every farm needs a qualified survey and design plan. In some cases, an AgVic concept plan and an installer design may be sufficient, particularly for updated plans.

The program could work with the EPA to incorporate dairy effluent system design into irrigation farm plans. This is a specialist area of expertise requiring a different skill set to existing farm planners. However, there are service providers in the area with these skills who could work with the CMA and AgVic to design an approach to make this work. The effort is worthwhile as dairy shed effluent is a significant source of phosphorus into Lake Wellington.

Insufficient funding meant that program farm planning services were not expanded into catchments above the MID. SRW's river monitoring program shows that significant nutrients loads are exported from these areas to Lake Wellington. Expansion of irrigation farm planning and extension services into upper catchment areas would increase the effectiveness of the existing program.

5 On-farm irrigation and drainage program

Goals for the program are that:

- irrigation and drainage infrastructure improve water use efficiency and retain nutrients on farm
- irrigation development guidelines and local government planning support high quality new irrigation development.

5.1 Background

The on-farm irrigation and drainage program is the LWMP's main delivery program. It supports the implementation of works and measures described in irrigation farm plans and, within the MID, it enables irrigators to take advantage of irrigation supply systems which have been upgraded under MID2030.

The program enables irrigators to improve irrigation water use efficiency and generate water savings which can then be used to drive farm production and profitability improvements. Related activities under this program also reduce labour requirements, thereby lowering costs and/or improving work-life balance for irrigators. These activities also provide significant environmental benefits by reducing export of nutrients and sediment from farms and reducing recharge to groundwater.

The program has two main components, firstly incentives for flood to spray conversion, installation of re-use systems and best practice surface irrigation (BPSI) and secondly implementation of new irrigation development guidelines (IDGs). The program is supported by agricultural extension focused on irrigation system design and management.

The on-ground works incentives offered by the program are (all values exclude GST):

- Reuse System – 50% of project cost up to \$400/ha up to a total value of \$20,000
- Flood to Spray/Drip Conversion – 50% of project cost up to \$600/ha up to a total value of \$20,000
- Best Practice Surface Irrigation – 50% of project cost up to \$200/ha up to a total value of \$20,000.

5.2 Discussion

2.1 and 2.2 Physical works supported by financial incentives

LWMP activity description –

- *Provision of high quality extension services and, as appropriate, financial incentives to support improvements in on-farm irrigation infrastructure and management practices. Activities which are supported include: Flood-to-spray conversion; Best practice surface irrigation (particularly high flow flood irrigation) on appropriate soil types; Irrigation outlet rationalisation (as part of connection to upgraded irrigation supply systems); Automation of irrigation; Soil moisture monitoring.*
- *Provision of high quality extension services and financial support for the construction or expansion (in appropriate settings) of irrigation reuse systems and related works to help retain nutrients and sediment on-farm.*

Over the first six years of the plan \$0.852 million in works incentives was paid to irrigators by the CMA and partners with CMA records reporting that irrigators contributed \$4.189 million to the total cost of works (**Table 4**).

Program staff advise that CMA records significantly understate the contribution of irrigators. Often irrigators only provide invoices for the amount required to satisfy program eligibility

requirements. In some cases these invoices may only be a tenth of the full cost of the project. Thus, the irrigation contributions discussed here are an extremely conservative estimate of irrigator contribution.

The proportion of the overall cost of works paid for by government varied significantly with the type of works. Government funds paid for 10 per cent of the cost of flood to spray conversions, 15 per cent of Best Practice Surface Irrigation and 31 per cent of reuse systems. Given the higher incentive contribution for reuse systems it is not surprising that 53 per cent of works incentives supported the installation of reuse systems.

Since the commencement of EC5 in 2020-21 irrigators received \$0.231 million through incentive payments and contributed \$1.386 million (**Table 5**). These figures, and those in **Table 4**, don't include \$0.342 million in committed incentive payments that are expected to be paid during 2024.

The data in these tables only include expenditure and works that were implemented through LWMP programs. The expenditure and areas of works undertaken outside of the programs are not included in the tables so the expenditure and areas are significant underestimates.

Despite covering four years, EC5 incentive payments are only 48 per cent of total payments over the six-year life of the LW LWMP. This is not a reflection of a decrease in demand for works incentives. Decreasing payments resulted from a 12-month delay in the program between EC4 and EC5 and challenging conditions to complete works over the past three very wet years. However, funds are now fully allocated and are expected to be expended by the end of 2024.

Table 4 – Incentive payments to landowners and their in-kind contribution to on-ground works activities over the first six years of LWMP implementation (to February 2024)

Activity	Incentives payments (6 years)	Landowner in-kind contributions (6 years)	Total* (6 years)	Comment
Flood to spray conversions	\$0.244 m	\$2.290 m	\$2.534 m	Landowners contributed 9.4 dollars for every government dollar invested
BPSI systems	\$0.156 m	\$0.901 m	\$1.057 m	Landowners contributed 5.8 dollars for every government dollar invested
New or expanded reuse systems	\$0.452 m	\$0.999 m	\$1.450 m	Landowners contributed 2.2 dollars for every government dollar invested
TOTAL	\$0.852 m	\$4.189 m	\$5.041 m	

* Does not include payments between March and June 2024

Table 5 – Incentive payments to landowners and their in-kind contribution to on-ground works activities over the four years of EC5 implementation (to February 2024)

OFFICIAL

Activity	Incentives payments (4 years)	Landowner in-kind contributions (4 years)	Total* (4 years)	Comment
Flood to spray conversions	\$0.070 m	\$0.712 m	\$0.782 m	Landowners contributed 10.2 dollars for every government dollar invested
BPSI systems	\$0.037 m	\$0.327 m	\$0.364 m	Landowners contributed 9.0 dollars for every government dollar invested
New or expanded reuse systems	\$0.124 m	\$0.347 m	\$0.471 m	Landowners contributed 2.8 dollars for every government dollar invested
TOTAL	\$0.231 m	\$1.386 m	\$1.617 m	

* Does not include payments between March and June 2024

Between 2018-19 and 2023-24 farm works supported by incentives were implemented across 3,803 ha of the MID. New or expanded reuse systems were the most extensive works with 2,194 ha of additional irrigated land draining to these systems (**Table 6**).

Works implementation fell short of the six-year targets in the LWMP as funding was only received for a proportion of these targets. All targets set through funding agreements have already been exceeded before over 1,000 ha of works still being case managed are considered (**Table 6**). These works will be completed by the end of 2024.

Table 6 – Area of flood to spray conversions, best practice surface irrigation systems and new or expanded reuse systems: i) originally targeted by the LWMP; ii) funded to be completed through the LWMP; and iii) delivered through the LWMP

Activity	LWMP Target (6 years)	LWMP Funded Target (6 years)	LWMP Actual* (6 years)	Comment
Flood to spray conversions	1,800 ha	680 ha	926 ha	Funding agreement target exceeded Not funded to meet LWMP target
BPSI systems	1,200 ha	650 ha	688 ha	Funding agreement target exceeded Not funded to meet LWMP target
New or expanded reuse systems	4,200 ha	1,830 ha	2,194 ha	Funding agreement target exceeded Not funded to meet LWMP target
TOTAL	8,200 ha	3,160 ha	3,803 ha	

*Additional works currently being case managed (February 2024): i) five flood to spray conversions covering 162 ha; ii) 16 BPSI systems over 652 ha; 13 new or expanded reuse systems over 488 ha

Consistent with expenditure, implementation of works supported by incentives funded by EC5 between 2020-21 and 2023-24 has been slower than in the prior two years. The four year works targets in the LWMP were not fully funded and will not be met. All targets in EC5 funding agreements are expected to be met once those currently being case managed are completed (Table 7).

Completed works are estimated to have generated 1,108 ML/year of water savings for irrigators and retained 0.6 tonnes/year of phosphorus on farm¹⁵. Once EC5 contracted works are complete they will have generated 3,712 ML of water savings and retained 1.9 tonnes/year of phosphorus on farm.

Table 7 – Area of flood to spray conversions, best practice surface irrigation upgrades and new or expanded reuse systems: i) originally targeted by the LW LWMP; ii) funded by EC5 to be completed through the LW LWMP; and iii) delivered through the LWMP by EC5 funding

Activity	LWMP Target (6 years)	LWMP EC5 Funded Target (4 years)	EC5 Actual* (4 years)	Comment
Flood to spray conversions	1,200 ha	160 ha	90 ha	Funding target expected to be achieved Not funded to meet LWMP target
BPSI systems	800 ha	240 ha	148 ha	Funding target expected to be achieved Not funded to meet LWMP target
New or expanded reuse systems	2,800 ha	700 ha	316 ha	Funding target expected to be achieved Not funded to meet LWMP target

* Additional works currently being case managed (February 2024): i) five flood to spray conversions covering 162 ha; ii) 16 BPSI systems over 652 ha; 13 new or expanded reuse systems over 488 ha

Achievement of works targets generated 7,616 ML/year of water savings and retained 3.8 tonnes/year of phosphorus on farm¹⁶ which will have increased farm and regional productivity and protected local waterways and Lake Wellington.

¹⁵ Assumes that works result in a 2 ML/year water saving and that each 1 ML/year of water saving retains 0.5 tonnes/year of P on farm.

¹⁶ Assumes that works result in a 2 ML/year water saving and that each 1 ML/year of water saving retains 0.5 tonnes/year of P on farm

There were no reported issues with the quality or timeliness of works beyond delays associated with floods and wet weather during 2021-22, 2022-23 and 2023-24. However, as discussed in **section 4** access to farm planning services can delay farm plan preparation, and given a plan is a prerequisite for other incentives, implementation of works.

The long-term, consistent and sustained investment in on-ground works since 2000 has supported the installation of best practice irrigation infrastructure across 22,400 ha (43 per cent of the MID).

It is estimated that since the government began supporting works implementation with incentives in 2000:

- reuse systems that capture drainage water from 15,092 ha (28 percent of the MID) have been installed
- 5,673 ha (11 percent of the MID) of irrigated land has been converted from flood to spray irrigation
- 1,658 ha of best practice surface irrigation has been completed (these incentives commenced in 2014-15).

These works have generated around 44,545 ML/year of water savings for irrigators and retained 22 tonne/year of phosphorus on farms.

Program partners advise that there has been a significant additional area of works completed outside of the LWMP program, particularly flood to spray conversions. These works were privately funded and are not captured in the above data.

Demand for incentives remains strong, especially for reuse systems. Lack of demand isn't an issue. Increasing the incentive rate for flood to spray conversions would attract more interest – incentive rates have increased little over the last decade resulting in public funds paying for a smaller proportion the overall cost of works.

Extension and incentive efforts continue to reach a new audience. Land use, technology, ownership and enterprise change means the program continues to provide advice and incentives to a changing cohort of irrigators who may be unfamiliar with irrigation or at least with the elements of best practice irrigation in the region.

The On-farm irrigation and drainage program is a mature program providing an efficient and affordable approach to achieving change:

- demand outstrips budget
- it leverages significant private investment
- it implements proven technologies that:
 - improve water use efficiency and productivity
 - reduce off farm drainage and groundwater recharged.

The program should continue while there is demand.

2.3 Extension

LWMP activity description – Provision of high-quality extension services and coaching for irrigators to enable on-going improvements in irrigation efficiency.

Critical to the success of the entire program is the independent, expert advice provided by AgVic/CMA extension officers. The extension officers act as the public face of the program and ensure that irrigators are informed and able to make sound decisions about their farming business.

Extension activities include one-on-one support, irrigation field days, farm walks, information sessions, courses and development of educational materials (e.g. media articles, brochures, field day notes). In recent years there was a strong focus on drought support as well as the ongoing role in supporting MID2030 projects. Specifically, this extension work helps irrigators to:

- manage irrigation water budgets, irrigation scheduling, irrigation business management during drought conditions
- identify and understand the delivery system changes that have occurred (or will be occurring) under MID2030
- identify and understand the opportunities that management and/or infrastructure changes on-farm can do to improve irrigation efficiency
- ensure irrigation systems are consistent with broader farm business development goals
- identify opportunities to generate water savings, productivity gains and environmental benefits
- sign-post irrigators to other relevant services (e.g. farm planning, agronomic advice, business planning, rural financial counselling and mental health)
- encourage private investment to implement best practice irrigation.

This extension support activity also delivers traditional services in areas such as irrigation farm planning, incentives case management, general irrigation management, water budgeting, nutrient management, salinity management and irrigation development guidelines. AgVic also operate three weather stations in the region and provide information to irrigators on past and forecast evapotranspiration and rainfall for irrigation scheduling purposes.

Between 2018-19 and 2023-24 AgVic had 340 contacts (143 for EC5) in relation to works incentives. These contacts include case management of works projects. Advice services were very high in the first two years and decreased over the EC5 period. Funded outputs were achieved.

When the full range of general advisory services (i.e. not specific to irrigation farm planning, irrigation incentive and IDGs) related to irrigation management are considered, deliverables were well in excess of funding targets. This is the case for both the six-year life of the LWMP and the four-year EC5 period. For example:

- there were 312 contacts for individual advice funded by EC5 where the target was 80 contacts. Advisory services were very broad, covering advice on matters including – water weeds, readily available water of soils, native vegetation, water testing, irrigation scheduling, soil moisture probes, spray system pricing, EPA manure guidelines etc... The

wide range of topics demonstrates the breadth of experience and expertise that extension offices must have so that they can do their jobs effectively

- field days and workshops funded by EC5 targeted at building knowledge of irrigators were attended by 587 participants. The funding target was 100 participants.

The IRG advised that impartial farm extension services are highly valued. Although not always explicit there was a theme throughout discussions with the group about the importance of independent advice provided by AgVic/CMA extension staff and other advisors, e.g. in relation to fertiliser advice and more generally about farm side operations. A local agronomist supported these comments and advised on the complementary of private and publicly funded advisory services.

The success of the extension and advisory program was driven to a large degree by partners working together and with irrigators to continuously identify opportunities and adapt the program. Key actions included the Newry Irrigation Farm Planning Project, making direct contact with over 200 irrigators to offer drought support (**see section 4**) and reaching out to managers of corporate farms to offer advice. The latter resulted in an organised session on irrigation management with several farm managers who had either had little experience with irrigation or with irrigation in West Gippsland.

The success of extension work in the final four years of LWMP implementation to be funded by EC6 will require the West Gippsland CMA and AgVic to continue to seek advice from the IRG, monitoring industry and enterprise changes and adapt strategies and activities to suit circumstances. Experience of staff efforts between 2018-19 and 2023-24 gives confidence that this can be done.

2.4 Industry partnerships, farm demonstrations and trials

LWMP activity description – Development of industry partnerships to establish local, on-farm demonstrations and trials of best practice irrigation management. Priorities for trials and demonstrations will be developed in conjunction with industry partners and irrigators and apply to dairy and horticulture sectors. They will be initially undertaken in the MID region and then in irrigation areas across Lake Wellington catchment, following engagement with irrigators in these areas.

Demonstrations and trials will, as appropriate, integrate across on-farm irrigation and drainage and on-farm nutrient management. Demonstrations could be at paddock, farm and/or sub-catchment scale, depending on consultation outcomes.

These demonstrations are half of the 'Irrigation and Nutrient Management Demonstration Project' that aims to demonstrate and extend innovative irrigation practices that promote wise water use and good nutrient management. The other two demonstration projects are discussed in **section 6.2**.

The Central Gippsland on-farm demonstrations were progressed during the first half of 2023-24 although installation of the solar-powered fixed sprays (demo 2) took longer than anticipated due to the extremely complicated nature of the programming. However, all infrastructure across

all of the projects is now installed, and measurements and analysis of these results are continuing.

The project team is confident that the demonstrations will produce high quality data and stories to drive practice change across the district in several crucial areas such as emissions reduction, adaptive responses to drainage issues, and in the instance of the two other demos, minimising nutrient leaving farms.

Demo 1 (Variable Rate Irrigation): this is the most complete of the projects as it commenced a year earlier than the other three projects; one field day was held in 2022-23 and the final report is almost complete. The exact timing for a final field day is yet to be decided but will be chosen based on the optimal time of the year to demonstrate the impact of the project.

Demo 2 (Solar-powered fixed sprays): all fixed sprays have been installed and buffering storage is complete. The programming of the sprays is well underway. This process was time consuming because of the complicated nature of individually programming each spray. A report about this project and its findings is currently being drafted and a field day is being planned for May 2024.

Both LWMP and EC5 funding outputs are on track to meet targets.

2.5 Irrigation Development Guidelines

LWMP activity description – Revision and updating of the Gippsland IDGs to set best practice standards for on-farm irrigation systems and practices for new or modified irrigation developments. A major revision to the IDGs would only occur after regulatory/legislative change to enable them to regulate or influence major irrigation redevelopments without change to water use licence conditions. This would be as part of a state-wide process with significant input from DELWP.

The Gippsland Irrigation Development Guidelines (IDGs) provide guidance for government agencies to process applications for new irrigation development. They ensure the statutory requirements for each agency are fully considered and addressed and in doing support high quality new irrigation developments.

The LWMP proposed to complete a review of the Gippsland IDGs in the first year of plan implementation. Completion of the IDGs was delayed due to statewide reviews, COVID, staff turnover and the decision to work collaboratively with the Glenelg-Hopkins CMA on development of their South-West IDGs to ensure consistency in IDG processes across Victoria.

The IDGs were completed in 2022-23 and endorsed by AgVic, DEECA (then DELWP) and the Boards of directors of SRW and the East and West Gippsland CMAs. Revisions to the guidelines bring them into line with changed regulatory requirements and statewide guidelines. The IDGs and supporting fact sheets are available from the West Gippsland CMA website¹⁷.

¹⁷ See https://wgcm.vic.gov.au/wp-content/uploads/2023/07/Gippsland-IDGs_Final.pdf

The IDGs are triggered when a new or expanding irrigation development submits a water use licence application (or variation). Good coordination between the West Gippsland CMA, AgVic and SRW is fundamental to the IDG process. SRW receives applications for new or varied licences and AgVic extension officers support the CMA by providing an important mix of technical, agronomic, soil and irrigation advice to the development process.

Demand for IDG services was strong throughout the first six years of LWMP implementation, with responses to referrals from SRW for new irrigation developments and assessment of AULs well above funding targets – there were 157 (70 for EC5) referral responses compared to a target of 52 (EC5 target of 32). Advice was also provided to another 16 inquiries in relation to the IDG process. These inquiries include pre-IDG meetings with landholders.

The high number of referral responses was in part associated with:

- West Gippsland CMA and AgVic support to SRW for the auctioning of 2,500 ML of new winter-fill water entitlements in the Tarwin River catchment in 2018-19. The auction resulted in the referral of 34 applications to the CMA for assessment against the IDGs. In a demonstration of the adaptive nature of the LWMP program the CMA put in place a three-step process to efficiently process the large volume of referrals –
 - Step 1 – All applications underwent a desktop risk assessment utilising the information provided in the application and internal mapping resources to quantify the risk of offsite impacts. Low risk applications were deemed safe to proceed to auction, predominantly due to the very low intensity of irrigation being proposed and the suitability of the landscape to handle irrigation. Medium and high-risk applicants moved to step 2.
 - Step 2 – Joint site visits with the CMA and SRW were conducted on all medium or high-risk applications. The site visits enabled the CMA and SRW to explain potential risks and future requirements should they proceed (such as the need for an Irrigation and Drainage Management Plan)
 - Step 3 – Post auction, all successful applicants were required to submit an Irrigation and Drainage Management Plan that was compliant with the IDGs).
- ongoing drought conditions up to January 2020 – the SIP team responded to an unprecedented level of referrals and advice requests about new or expanding irrigation developments. When rain returned in January 2020, the program saw a significant slowdown in the number of referrals and enquiries, however the year end outputs were still above target
- nine referrals in 2022-23 associated with the Tambo River winterfill water auction (up to 1,000 ML was available for sale).

An Irrigation Development Guideline Implementation Working Group was established in 2023 to review implementation arrangements and discuss specific development cases as required. The group is comprised of representatives from DEECA, AgVic, GippsWater and East and West Gippsland CMAs.

2.6 Investigation to increase reuse dam size

LWMP activity description – Investigation of the issues, benefits and impacts of a proposal to increase reuse dam size limits in a Gippsland context.

This work has commenced and is being undertaken as part of the *Untangling the mechanisms of nutrient export from agricultural catchments* ARC research project.

The research project will develop a SOURCE model of the Lake Wellington catchment and use this to assess the effectiveness of different options in reducing nutrient loads to Lake Wellington. This is expected to include evaluating:

- the effectiveness of existing LWMP activities (e.g. improved farm irrigation infrastructure and management, including reuse dams) at retaining nutrients on farm – these are generally considered to be effective in dry to average years
- increased capture of farm and catchment runoff in reuse dams or other detention basins to reduce nutrient export to Lake Wellington in wet years when there are high flows but not extensive flooding.

In very wet years with widespread flooding there is currently little that management and infrastructure can do to prevent the export of nutrients from farms to Lake Wellington. However, in these years it is thought that much of the flow into Lake Wellington (in the order of two-thirds) passes through the lakes system and out the entrance which also flushes nutrients through the system.

The work is expected to be completed by the end of 2025. See **section 6.3** for additional information on the project.

5.3 Achievement of MATs

The evaluation finds:

2.1 and 2.2 Physical works supported by financial incentives.

Funding agreement targets for implementation of works supported by incentives were exceeded during the first six years of the LW LWMP. Funding agreement targets for EC5 are expected to be met. Original works targets in the LWMP were not fully funded and were not met.

2.3 Extension

Extension targets/outputs in the LWMP and EC5 funding agreement have been met. The success of the extension and advisory program was driven to a large degree by partners working together with irrigators to continuously identify opportunities and adapt the program.

2.4 Partnership, demonstrations and trials

Although behind schedule due to the complicated nature of solar powered fixed sprays both LWMP and EC5 funding outputs are on track to meet targets.

2.5 Irrigation Development Guidelines

New IDGs were completed, although they were behind schedule due to circumstances beyond control of program partners. There has been strong demand for general advice and processing of referrals. The program developed an innovative approach to adapt to meet this demand with existing resources.

2.6 Reuse dam size

The proposed project has commenced and is expected to be completed by the end of 2025 as part of the Untangling Nutrient Runoff processes in the MID research project.

5.4 Lessons and advice

The goals for the program to improve water use efficiency and retain nutrients on farm are being met and the funding available to the on-farm irrigation and drainage program is being effectively prioritised and expended. Existing processes should continue.

Some technical work is warranted to review the assumptions used to quantify the nutrients retained on farm by implementing reuse, flood to spray conversion and BPSI following completion the ARC research project.

Given the success of the program in achieving implementation of best practice irrigation infrastructure and management across the MID, extending the program to include irrigated dairy in upstream areas of the Lake Wellington catchment is advised.

The capacity of reuse dams is limited to 1 ML for every 10 ha irrigated. This limit is established by the Ministerial Re-use Dam Order 2002. The Order was made to ensure that reuse dams did not capture catchment runoff. Larger reuse schemes would be able to store more run-off from irrigated paddocks further reducing nutrient loads to drains and ultimately Lake Wellington. The benefits of reducing drainage flows needs to be balanced with the contribution drainage makes to flows in waterways.

The order could be amended to enable larger reuse dams to be built in the Lake Wellington catchment by exception, where the CMA considers that a larger reuse dam would provide overall environmental benefits by reducing nutrient discharges.

6 On-farm nutrient management program

Goals for the program are that:

- improved nutrient and effluent management retain nutrients on farm
- efficient use of nutrients leads to improved profitability.

6.1 Background

The program reflects the objectives of the LWMP and its key role in meeting the SEPP (Waters) phosphorus load reduction target for Lake Wellington (now the phosphorus load target in the EPA's Environment Reference Standard).

The program provides benefits for irrigator's by maximising the effectiveness of their investments in fertiliser and use of other sources of nutrients (purchased feed, dairy effluent) to best effect: It reduces costs and increases productivity.

By improving the efficiency of nitrogen use within irrigation farming systems, the program also has potential to reduce emissions of nitrous oxide, which is a potent greenhouse gas.

6.2 Discussion

3.1 Irrigator nutrient training

LWMP activity description – Provision of training to irrigators to enable them to develop and implement nutrient management plans for their properties.

Budgets were insufficient to fund this activity. However, as discussed in section 3.1, the CORE 4 program did undertake related work throughout the period but this work was funded prior to commencement of the LWMP.

A local agronomist, who is a member of the IRG, advised that some irrigators are very reliant on advice of fertiliser companies for their fertiliser planning and that there would be significant public and private benefits in improved nutrient planning education and extension services. Increased irrigator knowledge would save thousands of dollars by avoiding unnecessary purchase and application of fertilisers and improve the Gippsland Lakes by avoiding the transport of applied nutrients off-farm. They saw the provision of private and public advisory services as being complementary and often referred irrigators to AgVic services for matters where, for example, farm and regional drainage issues interacted.

3.2 Extension and financial incentives for dairy effluent systems

LWMP activity description – Provision of high-quality extension services and financial incentives to improve the design and management of dairy effluent systems and undertake other measures which help to keep nutrients and sediment on farm.

Budgets were insufficient to fund this activity.

See next section for information on demonstration sites.

3.3 Industry partnership and demonstration sites

LWMP activity description – Establishment of industry partnerships for local on-farm demonstrations and trials of best practice systems for the management of dairy effluent and of nutrients and sediments in pasture and horticultural cropping systems.

Priorities for trials and demonstrations will be developed in conjunction with industry partners and irrigators and apply to dairy and horticulture sectors.

Demonstrations and trials will, as appropriate, integrate across on-farm irrigation and drainage and on-farm nutrient management. Demonstrations could be at paddock, farm and/or sub-catchment scale, depending on consultation outcomes.

These demonstrations are half of the 'Irrigation and Nutrient Management Demonstration Project' that aims to demonstrate and extend innovative irrigation practices that promote wise water use and good nutrient management.

The two nutrient management demonstration sites were established in 2023-24. The demonstrations aim to showcase the potential benefits when best practice effluent management and best practice irrigation management are combined. Progress on each site is:

- Demo 1 (application of effluent through a pipe and riser system): the final section of pipe and riser was installed in December 2023. Baseline sampling has been completed. Further sampling is scheduled for early 2024. The business was significantly impacted by rainfall and flooding events which delayed infrastructure installation.
- Demo 2 (a self-cleaning effluent suction pontoon filter & liquid fertiliser injection system installed into an existing irrigation system to allow for effective disposal of effluent and application of fertilisers across three centre pivot irrigators). The floating pontoon filter and post pump filter have been installed, spray assessment conducted and effluent and soil samples taken. Final spray assessment and sampling is scheduled for March 2024.

A field day involving visits to both sites is planned for the second half of 2024.

Although behind schedule due to flooding impacts on infrastructure installation both the LWMP and EC5 funding outputs are on track to meet targets.

3.4 EPA compliance monitoring of dairy effluent

LWMP activity description – EPA continuing compliance monitoring to ensure that dairy effluent management systems conform to regulatory standards.

Longer-term, EPA will be adjusting its business model and moving to pollution prevention rather than response. In relation to dairy effluent, this may include development and support for adherence to an industry Code of Practice.

The pollutant load objective for Lake Wellington in Table 5.21 of the EPA's Environment Reference Standard (ERS) 2022¹⁸ is for an average annual total phosphorus load entering Lake Wellington to be 100 tonnes. There is no reference to the LWMP or a reduction of 7.5 tonnes/year from irrigation sources.

The EPA has a limited role in proactively managing dairy shed effluent. It relies on other agencies and industry groups to proactively work with farmers to improve dairy shed effluent management.

¹⁸ <https://www.epa.vic.gov.au/about-epa/laws/compliance-and-directions/environment-reference-standard>

Effluent management systems do not require an EPA permit. Instead the EPA is the regulator and focuses on preventing the discharge of effluent off the farm onto a neighbour's property, a drain or a waterway. They may issue remedial notices requiring works to be undertaken by the farmer to prevent environmental harm or infringement notices.

There are two ways they may become involved. Firstly, they respond to complaints from the public. Secondly, they conduct unannounced compliance and enforcement inspections on dairy businesses in specific areas as part of 'their business as usual' work. The areas to be audited are selected when clusters of complaints from the public are identified.

For example, EPA officers¹⁹ visited 19 farms in the Poowong North, Hallora, Nyora, Ripplebrook and Athlone areas and found that 85 per cent of systems were non-compliant. Nine notices requiring non-compliant farms to install controls, or complete works to better manage their risks and seven fines were issued. The EPA publishes the compliance and enforcement outcomes in local media.

Most non-compliance issues concerned dairy effluent ponds that were full or overflowing into paddocks and down into waterways, broken or ineffective equipment like pumps and irrigation systems and not having an effluent management plan in place. Some farms even had pipes directly discharging into waterways.

The EPA has no role in preparing nutrient management plans.

While not in the Lake Wellington Catchment, the South Gippsland compliance audit provides strong evidence that actions to improve the management of dairy shed effluent should be a high priority for the on-farm nutrient management program.

The 2015 Report of the Gippsland Lakes INFFER Analysis²⁰ found that the enforcement of effluent management regulations was a cost-effective measure for reducing phosphorus loads. They advised that, given the emphasis on providing incentives to dairy farmers to improve practices, enforcement of existing effluent regulations is important. Especially so given the pressures for dairy expansion in high rainfall areas, and thus additional nutrient pressures on receiving waters.

3.5 Research into nutrient sources and pathways

LWMP activity description – Research to improve understanding of the sources and movement pathways of nutrients lost from irrigation farms and how these may be affected by horticultural expansion and potential new irrigation developments. The research will also consider the

¹⁹ EPA press release <https://www.epa.vic.gov.au/about-epa/news-media-and-updates/media-releases-and-news/gippsland-dairy-farms-not-managing-effluent>

²⁰ Anna Roberts, David Pannell, Peter Cottingham, Graeme Doole and Olga Vigiak (2015) Report on the Gippsland Lakes INFFER analysis. Department of Primary Industries, Victoria

influence of flooding and related episodic events in lowland and upland environments. It will build on the substantial body of data from historical water quality monitoring.

The Lake Wellington Sustainable Irrigation Group (LW-SIG) played an important role in the renewal of the LWMP in 2018/19. During the review, the need for improved modelling of nutrient transport through the catchment was identified as a critical research need. In response the LWMP proposed to undertake research to improve understanding of the sources and movement pathways of nutrients lost from irrigation farms and how these may be affected by horticultural expansion and potential new irrigation developments. The research was also to consider the influence of flooding and related episodic events in lowland and upland environments. It would build on the substantial body of data from historical water quality monitoring. The proposed outputs were research reports and extension activities based on research findings.

Together with Monash and Melbourne Universities, LWMP partners secured \$1.8 million from the Australian Research Council (ARC), DEECA and Victorian water agencies for a research project titled *Untangling the mechanisms of nutrient export from agricultural catchments*. The project commenced in 2020-21 and will be completed in the second half of 2025.

The research team from Monash and Melbourne Universities has provided short research project updates to partners and will soon publish initial results in scientific literature. Results are still too preliminary to adapt into extension advice.

The LW-SIG is playing an integral role in informing and supporting research partners. Ultimately, the project aims to provide a greater understanding of nutrient sources and movement throughout the catchment so that future Government investment can be targeted and guided by the best available science.

The research project is developing a nutrient budget for the Moe River catchment (upstream of the MID) and for the MID and undertaking sampling to understand how nutrients move through the catchments and what types of actions may reduce nutrient loads.

The nutrient budget for the catchments includes both natural sources of nutrients as well as that added from fertilisers, sewage treatment plants and feed. River and drain-scale water sampling showed that ammonia nitrogen and dissolved phosphorus exports from the MID dominated the nutrient loads. Chemical techniques traced the source and transformation of nitrogen and these data showed that the nitrogen is most likely derived from manure.

Sixteen active monitoring sites have been established on seven farms across the District including dairy, beef, and horticulture, which have sampled runoff from these farms during irrigation and rainfall events. Preliminary findings from the analysis of these samples have been that dairy and livestock release relatively large amounts of ammonia nitrogen and dissolved phosphorus, whereas horticulture releases relatively large amounts of nitrate nitrogen and relatively little dissolved phosphorus. This suggests manure is the main source of nutrients from grazing (livestock and dairy) whereas fertiliser is the main source from horticulture.

The findings will inform the development and calibration of an eWater SOURCE model of the MID. This model will then be used to run different scenarios that allow assessment of the effectiveness of different approaches to reducing nutrient loads entering Lake Wellington.

Program partners successfully secured funding for the research project proposed in the LWMP. The project is progressing well and should deliver stated outputs by the end of 2025.

3.6 Financial incentives for silt traps

LWMP activity description – Provision of financial incentives for vegetable growers to construct silt traps to capture sediments and nutrients that would otherwise be lost from their farms.

Budgets were insufficient to fund this activity. However, one example did proceed through IDG processes.

3.7 Agreed agency-industry position on dairy effluent management on irrigation farms

LWMP activity description – Development of an agreed agency-industry position and approach on the management of dairy effluent on irrigation farms. The position will be the subject of an industry-led communication campaign to increase regulatory compliance and adoption of best practice in dairy effluent management.

Budgets were insufficient to fund this activity. Program staff continue to work with local dairy industry representatives to have this activity incorporated into dairy specific strategies.

6.3 Achievement of MATs

The evaluation finds that:

3.1 Irrigator nutrient training

Budgets were insufficient to fund this activity.

3.2 Extension and financial incentives for dairy effluent systems

Budgets were insufficient to fund this activity.

3.3 Industry partnership and demonstration sites

Although delayed due to flood impacts on infrastructure installation the LWMP and EC5 outputs are expected to be met.

3.4 EPA compliance monitoring of dairy effluent

The EPA have met LWMP outputs to conduct compliance monitoring of dairy effluent management and report on compliance outcomes.

3.5 Research into nutrient sources and pathways

Program partners successfully secured funding for the research project proposed in the LWMP and the project is progressing well and should deliver stated outputs by the end of 2025.

3.6 Financial incentives for silt traps

Budgets were insufficient to fund this activity. However, one example did proceed through IDG processes.

3.7 Agreed agency-industry position on dairy effluent management on irrigation farms

Budgets were insufficient to fund this activity.

6.4 Lessons and advice

The On-farm nutrient management program goal of retaining nutrients on farm is primarily being delivered by minimising and retaining irrigation drainage on farm. This contributes to the efficient use of nutrients. However, the extent of activity in this project has been limited by the funding that has been available.

If additional funds become available they could be directed towards:

- developing a program to improve dairy shed effluent management in the MID and the rest of the lake Wellington catchment
- encouraging milk processors to be more actively involved in maintaining effluent management standards given their commitments to sustainability and the link to their social licence
- including a nutrient management module into the irrigation farm planning process
- including [provide links to] nutrient/effluent management in irrigation and drainage management plans.

As the ARC research project findings become available they should be used to prioritise LWMP activities during 2026-27 and 2027-28. Preliminary findings are unlikely to be sufficiently developed to inform the EC6 bid.

The ARC research project findings should also be used to inform the design of the new LWMP in 2028.

7 Groundwater and salinity program

Goals for the program are that:

- waterlogging and salinity risks are mitigated through operation of the regional sub-surface drainage system
- shallow groundwater is managed sustainably and used in appropriate settings.

7.1 Background

The groundwater and salinity program applies to the Macalister Salinity Management Zone (MSMZ), which includes the MID and adjacent areas. The main components of the program are public and private groundwater pumps and the groundwater monitoring bore network.

Public groundwater pumping (via the regional subsurface drainage infrastructure and private pumps) is implemented where high value assets will either not be protected by recharge control methods or will not be protected in a timely way.

The responsibility for subsurface drainage in and around the MID is jointly held by SRW and the West Gippsland CMA. The CMA provides the overall strategic direction and SRW oversees the implementation of new public and private pumps and the operation and maintenance of existing pumps. The CMA coordinates the shallow groundwater monitoring program.

7.2 Discussion

4.1 Maintenance of MSMZ subsurface drainage infrastructure

LWMP activity description – Maintenance of the Macalister SMZ’s public SSD infrastructure (groundwater control pumps), including renewing bores and pumping systems as they reach the end of their operating lives. SRW is encouraged to:

- *apply an asset management framework for the regional sub-surface drainage system*
- *review energy efficiency and/or renewable energy opportunities associated with operation of SSD system and implement them, if practicable and cost-effective.*

The groundwater control network originally consisted of 21 public groundwater pumps and more than 100 free flowing bores. The groundwater is disposed to the surface drainage network.

Currently there are nineteen public groundwater control pumps mainly in three zones. The Nambrok-Denison zone, constructed between 1960 and 1970, has nine pumps; and the Eastern Zone, constructed between 1994 and 2006, has nine pumps. There is one pump in the Heyfield zone, constructed in 2006.

Eleven of the original 21 public pumps are operational, the status of the free-flowing bores is unknown but likely to be ineffective.

The public pumps are owned and operated by SRW. Government paid for the pumps and the costs associated with constructing the bores. SRW fund the operation and maintenance of the pumps via the Salinity Management Rate collected from MID customers. There is no government policy about whether government is prepared to fund the capital cost of replacing public bores that have reached the end of their working lives.

Groundwater pumps have a limited life and maintenance costs increase as they age to the point where they require major costly refurbishment or replacement. Because of constrained budgets and the drop in water table levels during the millennium drought many assets have fallen into varying states of disrepair and would require significant expenditure to bring them back into service.

The area protected by the public groundwater pumps is reducing as public pumps cease operating because they reach the end of their life or require expensive refurbishment.

The first question to answer is whether the legacy public groundwater control network should be reconfigured given:

- the reduction in irrigation induced recharge largely through improved irrigation practices
- the ability to adapt farming practices in areas with shallow water tables
- changes in rainfall patterns with a drier future on average but with exceptionally wet periods, such as in 2022
- contemporary salinity and waterlogging risks which have been found to be reemerging across the MID and Lake Wellington catchment following three wet years.

It may be found that there is no longer a need for a private or public groundwater control network. In this case the most efficient outcome may be to continue to operate public pumps until they reach the end of their effective life.

Alternatively, given the reemergence of salinity and waterlogging impacts in recent years, there may be an ongoing need for public groundwater pumps. If this is the case, criteria will need to be developed to determine which pumps should be replaced, where new pumps are needed and which pumps can be decommissioned rather than be replaced.

Pump operating rules will also need to be reviewed to determine triggers for turning pumps on and off.

If there is an ongoing need for public groundwater pumps budgets will need to be developed and government will need to decide if they are prepared to meet capital costs or if all costs should be met by SRW customers.

Until these decisions are made it would be prudent to continue to operate the eleven serviceable pumps.

Any decision requires knowledge of the extent and cost of salinity and waterlogging impacts across the MSMZ.

What is known is that:

- the area of high water tables exceed the target (33,000 ha – to be revised to 28,000 ha) in wet periods when rainfall and flooding drive groundwater recharge overwhelming the actions to reduce irrigation induced recharge
- salinity and waterlogging impacts on crop productivity are reemerging across the MSMZ and because it has been many years since previous occurrences many irrigators wouldn't associate production losses with them
- there is agreement that the extent of salinity and waterlogging issues are not well known and that a project to better determine the extent of salinity and waterlogging impacts across the MSMZ would be valuable. In the first instance this could be as simple as using knowledge of program staff and private service providers in consultation with irrigators to map known areas of impacts. Such an exercise should be undertaken as part of a broader assessment of the need to refurbish or expand the existing public groundwater control network

- throughout 2021-22, water quality testing at Gippsland Water’s Maffra Treatment Plant, drawing from the Macalister River, indicated persistently elevated salinity levels compared to recent historical averages. It is inferred that the elevated water table is discharging significant volumes of saline groundwater into the Macalister River.

SRW are undertaking work to understand the need for and benefits of refurbishing the public groundwater pumping network. They are aware of the asset condition of the 19 pumps but are not yet able to determine an appropriate maintenance and refurbishment program.

SRW providing periodic (annual) reporting of revenue, expenditure and activities related to the groundwater and salinity program to LW-SIG would assist greatly in reviewing and improving program performance.

4.2 Irrigators using shallow groundwater for irrigation in the MSMZ

LWMP activity description – Irrigators with groundwater licences continuing to use shallow groundwater for irrigation, when it is available and of suitable quality, in accordance with local groundwater management rules.

Groundwater is pumped from the Denison and Wa De Lock groundwater management areas (GMAs). Lowering groundwater levels increases downward drainage and lowers water tables. Lowering water tables also creates a ‘buffer’ that helps to reduce the costs of high water tables during wet periods.

Table 8 shows details of the groundwater entitlements in these two GMAs. The total licenced volume of the two GMAs is 47,623 ML.

Table 8 – Groundwater entitlements in Denison and Wa De Lock GMAs in 2020/21 (Source: State Water Accounts 2020-21: <https://www.waterregister.vic.gov.au/images/documents/Victorian-Water-Accounts-2020-2021.pdf>)

	Denison	Wa De lock
Permissible Consumptive Volume	18,502 ML	30,795 ML
Total licenced volume	18,499 ML	29,124 ML
Number licences	121	251
Number of Domestic and Stock bores	71	253

Figure 6 shows the volume of groundwater pumped from these two GMAs between 2011-12 and 2020-21. The volume of groundwater pumped is relatively small in wet years with lower irrigation demand and high surface water allocations. Larger volumes of groundwater are pumped in years with low annual rainfall, higher irrigation demand and relatively low surface water allocations, particularly at the start of the season.

The largest volume pumped was 22,642 ML in 2018-19 but this is only 47 per cent of the licenced volume. The start of the 2018-19 irrigation season was relatively dry with an opening high reliability water share allocation of 40 per cent on 1 July 2018. This was increased to 65 per cent on 31 July and 100 per cent on 29 August. Surface water usage was above the five-year average. Hot dry conditions continued through the summer. There was no spill entitlement. A seasonal allocation of 35 per cent of LRWS was made on 17 December.

The 2020-21 season had a wet start to the season with more than 25,000 ML of spill water being available up to 19 November. The season opened with an allocation of 100 per cent of high reliability water shares on 1 July. Below average deliveries totalled 138,615 ML for the year. Deliveries in the first six months of the season were only 58,000 ML due to rainfall. A total of 8,722 ML of groundwater was pumped in this season which was only 18 per cent of the licenced volume.

Figure 6 suggests that the largest volumes of groundwater are pumped in dry seasons, when water tables are low and the smallest volumes are pumped in wet seasons when water table levels are high. Large volumes of groundwater should be pumped in wet years to maximise the control of water tables.

The conclusion is that consistent with LWMP outputs, irrigators continue to use shallow groundwater for irrigation, when it is available and of suitable quality, in accordance with local groundwater management rules.

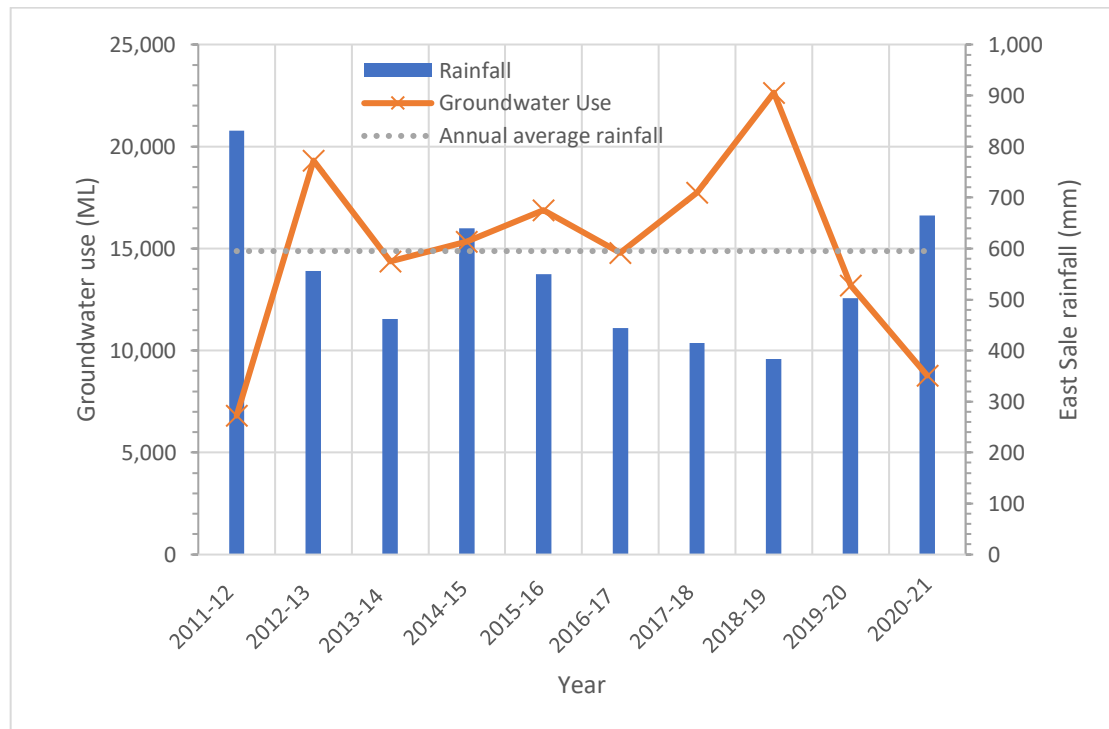


Figure 6 – Annual volume of groundwater used from the Denison and Wa De Lock aquifers compared to annual rainfall

4.3 Periodic reviews of shallow groundwater management arrangements

LWMP activity description – SRW undertaking periodic reviews of management arrangements for the use of shallow groundwater to ensure these support effective use of the resource and management of salinity risks.

The Future Macalister Salinity Management Zone (MSMZ) Salinity Management Discussion Paper was completed in March 2023 (Anonymous, 2023). The paper summarised some of the recent history and issues relating to salinity management in the MSMZ and sort to identify the next

steps and potential management options for agencies involved in managing the aging groundwater pumping and free flowing bore infrastructure.

The paper confirmed that:

- salinity management should continue to cover the full area of the MSMZ
- the objectives of the groundwater and salinity program remain valid
- there is a need to continue to implement the program
- this evaluation presents an opportunity to incorporate any changes to the program for the remainder of the LWMP
- an assessment of salinity risk should be undertaken as a next step in determining the future direction of the program
- there was need to review how community engagement about salinity is undertaken.

The MSMZ risk assessment is nearing completion (Jacobs, 2024). Preliminary findings are that additional research is required to understand the relative benefit of the public pumps to irrigators. This work could include the project to better determine the extent of salinity and waterlogging impacts across the MSMZ.

Although SRW haven't specifically reviewed the management arrangements for the use of shallow groundwater, together with program partners they have undertaken periodic reviews of the program to determine future management arrangements. These investigations are ongoing and must continue. The potential cost and implications for irrigation productivity of these decisions potentially warrant broader consideration of the issues as part of development of a broader drainage strategy for the region.

4.4 Extension services for 'living with salt'

LWMP activity description – The provision of high quality extension services to support farmers in areas of salinity and shallow water tables to “live with salinity”. This includes providing advice to support the establishment and sustainable management of appropriate, generally salt-tolerant pastures, fodder or crops. This action continues the Living with Salt program of the West Gippsland Salinity Management Plan.

A sequence of wetter than average years commencing in 2019-20 resulted in rising water table levels and salinity and waterlogging impacts on crop yields on properties across the MSMZ. These issues hadn't been seen for many years which meant that irrigators, especially those new to the region, weren't aware of what signals to look for and if problems were identified how to respond.

The AgVic extension team responded by making salinity a focus. The response included:

- rollout of an awareness raising campaign regarding the increased risks of salinity –
 - a media release which was printed in local papers and run on local radio and local television
 - articles in newsletters and email updates to the irrigation community including the AgVic weekly ETO update and GippsDairy's 'How Now Gippy Cow' newsletter

- new salinity page on website
- salinity field days
- farm visits to specifically address challenges related to salinity; these involved providing advice on irrigation scheduling and system selection, salt tolerant species, bore levels, as well as a referral for further information to SRW
- developing one of these instances into a Mini Case Study.

The response to salinity was successful in providing advice to affected irrigators and to some degree in raising general awareness of salinity across the region. However, extension staff report that many irrigators would still be unaware of the signs of salinity impacts on crop yields until they become severe. There is still work to be done in raising awareness and knowledge about salinity and increasing capability to respond. These findings were supported by a local agronomist who advised that they have seen a large increase in the area affected by salinity and waterlogging and that irrigators often aren't aware of the cause of the problems. They supported the need for a two-pronged approach where AgVic staff and private service providers work together to improve awareness of salinity and waterlogging, how to recognise when it is impacting crop productivity and how to respond to address it.

Groundwater monitoring network

The groundwater monitoring bore network contains approximately 240 bores. Monitoring results are used to prepare depth to water table maps which are used to help to inform the salinity threat to community and assess progress against RCT 2 – salinity target.

Approximately half of the bores are monitored on a quarterly basis and the other half are monitored on an annual basis. All bore monitoring runs were completed throughout the period except for one or two unavoidable instances, e.g. flooding and tragic personal circumstances for the contractor. Data were uploaded to the Victorian Water Measurement Information System and timeseries maps produced. The timeseries of depth to water table maps now extends from 1996 to 2024. The current series presents the area within the MSMZ with water table levels less than 2 m. A depth to water table time lapse video is also available at <https://vimeo.com/624946333>.

Costs associated with maintenance of the aging monitoring bore network is one part of longer-term risks relating to aging salinity and drainage infrastructure in the region (other components include public groundwater pumps and free flowing bores).

Given the changed hydrogeological setting that now exists in the MID and surrounding areas compared with the pre-2000 era when most salinity and drainage infrastructure was installed, it is not a straightforward task to determine the quantity of investment that is warranted and obtaining the required funding.

An audit of the network was conducted in 2022 and the standard of the bores is therefore known with confidence. The proposed next step following the bore audit was to complete a monitoring needs assessment but budgets were insufficient for the next step. The SRW salinity risk project was done instead. The results of the network audit and needs assessment were to be used to help identify what investment is needed to eliminate/reduce risks and ensure a sustainable

monitoring program into the future. The work was to run in parallel with an SRW assessment of the public pumps.

Irrigators and program staff advise that the groundwater monitoring and the water table maps provide important management information and extension material. Monitoring and publication of maps needs to continue.

The monitoring needs assessment and estimation of investment needs should be completed as a priority. Funding to maintain the network should be sort through EC6.

Routine maintenance is being funded, but funding is not sufficient to replace bores which have been destroyed (e.g. bore run over by a tractor). A few sites are irretrievably damaged every year.

7.3 Achievement of MATs

The evaluation finds that:

4.1 Maintenance of MSMZ subsurface drainage infrastructure

SRW understand the deteriorating condition of the public groundwater pumping network and continue to work to understand the need for and benefits of refurbishing the network. They are aware of the asset condition of the 19 pumps but are not yet able to determine an appropriate maintenance, refurbishment or renewal program.

4.2 Irrigators using shallow groundwater for irrigation in the MSMZ

The LWMP output that irrigators continue to use shallow groundwater for irrigation, when it is available and of suitable quality, in accordance with local groundwater management rules has been met.

4.3 Periodic reviews of shallow groundwater management arrangements

Although SRW haven't specifically reviewed the management arrangements for the use of shallow groundwater, together with program partners they have undertaken periodic reviews of the program to determine future management arrangements. These investigations are ongoing and must continue. The potential cost and implications for irrigation productivity of these decisions potentially warrant broader consideration of the issues as part of development of a broader drainage strategy for the region.

4.4 Extension services for 'living with salt'

High quality extension services have been provided to irrigators through farms visits and one and one advice. Making irrigators aware of potential salinity impacts and increasing their capability to identify issues and develop responses is a pressing need and work in progress.

4.5 Groundwater monitoring network

LWMP and funding agreement outputs for monitoring, data storage, analysis and public presentation of information have been met. The monitoring needs assessment and estimation

of investment needs should be completed as a priority. Funding to maintain the network should be sort through EC6.

7.4 Lessons and advice

The goals of the groundwater and salinity program to mitigate waterlogging and salinity through operation of the regional sub-surface drainage system have been met in average and dry years, but not in the wet years like the ones that have recently occurred. Nevertheless, groundwater pumping has been proven to be effective in mitigating salinity risks in appropriate settings.

The evaluation notes that only 11 of 19 public pumps are operating and supports SIP funding a staged project to optimise the groundwater drainage system. Work to systematically optimise groundwater drainage needs to be informed by an updated understanding of the extent of salinity and water logging risks across the MSMZ and the best management response to these risks (e.g. on farm measures, improved groundwater drainage or improved surface water drainage).

Stage 1 would build on the past understanding of the need for groundwater pumping to manage salinity risks and focus on optimising the existing groundwater drainage system. It could commence whenever budgets permit and involve:

- for each existing pump:
 - Assess the salinity risk of the area protected by the pump
 - Assess the benefits and costs of maintaining the pump
 - Decide whether to:
 - continue to operate the pump
 - deactivate or reactivate the pump
 - decommission the pump
- confirm funding arrangements and budgets.

Private groundwater pumping to supplement surface water allocations is likely to continue to contribute to reducing salinity and waterlogging risks. But it is very difficult to increase private pumping rates in wet years when lower cost surface water irrigation allocations are sufficient to meet demand. Changes to the existing private pumping arrangements are not advised.

Ongoing investment is warranted to help irrigators recognise and respond to salinity and waterlogging impacts caused by the very high water tables currently being experienced across the MSMZ.

Continued or increased investment into maintaining and managing groundwater monitoring network is required from government.

8 Floodplain and off-farm drainage program

The goal for the program is that the regional surface water management system reduces impacts of flooding and waterlogging.

8.1 Background

The MID is drained by a comprehensive system of natural waterways and constructed drains owned and operated by SRW. The system collects and removes rainfall run-off, excess irrigation water, outfalls from irrigation channels and discharges from public groundwater pumps. The full off farm drainage network consists of about 411 km of constructed drains.

The operation of this core drainage network is not a central focus of the LWMP. Instead it is part of SRW's 'business as usual' activities and its operation and maintenance is funded through customer fees and charges which are reviewed by the Essential Services Commission.

8.2 Discussion

5.1 Continuation of transfers of SRW drain heads to irrigators

LWMP activity description – Continuation of transfers of SRW drain heads to irrigators to enable tail water to be harvested and reused on farms.

The Plan originally supported the transfer of SRW drain heads to irrigators to support irrigation reuse. However, there is a moratorium on Drain Head transfers until some administrative matters such as land transfers are clarified. The moratorium is limiting opportunities for the capture of drainage water from farms. Capturing this water would increase the efficiency of nutrient use by irrigators and reduce operating costs and reduce nutrient loads entering the regional drainage system and Lake Wellington.

Effort should be made to address administrative issues and remove the moratorium.

5.2 Diversion of drainage water by irrigators

LWMP activity description – Diversion of drainage water by irrigators where it is available and its quality is suitable.

Irrigators may enter into agreements with SRW to divert water from the drainage system. A drainage diversion fee of \$22.81 per ML was charged in 2023-24²¹. The agreement provides 'opportunistic' access to water when available in the drainage system.

The LWMP does encourage, but not fund diversion of drain flows for irrigation to reduce nutrient and salt loads to Lake Wellington. However, availability of drainage water to divert is declining because of on farm irrigation efficiency improvements and reuse and reduced channel outfalls due to MID2030 supply system upgrades.

Some irrigators continue to make opportunistic use of drainage diversions but the number of irrigators doing this and the volumes they are diverting was not reported.

²¹ <https://www.srw.com.au/sites/default/files/documents/2023-06/Tariff%20Schedule%202023-2024.pdf>

Incorporation of basic reporting on drainage diversions into program annual reports is important.

5.3 Improving the function of natural and constructed surface drainage systems

LWMP activity description – Consideration of planning and funding mechanisms to improve the function of the natural and constructed surface drainage systems and health of waterways and wetlands.

Budgets were insufficient to fund this activity.

5.4 Research to improve capture of nutrients

LWMP activity description – Research to investigate opportunities for drains and floodplain waterways and wetlands to be managed to capture or use nutrients carried off-farm during small-medium floods/rain flow events.

This activity is proceeding via the ARC research project (see **section 6.2**).

5.5 Research to quantify changes in streamflows resulting from drainage systems

LWMP activity description – Research to quantify changes in streamflows resulting from on and off-farm irrigation and drainage management activities supported by the Plan and to assess their impacts.

SOURCE modelling to be done as part of the ARC research project may provide some insights into these matters.

5.6 Regional surface water drainage system maintenance

LWMP activity description – On-going maintenance of elements of the regional surface water drainage system that are retained under SRW operational control.

Maintaining an effective surface drainage network is a fundamental requirement for a productive future for the MID. SRW operates a mature drainage network that serves basic needs. It is proposing to enhance the drainage services as part of its core business. These improvements are to be funded through customer fees and charges.

SRW's Corporate Plan 2023-24²² sets out the performance standards and targets for the drainage system as:

- number of rainfall events at a frequency of more than 1:50 resulting in complaints of water being on properties for more than 24 hours from 5 in 2023-24 to 1 in 2027-28
- proportion of priority drains maintained on annual basis increasing from 10% in 2023-24 to 25% in 2027-28.

SRW reported in their 2023 price submission that some customers in the Macalister irrigation area raised concerns about drainage. They wanted SRW to invest more effort in this space but were unwilling to pay additional costs to improve drainage. The IRG raised concerns about

²² <https://www.srw.com.au/sites/default/files/documents/2023-07/Corporate%20Plan%202023-24.pdf>

inadequate maintenance of the surface drainage scheme. SRW proposed to work with customers and West Gippsland CMA, Melbourne Water and councils to understand how to optimise drainage services within existing operational budget.

The Plan supports but has not funded the consideration of opportunities to use Drainage Course Declarations as a low-cost option to improve or maintain some drainage services. Drainage Course Declarations are a low-cost option to drain water after flood events (i.e. not irrigation drainage). The approach involves formally declaring natural drainage courses using the powers available in the *Water Act 1989* and taking actions to both remove blockages in them (i.e. banks, farm tracks, inadequate culverts, etc.) and maintain the free flow of water in declared drainage courses. The Plan proposed that drainage course declarations actions would be developed and implemented through the Plan's adaptive management processes.

8.3 Achievement of MATs

The evaluation finds:

5.1 Continuation of transfers of SRW drain heads to irrigators

There is a moratorium on the program which is limiting opportunities for the retention of drainage water and nutrients on farm.

5.2 Diversion of drainage water by irrigators

Irrigators continue to make opportunistic use of drainage diversions, however the volume of drainage available to divert has decreased. The number of irrigators diverting water and the volume being diverted was not reported.

5.3 Improving the function of natural and constructed surface drainage systems

Budgets were insufficient to fund this activity.

5.4 Research to improve capture of nutrients

This activity is proceeding via the ARC research project (see **section 6.2**).

5.5 Research to quantify changes in streamflows resulting from drainage systems

SOURCE modelling to be done as part of the ARC research project may provide some insights into these matters.

5.6 Regional surface water drainage system maintenance

SRW continue to maintain the system but customers and the IRG have expressed a need for improvement.

8.4 Lessons and advice

The goal of this program for the regional surface water management system to reduce impacts of flooding and waterlogging is largely being met, but some concerns were expressed about the level of maintenance of the system.

There is an ongoing need for a drainage network to remove rainfall runoff and ponding after significant rainfall events and in wet years, but there is some uncertainty about future drainage needs because:

- of reduced irrigation drainage from farms because of improved farm irrigation efficiency and reuse schemes
- outfalls from irrigation channels have reduced due to MID2030
- of reduced discharges from public groundwater pumps
- climate change is projected to reduce rainfall and water availability.

The evaluation supports SIP contributing funding to a project to optimise the surface drainage system. This investment would be consistent with the Victorian Irrigation Drainage Program Strategic Directions which recognise that government has an important role in supporting collective action to manage waterlogging, salinity and drainage – in this case supporting investigations to optimise the surface drainage system. The optimisation process should:

- ensure operating and maintenance expenditure maintains adequate drainage service levels
- investigate options to contain operating and maintenance costs
- investigate options to improve drainage through drainage course declarations
- investigate options to remove the moratorium on the heads of drain transfers to landholders.

While the floodplain and off-farm drainage program appears to be effective and an integral part of the LWMP, there are opportunities to improve how activities are included in Plan reporting. This is because surface drainage is part of SRW's core business and it is managed through SRW's governance arrangements.

9 Innovative and connected irrigation communities program

The goals for the program are that:

- energy efficiency and renewable energy opportunities are identified and implemented
- awareness of social and cultural values has increased, as has knowledge of actions to maintain and improve them
- farmer-led irrigation discussion groups are thriving. Research collaborations bring new science and technology to irrigators.

9.1 Background

The LWMP introduced this program into activities for the first time. It was designed to incorporate new thinking and improved adaptive management into operations to better support a sustainable, profitable and resilient irrigation sector.

The rationale for the program was to better account for:

- shifts in land use and new technology driving changes to farming practices and improving real-time management

- climate variability and climate change
- consumer preferences and market forces shaping irrigation industries
- new policy seeking to strengthen links between land and water management and the social and cultural values of local communities and Traditional Owners.

9.2 Discussion

6.1 On-farm energy efficiency and renewable energy module

LWMP activity description – Development of an on-farm energy efficiency and renewable energy module for delivery within the farm planning framework.

Budgets were insufficient to fully fund this activity but some pump efficiency tests were undertaken.

6.2 Irrigation energy efficiency plan for the Lake Wellington catchment

LWMP activity description – Development of an irrigation energy efficiency plan for the Lake Wellington catchment. The plan will:

- *Review and assess any water policy or regulatory constraints on use of renewable energy in pumping;*
- *Document renewable energy and energy efficiency opportunities appropriate to dairy and horticultural production in Lake Wellington catchment;*
- *Describe an implementation program to take advantage of renewable energy and energy efficiency opportunities.*

Any implementation measures will be developed as part of the Plan's adaptive management processes.

This activity links with DEECA's Primary Production Adaptation Plan. AgVic have done farm emission reduction plans as part of a pilot program. To date the pilot program has been doing plans on an industry by industry. The next round of pilots will be for any industry. However, there has been insufficient budget to full fund this activity.

6.3 Farm planning module for cultural heritage planning and management

LWMP activity description – Development of a farm planning module for cultural heritage planning and management.

There was insufficient budget to fund this activity. However, for the past three years every irrigation farm plan completed by the program has a cultural heritage overlay. This is prepared during the Concept Plan stage of farm plan development.

6.4 Research collaborations

LWMP activity description – Facilitation of irrigation land and water management research collaborations that address regional research priorities.

This work has commenced and is being undertaken as part of the *Untangling the mechanisms of nutrient export from agricultural catchments* ARC research project (see **section 6.2**).

6.5 Cultural awareness training materials

LWMP activity description – Development of communications and cultural awareness training materials related to Indigenous cultural values, Native Title and protection of cultural heritage for irrigation areas in Lake Wellington catchment.

The West Gippsland CMA have a current Memorandum of Understanding with the Gunaikurnai Land and Water Aboriginal Corporation (GLaWAC) and the Bunurong Land Council Aboriginal Corporation (BLCAC). These MoUs outline shared partnership goals and how organisations will work together to build the capacity of Traditional Owners to work on Country and to enable participation in project development and delivery.

Through the Regional Partnerships EC5 project (Project No: WG2021.23.363, Fund Stream: OCOC), funding continues to be provided to GLaWAC to support their capacity building to engage more widely on projects.

The West Gippsland CMA invests in building the cultural competency of their Board, staff and partners to develop a culturally safe environment to enable them to work together with Traditional Owners. The CMA is guided by partners about their capacity and readiness to actively participate in individual projects and programs and provide opportunities where appropriate to support building capacity.

The CMA have provided GLaWAC with an overview of the SIP and LWMP through strategic meetings, however there has not been the capacity for Traditional Owners to actively participate in the project to date.

6.6 Protection of cultural heritage values

LWMP activity description – Development of and support for collaborative arrangements between irrigators and Gunaikurnai to protect cultural heritage values.

As noted above every irrigation farm plan completed by the program has a cultural heritage overlay check. This is done during the Concept Plan stage of farm plan development.

The West Gippsland CMA also facilitated a discussion about cultural safety with the Irrigator Reference Group (in 2023-24). This was conducted by the Manager Strategy, Investment and Partnerships who oversees the Memorandum of Understandings (MOUs) and partnerships between the West Gippsland CMA and Traditional Owners. The discussion allowed irrigators to ask questions relating to how the CMA work with Traditional Owners, cultural heritage requirements for farmers and Traditional Owner water.

6.7 Community cultural events

LWMP activity description – Community events which recognise Indigenous and non-Indigenous cultural and social values associated with Lake Wellington irrigation areas.

The inaugural Yarns on Farms event in Gippsland was held in 2022-23. It was coordinated by the West Gippsland CMA and GLAWAC and saw 30 agency staff, GLAWAC staff and irrigation community representatives come together at the Knob Reserve in Stratford to yarn about

Gunaikurnai heritage and foster mutual understanding between Gunaikurnai and the irrigation community.

Both the West Gippsland CMA and GLaWAC maintain an interest in continuing the Yarns on Farms concept. Traditional Owners have informed the CMA that while they have an interest in continuing the project, due to capacity constraints the timing of further events remains uncertain. The CMA will continue to look for shared opportunities across the life of the LWMP.

6.8 Farmer-led irrigator discussion groups

LWMP activity description – Facilitation of farmer-led irrigator discussion groups which support (e.g.) farm planning, irrigation efficiency, nutrient management planning and implementation.

These groups are yet to be established.

6.9 Engagement support services

LWMP activity description – Engagement with financial and other support services about irrigation land and water management issues.

There was insufficient budget to fund this activity.

9.3 Achievement of MATs

The evaluation finds:

6.1 On-farm energy efficiency and renewable energy module

This activity was partially funded. The module was not developed but pump efficiency tests were undertaken.

6.2 Irrigation energy efficiency plan for the Lake Wellington catchment

There was insufficient budget to fund an energy efficiency plan but some farm emissions reductions plans were undertaken as part of an AgVic pilot program.

6.3 Farm planning module for cultural heritage planning and management

There was insufficient budget to fund the development of the module but all irrigation farm plans completed in the last three years have a cultural heritage overlay. This is prepared during the Concept Plan stage of farm plan development.

6.4 Research collaborations

Facilitation of research collaborations have been successful and the output will be delivered as part of the ARC research project (see **section 6.2**).

6.5 Cultural awareness training materials

The program is working with GLaWAC and irrigators to develop collaborative arrangements in line with an approach and timetable advised by TOs.

The West Gippsland CMA works closely with TOs to build cultural competency of staff and partners and the LWMP is working with GLaWAC to develop a shared understanding of the plan and investigate opportunities for TO participation when capacity allows.

6.6 Protection of cultural heritage values

Every farm plan has a cultural heritage overlay check. This is done during the Concept Plan stage of farm plan development.

6.7 Community cultural events

The inaugural Yarns on Farms event was held with GLaWAC in 2022-23 and, TO capacity permitting, future events are planned.

6.8 Farmer-led irrigator discussion groups

There was insufficient budget to fund this activity.

6.9 Engagement support services

There was insufficient budget to fund this activity.

9.4 Lessons and advice

The goals for the Innovative and connected irrigation communities' program to: identify and implement energy efficiency and renewable energy opportunities; increase awareness of social and cultural values; and research collaborations to bring new science and technology to irrigators have partially been met because of funding constraints.

Most of these activities were new, innovative and higher risk and therefore it was difficult to attract funding.

Facilitation of research collaborations are progressing well.

Cultural aspects are being pursued in a way and according to timeframes as advised by TOs.

10 LWMP and EC5 Evaluation

10.1 Impact

- Is the program making a difference?
- Measure(s) – i) Extent to which LWMP outcomes have addressed the problems; and i) contribution of plan implementation to RCTs

The evaluation finds that after six years of implementation LWMP outcomes are addressing identified problems by increasing farm water use efficiency and resilience to drought and climate change, contributing to decreased phosphorus exports to Lake Wellington and protecting land from salinity and waterlogging. Four years of EC5 investment made a major contribution to the achievement of outcomes.

Farm planning remains the foundation driving practice change required to achieve best practice farm water management that provides both public and private benefits. They are guiding decision making to support government investment and resulting in on-ground works being implemented²³.

Extension support (advice, knowledge and capability building) for farm planning, management and infrastructure across a wide range of topics ensured existing irrigators and new developers continue to receive clear and accurate advice about new irrigation technologies, management practices and standards. A changing cohort of irrigators who may be unfamiliar with irrigation or at least with the elements of best practice irrigation in the region are being reached as changes in land use, ownership and enterprise change occur across the MID.

Continuing improvements to farm irrigation and drainage infrastructure and management are improving water use efficiency and retaining nutrients on farm – keeping them out of Lake Wellington. It is estimated that new or upgraded reuse systems, flood to spray conversions and best practice surface irrigation have generated 7,616 ML/year of water savings and retained 3.8 tonnes/year of phosphorus on farm since the LWMP commenced (once EC5 contracted works are complete they will have generated 3,712 ML of water savings and retained 1.9 tonnes/year of phosphorus on farm). The innovative Newry Irrigation Farm Planning Project also successfully supported and enhanced delivery of the distribution system modernisation program (including reducing costs) and enabled farm changes to take full advantage of improved water delivery. It was funded through EC5.

Water savings and improved irrigation infrastructure and management has increased the volume of water available to irrigation businesses and increased their resilience to droughts and climate change. This was evidenced in the very dry 2018 when irrigators were able to budget water use

²³ It is estimated that since support for farm planning commenced in 2000, just under half of the area covered by plans has been upgraded in accordance with the funded plans – Bonnie Dawson and Anthony Goode (personal communication 5 March 2024). Updates of farm plans are typically required every 10 years.

to enable irrigation for much of the season when in the past many would have run out of water by mid-season.

The new Gippsland Irrigation Development Guidelines align closely with changed regulatory requirements and statewide guidelines. Their application guided over 157 referral responses from SRW for new irrigation developments and AUL assessments. Irrigation farm plans comply with statutory requirements meaning LWMP processes funded by EC4 and EC5 are supporting high quality new irrigation development.

Some improvements in nutrient and effluent management on farms has been made and there are reports of improved profitability from more efficient use of nutrients. EPA compliance activities and the CORE 4 nutrient and effluent system program have reduced nutrient loads from farms²⁴. Two new demonstration sites funded by EC5 and a major research project will provide contemporary data and advice for better targeting of future activities aimed at reducing nutrient exports.

The culmination of these efforts is that LWMP implementation including the four years funded by EC5 continues to make an important contribution towards managing the discharge of phosphorus from the MID to Lake Wellington and may, by 2030, achieve RCT 1, i.e. to reduce phosphorus loads to Lake Wellington by 7.5 tonnes/year. Work is required by SRW to review phosphorus load monitoring and modelling – Monash University have been engaged to undertake this work.

Waterlogging, salinity and flooding risks are being mitigated to some extent by public groundwater pumps and surface drains which are operated by SRW. Local agency staff and a local agronomist advised that salinity and waterlogging impacts are reemerging across several areas of the MID and Lake Wellington catchment. The full extent of negative impacts requires further investigation. Investment is required to optimise the benefits provided by both the groundwater pumping and surface drainage systems. This work would need to consider the effectiveness of existing drainage infrastructure and management under changing climate conditions.

RCT2 aims to contain risks from irrigation-induced salinity and shallow water tables by limiting the area of land in the MSMZ with high water tables to a 2012 benchmark of 33,000 ha²⁵ during the life of the Plan (2018-2027). The target was not met in 2022 and 2023 because of well above average rainfall and flooding that occurred in this period. Changes in the annual area of water tables within 2 metres of surface do not necessarily reflect the effectiveness of the six LWMP programs being implemented in the MID because of the large effects of rainfall, river height and

²⁴ The CORE 4 program received funding prior to the commencement of the LWMP but was implemented throughout the life of the plan.

²⁵ This target should be revised to ~28,000 ha following the appointment of a new supplier and adjustment to the mapping approach.

floods on water table levels. The influences of these factors overwhelm the effects of management actions on water table behaviour. The appropriateness of RCT2 requires review.

Limited funding was received to deliver the energy efficiency outcomes for the innovative and connected irrigation communities program meaning progress has been slow. EC5 investment has supported building the cultural competency of LWMP partners who have worked with Traditional Owners and irrigators to increase awareness of social and cultural values and knowledge and actions to maintain and improve them. More funding and work are required to continue to develop collaborative arrangements in line with an approach and timetable advised by TOs. LWMP partners have developed strong research collaborations that, once completed in 2025, will bring new science and technology to improve how irrigators and the program manage nutrients on farm and across the catchment.

10.2 Effectiveness

- Is the program delivering the activities/management actions it said it would?
- Measure(s) – Progress against funded activities and management action targets.

The evaluation finds that after six years funded LWMP activities, including those funded through EC5, have been implemented effectively with all MATs having been delivered or expected to be delivered by the end of 2024. The effectiveness of some plan activities funded by partner agencies could be improved and there are opportunities to fund additional activities in the plan to increase plan effectiveness.

Farm planning program

Between 2018-19 and 2023-24 LWMP implementation met the original LWMP targets for farm plans and targets set through funding agreements for the LWMP. The 10-year LWMWP target of 10,000 ha has already been exceeded. The total area with farm plans is now 53,744 ha of the total area of the MID of 59,528 ha. EC5 targets set through funding agreements have also been met. Importantly, it is estimated that since support for farm planning commenced in 2000, just under half of the area covered by farm plans has been upgraded in accordance with the plans, i.e. the plans are leading to on-ground improvements.

Farm planning program activities not funded and not delivered include the upland irrigation farm planning guidelines. Funding and delivery of these activities would aid in building the resilience of businesses to climate change and drought and decreasing nutrient exports from upper areas of the catchment to the Gippsland Lakes.

On-farm irrigation and drainage program

All activities in the on-farm irrigation and drainage program between 2018-19 and 2023-24 were funded and MATs met. Highlights include:

- Flood to spray conversions exceeding the 6-year funded target of 680 ha by 246 ha. However, there is still 2,074 ha to be converted to meet the LWMP 10-year target. At current funding and implementation rates the 10-year target of 3,000 ha is unlikely to be met. The total area of flood to spray conversions that has occurred over the past 6 years

is unclear because not all conversions occur through the incentives scheme. Some conversions are done privately.

- Best practice surface irrigation exceeding the 6-year funded target of 650 ha by 38 ha. However, there is still 1,312 ha to be treated to meet the 10-year LWMP target of 2,000 ha. At current funding and implementation rates the 10-year LWMP target of 2,000 ha is unlikely to be met.
- New or expanded reuse systems exceeded the 6-year funded target of 1,830 ha by 364 ha. However, at current funding and implementation rates the 10-year LWMP target of 7,000 ha is unlikely to be met. Currently 15,092 ha of the MID is serviced by reuse schemes funded through the LWMP.
- Completion of new Irrigation Development Guidelines to support best practice new developments and completion of advice responses to 157 associated referrals from SRW.
- Initiation of investigations into the benefits and costs of increasing reuse dam size above the current limit of 1 ML per 10 hectares.

All targets in EC5 funding agreements are also expected to be met once those currently being case managed are completed.

On-farm nutrient management program

Activities in the on-farm nutrient management program attracted limited funding. EPA compliance activities and the CORE 4 nutrient and effluent system program were completed; two new farm demonstration sites funded through EC5 were established and a major research project commenced and is expected to be completed in 2025.

Several unfunded activities provide obvious opportunities for improving program outcomes. These include irrigator nutrient training, extension and incentives for dairy effluent management systems and financial incentives for silt traps on horticultural enterprises.

Groundwater and salinity program

Activities led by SRW in the groundwater and salinity program were completed but there is much to be done in terms of identifying the need for and optimising the use of groundwater pumps. Investigations into management arrangements and the state of salinity risk which were partially funded by EC5 will inform this work. Activities and associated MATs funded by the EC were completed including high quality extension services targeting how to 'live with salt' and outputs for monitoring, data storage, analysis and public presentation of information from the groundwater monitoring network.

A monitoring needs assessment and estimation of investment needs should be completed as a priority. Funding to maintain the network should be sort through EC6.

Floodplain and off-farm drainage program

SRW undertook ongoing maintenance of the regional surface water drainage system but work is required to optimise the performance of the system, including restarting the transfers of drain heads to irrigators. Some irrigators continue to make opportunistic use of drainage diversions,

although the number of irrigators diverting water and the volume being diverted was not reported. The ARC research project is expected to progress activities relating to research into opportunities for drains and floodplain waterways and wetlands to be managed to capture or use nutrients carried off-farm during small-medium floods/rain flow events and quantifying changes in stream flows resulting from drainage systems.

No funding was received for work to consider planning and funding mechanisms to improve the health and function of the natural and constructed surface drainage systems and health of waterways and wetlands.

Innovative and connected communities program

Limited funding was received to deliver the energy efficiency outcomes for the program meaning progress has been slow. Cultural competency of LWMP partners is building and they have worked with Traditional Owners and irrigators to increase awareness of social and cultural values and knowledge and actions to maintain and improve them. Every irrigation farm plan prepared through the LWMP includes a cultural heritage overlay. This is prepared during the Concept Plan stage of farm plan development. This work has been funded by EC5. More funding and work are required to continue to develop collaborative arrangements in line with an approach and timetable advised by TOs. LWMP partners have developed strong research collaborations and initiated a \$1.8 million research project that is scheduled for completion in 2025.

Limited progress was made in towards developing farmer-led irrigator discussion groups and improving engagement with financial and other support services.

Lack of funding meant the following activities were not completed:

- On-farm energy efficiency and renewable energy module
- Irrigation energy efficiency plan for the Lake Wellington catchment
- Farm planning module for cultural heritage planning and management.

10.3 Efficiency

- Are resources being used efficiently?
- Measure(s) – Delivering expected activities on budget and time; prioritising investment and adapting implementation to changing circumstances; co-investment.

The evaluation finds that after six years LWMP implementation has been highly efficient in delivering the funded activities within the six programs.

- All the \$10.452 million in funding received from EC4 (\$3.752 million) and EC5 (\$6.7 million) is expected to be expended by the end of 2024.
- All MATs for EC funded activities across the programs were delivered on or below forecast budgets.
- All EC funded activities are expected to be delivered by the end of 2024 despite interruptions due to the COVID-19 pandemic, severe drought in 2018-19 and floods in 2021-22, 2022-23 and 2023-24.

- The \$10.452 million of EC4 and EC5 investment attracted significant levels of co-investment –
 - \$7.347 million in co-funding was received (\$4.5 million from irrigators for farm plans and works, \$1.275 million from SRW customers for drainage programs and Newry Irrigation Farm Planning Project, \$0.822 million from the Commonwealth government for research, \$0.75 million from the Victorian government and agencies for research)
 - this represents \$0.70 in co-investment for every dollar of investment from EC (there was \$0.60 in co-investment for every dollar from EC5).

Major factors contributing to efficient implementation were:

- maintaining strong governance oversight of program budgets and resources
- engaging closely with irrigators and partner agencies during development and implementation of the LWMP
- prioritising investment during development of the LWMP, e.g. considering how well programs and activities would help to meet objectives, relative costs and benefits and likely adoption by irrigators
- reallocation of funds and resources between activities and programs during the life of the plan as circumstances changed
- seeking advice from the IRG about how to respond to major shocks such as drought in 2018-19
- adapting program implementation as opportunities arose, e.g. development of the Newry Irrigation Farm Planning Project to align with MID2030
- adapting program delivery methods in response to changed conditions, e.g. online methods for engaging with stakeholders and the community, online meetings and forums and the use of video's, podcasts and social media to extend services that would normally be completed in-person
- revision of the irrigation farm planning process to incorporate development of concept plans and business planning early in the process and development of the Sustainable Irrigation Decision Support Tool to assist irrigators, extension officers and service providers in delivering best practice farm plans.

10.4 Appropriateness

- Is the LWMP design aligned with local, state and national priorities and are governance arrangements working well?
- Measure(s) – Alignment with EC and state SIP priorities and conclusions from governance reviews and reporting.

The evaluation finds that EC4 and EC5 investment in the LWMP has been appropriate in promoting and delivering EC and State SIP objectives and priorities. This conclusion is based on:

- funding being expended on core activities listed in the LWMP
- payment of financial incentives is directed by the Central Gippsland Irrigation Efficiency Incentives Program Governance paper which sets out clear guidance on governance,

incentives being offered, application processes, eligibility, prioritisation and requirements to avoid fraud, corruption and conflicts of interest

- the LWMP meeting the requirements of Victoria's Sustainable Irrigation Program LWMP Guidelines which require it to support state and regional policies, plans and legislation
- the LWMP funding business cases and agreements meeting EC and state SIP investment criteria and objectives
- the strong correlation between program logics for the LWMP, state SIP and EC
- LWMP governance reviews concluding that governance arrangements are appropriate
- LWMP programs were supported by comprehensive monitoring, reporting and evaluation and used these to manage the program adaptively.

10.5 Legacy

- Will the benefits last?
- Measure(s) – Level of confidence that RCTs and long-term outcomes will be achieved and sustained over time.

The evaluation finds that six years LWMP implementation, including four years funded by EC5, has enhanced outcomes from previous plans and that it is building a lasting legacy of: i) increased irrigator capability and knowledge sharing; ii) recognition that irrigation can be improved and farm business and irrigation planning are essential elements of a successful business; iii) best practice irrigation management and infrastructure; iv) increased resilience of irrigation businesses to drought and climate change; v) retention of water and nutrients on farm rather than exporting them to the Gippsland Lakes; vi) understanding the need for continuous technological and management improvements and the essential role of research and extension in providing this; vii) sustainable irrigation requiring effective and affordable regional drainage systems. Highlights are that:

- it is building a legacy of widespread best practice farm infrastructure and management to increase farm productivity, reduce phosphorus exports to Lake Wellington and decrease impacts of salinity and waterlogging. This is reflected in phosphorus monitoring which shows a continuous decline in exports to Lake Wellington
- off-farm surface and subsurface drainage programs are helping to alleviate salinity and waterlogging impacts on farm productivity but outcomes will be improved with an improved understanding of the extent of impacts and additional investment to optimise these programs
- extension (advice, knowledge and capability building) and financial incentives are resulting in the widespread development of irrigation farm plans which are leading to community recognition and acceptance that the way irrigation is done can be improved and best practice approaches to farm infrastructure and management are resulting
- collaborative arrangements with SRW distribution system modernisation programs is enhancing farm productivity benefits from improved water delivery and reducing implementation costs

- research into and modelling of the source and transport of nutrients from farms and catchments to the Gippsland Lakes will enhance the design of LWMP programs and facilitate continuous improvement
- the cultural competency of West Gippsland CMA and partner agency staff is improving, relationships and program interactions with Traditional Owners are developing as deemed appropriate by Traditional Owners. These initiatives and early activities and discussions with irrigators are building a base for developing stronger awareness of social and cultural values and knowledge in the longer term.

11 Conclusions and recommendations

11.1 Conclusions

The evaluation finds after six years of implementation, including four years of EC5 funding:

1. Impact – LWMP outcomes funded through EC4 and EC5 are addressing identified problems by increasing farm water use efficiency and resilience to drought and climate change, contributing to decreased phosphorus exports to Lake Wellington and protecting land from salinity and waterlogging.
2. Effectiveness – funded LWMP activities have been implemented effectively with all MATs delivered or expected to be delivered by the end of 2024. The effectiveness of some plan activities funded by partner agencies could be improved and there are opportunities to fund additional activities in the plan to increase plan effectiveness.
3. Efficiency – LWMP implementation has been efficient in delivering the funded activities within the six programs, including EC5 funded activities. A readiness to adapt program focus and delivery methods in response to ‘shocks’ in the operating environment and advice from irrigators and partners contributed to efficient delivery.
4. Appropriateness – EC4 and EC5 investment in the LWMP has been appropriate in promoting and delivering EC and State SIP objectives and priorities including building the cultural competency of staff and partners to develop a culturally safe environment to enable them to work together with Traditional Owners.
5. Legacy – LWMP implementation has enhanced outcomes from previous plans and is building a lasting legacy of: i) increased irrigator knowledge and capability; ii) recognition that irrigation can be improved and farm business and irrigation planning are essential for business success; iii) best practice irrigation management and infrastructure; iv) increased resilience of irrigation businesses to drought and climate change; v) retention of water and nutrients on farm rather than exporting them to the Gippsland Lakes; vi) understanding the need for continuous technological and management improvements and the essential role of research and extension in providing this; vii) sustainable irrigation requiring effective and affordable regional drainage systems.

11.2 Recommendations

11.2.1 General

The evaluation has found that continuous change and investment has occurred and continues to be required to complete implementation of the LWMP, to maintain and build on the gains made through delivery of the existing and previous plans and to continue to meet EC and state SIP objectives and outcomes. Additional positive outcomes for farm productivity and the health of the Gippsland Lakes could be achieved by investing in LWMP activities that to date have received little or no funding.

Program 1 – Farm planning program

Recommendation 1 – Continue and extend the irrigation farm planning process to irrigation farms in the upper catchment to reduce nutrient loads to Lake Wellington and investigate options to remove bottlenecks in the farm planning process. This is consistent with activity 1.3 in the LWMP.

Program 2 – On-farm irrigation and drainage program

Recommendation 2 – Work with DEECA to amend the 2002 Ministerial order for reuse schemes to enable the CMA to approve larger reuse schemes where beneficial to the environment. This is consistent with activity 2.6 in the LWMP. Implementing this recommendation is contingent on findings from the ARC research project, which is assessing the benefits and impacts of increasing dam size limits, and any farm trials that may be run.

The capacity of reuse dams is limited to 1 ML for every 10 ha of catchment land. This limit is established by the Ministerial Re-use Dam Order 2002. The Order was made to ensure that reuse dams did not capture catchment runoff. Larger reuse schemes would be able to store more runoff from irrigated paddocks further reducing nutrient loads to drains and ultimately Lake Wellington. The benefits of reducing drainage flows needs to be balanced with the contribution drainage makes to flows in waterways.

The order could be amended to enable larger reuse dams to be built in the Lake Wellington catchment by exception, where the CMA considers that a larger reuse dam would provide overall environmental benefits by reducing nutrient discharges.

Program 3 – On-farm nutrient management program

Recommendation 3 – Develop, in partnership with the dairy industry and the EPA, a proactive program to encourage best practice dairy shed effluent management and nutrient management in the MID and the rest of the catchment to reduce nutrient loads to Lake Wellington. This is consistent with activities 3.1 and 3.2 in the LWMP. The general nutrient management component of this work should include other industries, such as horticulture, where there will also be opportunities to reduce nutrient export from farms, e.g. the use of silt (sediment) traps on vegetable farms as proposed in activity 3.6 in the LWMP.

Program 4 – Groundwater and salinity program

Recommendation 4 – Develop a plan with SRW to optimise groundwater pumping in the MID focussing on the public pumps. This will include development of a state policy on provision of funding for the renewal of groundwater pumping infrastructure (readers should also refer to Recommendation 14 for additional context on this recommendation).

Program 5 – Floodplain and off-farm drainage program

Recommendation 5 – Develop a plan with SRW to optimise the surface drainage system in the MID considering improved drainage maintenance, drainage head transfers and drainage course declarations (readers should also refer to Recommendation 14 for additional context on this recommendation).

Program 6 – Innovative and connected irrigation communities program

Recommendation 6 – The LWMP has made commendable progress in improving the cultural competency of staff and program partners to develop a culturally safe environment to enable them to work together with Traditional Owners. The program is guided by Traditional Owners partners about their capacity and readiness to actively participate in individual projects and programs and provide opportunities where appropriate to support building capacity. This work will continue to take considerable time and effort to implement and should continue to be supported. This work is consistent with activities 6.3, 6.5, 6.6 and 6.7 in the LWMP.

MERI

Note: Implementation of Recommendation 7 is dependent on complementary changes being made to DEECA reporting requirements.

Recommendation 7

- a) If integrated evaluations of LWMPs and EC are to be undertaken in the future, evaluations would be streamlined by preparing annual reports which track and compare LWMP targets and estimated budgets with funding agreement targets and budgets.
- b) To simplify reporting and make it more transparent to partners and DEECA a consolidated annual report could be prepared containing:
 - SIP budget and expenditure
 - other government budget and expenditure
 - estimated private expenditure
 - SRW activities and expenditure on the public drainage networks
 - explanations of adjustment to targets
 - explanations of significant events.

Recommendation 8 – To enable improved CMA reporting on LWMP implementation DEECA should consider how reporting templates can better capture progress towards LWMP targets.

Recommendation 9 – Assist future reviews and evaluations by providing the following information and data sources at or immediately following inception meetings:

- consolidated data and information from external partners, e.g. reporting against groundwater and salinity responsibilities for SRW; reporting against surface drainage

responsibilities of SRW; reporting against EPA effluent management compliance activities

- annual program reports; consolidated standard output tables; consolidated incentives implementation spreadsheet; data for depth to groundwater map; incentives program investment data and matching in-kind contribution spreadsheet
- ensuring that a process for surveying irrigator views of program performance is undertaken in an efficient manner.

Recommendation 10 – Complete the review of SRW’s nutrient monitoring network and modelling approach to confirm LWMP contributions to phosphorus load targets in the EPAs Environmental Reference Standard.

Recommendation 11 – Investigate whether RCT2 remains appropriate or whether:

- the use of water table depths shallower than 2 m (i.e. <1 m or 0.6 m) provide a more representative indication of salinity risk in the MSMZ
- to exclude areas close to waterways (i.e. within the 1 in 100-year flood extent) which have permanent water tables less than 2 m (or <1 m or 0.6 m).

The investigation should include a project to better identify/map the correlation of salinity and waterlogging impacts with water table depth. If there is good correlation between impacts and areas with water tables less than 2, 1 or 0.6 m then this depth is likely to be a better indicator of risk. It should also consider whether the target would have been met if the full suite of 19 public groundwater pumps were operating.

11.2.2 EC6 Investment

The objective of the project was to evaluate implementation of the LWMP and EC5 investment. As part of the evaluations Woodwater also collected substantial evidence relevant to EC6 investment priorities for irrigation related activities in the Lake Wellington catchment. Recommendations and a summary of reasons is provided below.

Recommendation 12 – Continued public investment in farm programs in the MID. Continued public investment is warranted in the MID because of the public benefits generated by controlling water table levels and by reducing phosphorus loads to Lake Wellington and to meet Australia’s obligations under the Ramsar convention.

Public investment in farm programs in the MID should continue because there is more to be done to implement the agreed LWMP and because existing programs:

- have been successful in implementing proven best practice farm water management (irrigation farm plans, adoption of sprinklers, reuse systems, etc)
- have ongoing demand and will reduce groundwater recharge, off farm drainage and phosphorus loads to Lake Wellington
- drive significant private investment and attract significant co-investment from other government and agency programs
- have capable agency staff and processes that enable efficient delivery.

The importance of extension services and the ability to adapt these services in response to a changing operating environment has been highlighted throughout this report. These services are, and should remain, core to the delivery of the program.

Future investment is justified to maintain staff with the capability to effectively engage with irrigators and industry and to help government respond to emergencies, such as the drought in 2018-19.

High-quality extension services will be crucial to the relevance of the whole program in an operating environment where funding for incentives is likely to decrease and irrigation businesses are increasingly time poor.

It is early days but activities like the Demo Project appear to offer an innovative response to changing circumstances. They provide one avenue for government agencies and industry to work together to achieve the practice change on farms that helps to deliver the outcomes targeted by the LW LWMP.

Recommendation 13 – Public investment in the Lake Wellington Catchment outside the MID. Public investment is warranted in the rest of the Lake Wellington catchment because of the public benefits generated by reducing phosphorus loads to Lake Wellington and to meet Australia’s obligations under the Ramsar convention. Investment should be targeted at:

- farm planning assistance for irrigation farms because farm planning is the foundation for implementing best practice farm water management
- farm plans should support dairy shed effluent management as a prelude to tighter regulation by the EPA
- the expansion of irrigation within the catchment which should be subject to the Irrigation Development Guidelines to minimise future increases in phosphorus loads.

Recommendation 14 – Public investment into drainage planning in the MID. Public investment into drainage planning in the MID is warranted as a functioning surface drainage network is essential for irrigation to be sustained in the MID. Groundwater drainage is also needed in some areas to reduce water levels to control salinity. Investment should be directed to planning projects to develop:

- an optimisation plan for the public surface drainage network
- funding principles for optimising the surface drainage network
- an optimisation plan for the public groundwater pumping network
- funding principles for optimising the public groundwater network.

The above investigation will establish the case for additional private investment and public investment from EC6 to implement the plans. Program partners need to determine the best model within which to complete the investigations, e.g. a single MID Drainage Strategy or as two separate projects.

Aside – The approach to optimising public groundwater pumping should firstly assess the costs and benefits of continuing to operate these pumps. Secondly the need, costs and benefits of reactivating the eight public pumps that are no longer operating should be assessed. Thirdly, the

need for additional pumps should be assessed. In addition to these technical assessments policies for funding the costs of running, activating, deactivating and decommissioning public pumps needs to be revisited.

The approach to optimising the surface drainage network should investigate options to contain operating and maintenance cost, balancing costs and service levels. The investigations should include opportunities to improve drainage through drainage course declarations and reinstate the program to transfer the heads of drains from SRW to farmers.

Recommendation 15 – Complete a monitoring needs assessment and estimation of investment needs for the public groundwater monitoring bore network as a priority. Funding to maintain the network should be sort through EC6.

Routine maintenance is being funded, but funding is not sufficient to replace bores which have been destroyed (e.g. bore run over by a tractor). A few sites are irretrievably damaged every year.

Recommendation 16 – Public investment in dairy effluent management and nutrient reduction plans covering a range of industries to reduce phosphorus exports to Lake Wellington. Reducing phosphorus loads to Lake Wellington provides public benefits. Public investment in extension activities, demonstration farms and potentially incentives which support best practice dairy effluent management systems and nutrient reduction plans is needed to:

- to reduce phosphorus loads from the MID and other irrigated dairy farms to meet government obligations
- because best practice dairy shed effluent system design and management are effective in retaining nutrients on farm
- because phosphorus loads will be reduced when combined with improved farm water use efficiency
- because experience has shown that public funding achieves practice change and leverages significant private investment
- because there are experienced, capable private service providers and SIP agency staff and processes that could be adapted to efficiently deliver the program.

Recommendation 17 – Determining what success looks like for the MID to inform the next LWMP. LWMP program delivery has been successfully improving farm irrigation management and infrastructure in the MID for around 25 years. However, the reemergence of salinity and waterlogging impacts and requirements for improved nutrient education means there is more to be done. In preparation for, or as part of, LMWP renewal in 2028 it is recommended that program partners determine what success looks like for the MID, including in relation to modern irrigation system infrastructure and management (noting future drainage requirements are the subject of Recommendations 4, 5 and 14). To inform this assessment estimates could be made of the area of the following activities implemented through the LWMP and, if possible, privately:

- irrigation farm plans
- conversion from flood to sprinkler irrigation
- land draining to reuse systems

- best practice surface irrigation.

Using this information, and knowledge of the ongoing need to upgrade or renew farm plans and infrastructure periodically, estimates could be made of:

- remaining areas within the MID that would potentially benefit from assistance through the LWMP, e.g. the remaining area that would potentially benefit from: a new or upgraded irrigation farm plan; a new or enlarged reuse system; conversion to flood to spray irrigation; improving surface irrigation systems
- the public benefits associated with these activities.

References

- Anonymous. (2023). *Future Macalister Salinity Management Zone (MSMZ) Salinity Management Discussion Paper*. Unpublished.
- Blue Sense Consulting. (2020). *Lake Wellington Sustainable Irrigation Group Evaluation- Final Report*.
- Blue Sense Consulting. (2022). *Evaluation of the Newry Irrigation Farm Planning Project*. Unpublished (prepared by Blue Sense Consulting and Gillian Hayman Facilitation & Project Services).
- Connolly, B., & Hylands, P. (2009). *Economic Impact of the 2008 Blue Green Algal Bloom on the Gippsland Lakes Tourism Industry*. Gippsland Lakes and Catchment Taskforce. Retrieved from <https://www.loveourlakes.net.au/wp-content/uploads/2015/05/EcoImpAlg200809.pdf>
- CORE 4. (2018). *CORE 4 in the Macalister Irrigation District. Final Report*. Love Our Lakes, Gippsland Lakes.
- Hayman, G. (2020). *Lake Wellington Irrigator Reference Group - Evaluation*. Unpublished. Report prepared for the West Gippsland Catchment Management Authority.
- Jacobs. (2024). *Macalister Salinity Management Zone Risk Review - Draft Report*. Unpublished. Report prepared for SRW.
- Jacobs SKM. (2014). *MID Nutrient Method: Method and Model Development. Final A Final Report*. Jacobs SKM.
- Kennedy, D., Thom, B., Gell, R., & Rosengren, N. (2024). Coastal Geomorphology and Geology of the Gippsland Lakes Region: A review and future directions. *Proceedings of the Royal Society of Victoria*.
- Nolan ITU. (2002). *Strategic Plan for Salinity Management*. Nolan ITU - prepared for the West Gippsland Catchment Management Authority.
- WG CMA. (2022). *Central Gippsland Irrigation Efficiency Incentives Program*. Unpublished. Prepared by the West Gippsland Catchment Management Authority.

Attachment 1 – Irrigation and drainage development in the MID

Irrigation development

A brief chronology of the development of the Macalister Irrigation District (MID) is provided in **Table 9**.

It is clear from the table that high water tables developed quickly after the introduction of irrigation in 1925 and have been a persistent problem since then. The high water tables reduced productivity and quickly led to communities lobbying for the installation of drainage systems to restore productivity. Irrigators called for improved drainage. Governments responded with surface drainage schemes in the 1930s.

Government implemented the first groundwater drainage scheme in the 1960s. The Nambrok-Denison Groundwater Interception Scheme included 18 groundwater pumps, 84 free flowing bores in the Nambrok-Denison area and 18 free flowing bores in the Cobains area.

High water tables and salinity continued to be a concern and the first salinity management plan *Dropping the Water Table: Lake Wellington Catchment Salinity Management Plan* was prepared in 1993 as part of Victoria’s Salt Action Joint Action program.

In 1996 the State Environment Protection Policy (Waters of Victoria) introduced a target to reduce total phosphorus (TP) input to Lake Wellington to less than 115 tonnes/year for median streamflow and for loads from irrigation drains in the MID to fall by 40 per cent by 2005. These and subsequent nutrient targets have been incorporated into land and water management planning for the Lake Wellington Catchment.

The initial concerns about high water tables have continued and have been compounded by concerns about the need to reduce phosphorus loads to Lake Wellington. Irrigation is not sustainable in the long term without adequate surface/groundwater drainage to prevent waterlogging and the build-up of salt in the soil profile.

Table 9 – Brief chronology of the development of irrigation, waterlogging and salinity in the MID

Date	Development
1925	Glenmaggie weir built to supply small irrigation area near Boisdale Closer settlement schemes extended irrigation to the Maffra and Sale areas
1926	Water to be supplied to 3,600 hectares in Boisdale, Airly, Cobains and other estates near Sale
1927	The Maffra and Sale Irrigation and Water Supply Districts, which then totalled 14,000 hectares, were constituted
1928	Problems of waterlogging and inadequate drainage rapidly emerged

OFFICIAL

1930	The Main Nuntin and Airly-Nuntin Drains were completed in 1930 and Myrtlebank Drain
1933	By 1933 the area under irrigation was approximately 7,400 hectares, served by 310 kilometres of channels and 90 kilometres of drains
1949	Sale-Myrtlebank Seepage Committee formed to investigate salinity and lack of drainage in the area
1952-58	Central Gippsland Soldier Settlement Project extended irrigation to 24,000 hectares of land in the Nambrok and Denison areas
1955	Maffra-Sale Irrigation League met the Minister for Water Supply to voice concerns about expanding irrigation into the Clydebank area without addressing the problems of drainage and high water tables
1957	Capacity of Glenmaggie Weir increased to 190,410 ML
1959	Cowwarr Weir constructed to divert water from the Thomson River
Early 1960s	High water tables were lowering productivity
1960s-1970	<i>Nambrok-Denison Groundwater Interception Scheme</i> consisting of groundwater pumps and free flowing bores built (six public groundwater pumps, 84 free flowing bores in the Nambrok-Denison area and 18 in the Cobains area)
1993	Dropping the Water Table - Lake Wellington Catchment Salinity Management Plan
1994-2006	Thirteen additional public groundwater pumps installed as part of the Lake Wellington Groundwater Control Program Total of 19 public groundwater pumps operating in the Lake Wellington area
1996	<i>SEPP (Waters of Victoria)</i> introduced a total phosphorus (TP) input to Lake Wellington target of less than 115 tonnes/year for median streamflow and for irrigation drains in the MID to fall by 40 per cent After much discussion agreed baseline load for the MID was 70 tonnes/year
1998	<i>Macalister Irrigation District Nutrient Reduction Plan</i> incorporated MID-specific components
2005	<i>Review of the Macalister Irrigation District Nutrient Reduction Plan</i>

	Reviewed the 1998 plan and recommended that the renewed plan be incorporated into the <i>Macalister Land and Water Management Plan</i>
2005	<i>West Gippsland Salinity Management Plan</i>
2007	<p><i>Macalister Land and Water Management Plan</i></p> <p>The plan had broad objectives including for native vegetation, pest plants and animals and environmental flows. However, implementation activities funded through the plan largely related to nutrient and salinity management in the MID</p> <p>Renewed the Macalister Irrigation District Nutrient Reduction Plan and to some extent replaced the West Gippsland Salinity Management Plan</p> <p>Included a target that by 2015, the maximum phosphorus load discharge from the drained area of the Macalister Irrigation Area is to be no greater than 25 tonnes/year</p>
2013	Macalister Irrigation District modernisation project commences to replace the aging inefficient channel network with a modern automated system
2018	<p><i>Lake Wellington Land and Water Management Plan</i></p> <p>Set a target to reduce average annual total phosphorus inputs to Lake Wellington from 115 tonnes/year to 100 tonnes/year by 2030. The irrigation component was to contribute a reduction of 7.5 tonnes/year</p>
2024	<i>Lake Wellington Land and Water Management Plan</i> Mid-term review of the plan

Basic water balance

The causes of the physical problems of waterlogging and salinisation of land, and the related problems of elevated salinity and nutrient levels in waterways caused by drainage, have been well understood for many years.

Problems occur when the water table and groundwater levels rise. Groundwater levels rise when surface water infiltration rates increase. High water tables cause waterlogging and bring salt previously stored in aquifers and the soil to the surface where it is concentrated by evaporation. Waterlogging and increased salinity levels damage soils and vegetation, reduce agricultural productivity and increase concentrations of salt, sediments and nutrients in streams, rivers and wetlands.

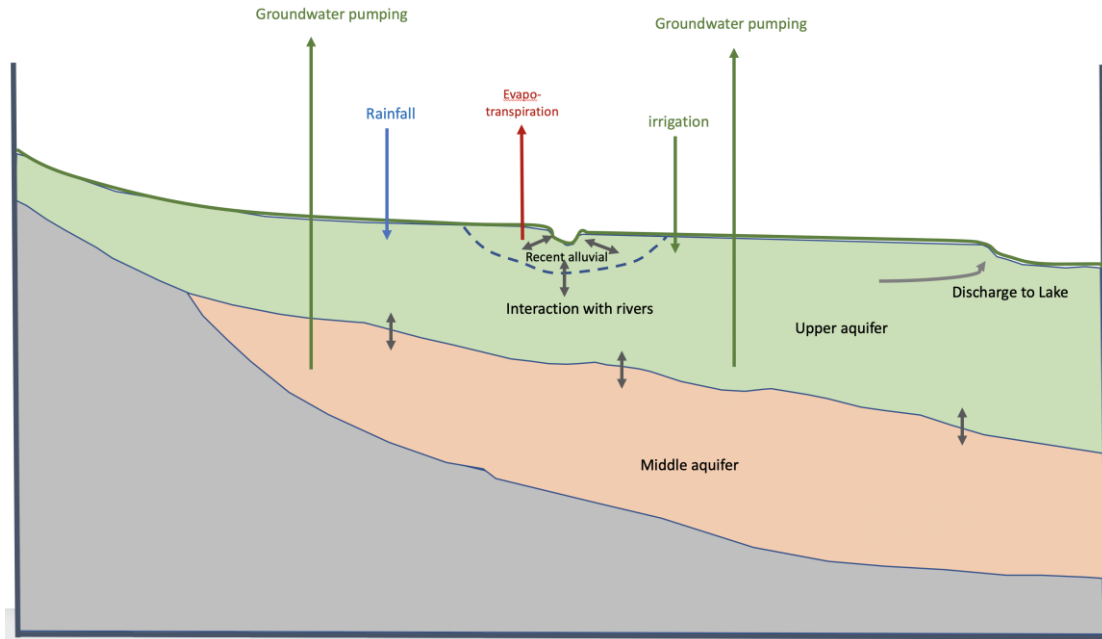


Figure 7 – Simplified representation of water balance in the MID

Water table levels may rise naturally during prolonged wet periods and flooding events. The addition of imported water for irrigation increases groundwater recharge and water table levels and salinity. Water tables fall during dry periods when rainfall and irrigation accessions are less than discharges. Salt will be leached down the soil profile and into the groundwater.

In theory an equilibrium is reached when infiltration rates equal discharge rates. However, in practice water table levels fluctuate with rainfall. While high water tables may be inevitable in very high rainfall years and after flooding, the consequences depend on the how quickly the water tables fall after these events. Damage increases as the length of time the water tables remain high increases.

Discharge rates increase as water tables approach the surface as capillary rise and evaporative losses increase, but this also causes increased levels of salinity in shallow groundwater and soil and discharges to waterways and drains.

As water tables fall, the rate of evapotranspiration losses and discharge to waterways and drains decrease.

Water tables can be lowered by improving irrigation efficiency, providing surface drainage to reduce ponding, reducing leakage from the irrigation network and by directly pumping out groundwater.

Management irrigation drainage and high water tables

There is a limited set of management responses available to manage irrigation induced high water tables and salinity. These are illustrated in **Figure 8**.

Firstly, there are a set of on-farm options designed to ensure irrigation water is used efficiently (i.e. apply only enough water to meet crop needs (in the MID case to supplement rainfall) and to ensure salt does not build up in the root zone. Salt tolerant crops and pastures are encouraged

to improve productivity and reduce soil erosion in on farm areas that cannot be protected by other measures.

Secondly, there are a set of options to manage farm drainage to either prevent water ponding, which reduces productivity and increases groundwater recharge, or directly reduce water table levels using tile drainage, free flowing bores or groundwater pumping.

Delivery of farm actions to improve practices on existing farms relies on the willing participation and investment of the farmers that may be encouraged by a combination of extension, incentives and enforceable regulations.

The regulatory powers available in the *Water Act 1989* are used to require new irrigation developments and significant re-developments to apply best management practices. Irrigation development guidelines are used to guide applicants through the licencing process and coordinate licencing approvals.

These two options require significant investment by the irrigators which many be encouraged by a combination of extension, incentives and regulation.

Farm options alone have proven to be insufficient to control water tables in wet years, or sequences of wet years in the MID (or in northern Victoria). Therefore, a third set of options is required to manage excess water that cannot be retained and productively used on farm. This set of options involves minimising losses through leakage from SRW's irrigation network that recharges groundwater and channel outfalls to the drainage network.

The fourth set of options involves the effective operation of SRW's surface drainage network together with directly lowering groundwater levels with free flowing bores and public groundwater pumps.

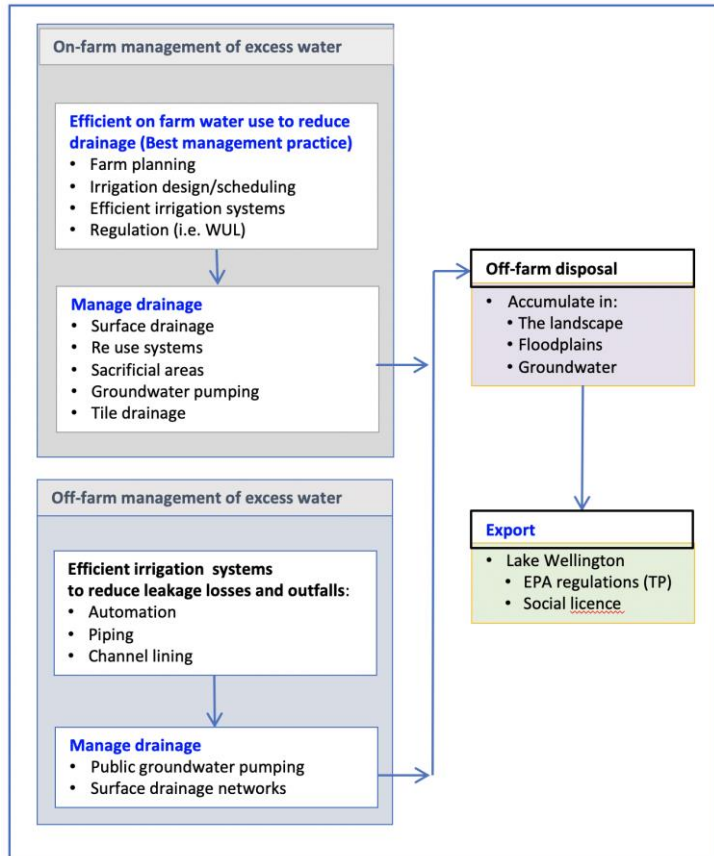


Figure 8 – On-farm and off farm options to manage waterlogging and salinity[DN update figure to include living with salinity]

Finally, excess water, salt and nutrients in the drainage network either accumulates in the landscape or groundwater or is exported to Lake Wellington. Limiting phosphorous is the major consideration when exporting excess water to Lake Wellington.

A feature of the management options is that effective control at a district level requires collective action. A landowner acting alone will not effectively control local waterlogging and groundwater levels. Surrounding landholders need to act collectively.

Table 9 shows that early efforts to control water tables focused on providing a surface drainage network. This was supplemented in the 1960-70s by directly lowering water tables in areas with significant problems using free flowing bores and groundwater pumping.

Management responses were expanded in the *Dropping the Water Table: Lake Wellington Catchment Salinity Management Plan* (1993).

Dropping the Water Table: Lake Wellington Catchment Salinity Management Plan (1993)

The Lake Wellington Catchment Salinity Management Plan included a:

- Groundwater Pumping Program including the encouragement of private pumping and the installation of public groundwater control pumps
- Recharge Control Program primarily related to increasing irrigation efficiency

- Living with Salinity Program involving the planting of salt tolerant pastures in saline affected areas
- Surface Drainage Program including the recommendation of additional drainage in key undrained areas
- Environmental Management Program including investigation of wetlands, streams and lakes and the expansion of the groundwater monitoring system
- Implementation Support Program including community education, monitoring of groundwater levels and salinity research into interactions between groundwater, surface water, wetlands and nutrients.

A review of the plan by Nolan ITU (2002) concluded that installing groundwater pumps was the main implementation activity undertaken since the plan's inception and that they had achieved a substantial decrease in water table levels and land salinity in the Nambrok/Denison and Clydebank regions.

Farmers were also assisted to install private irrigation bores in high water table areas to lower groundwater levels. Nolan ITU (2002) estimated that the area of influence of the Groundwater Control Pumps was approximately 16,600 ha.

Macalister Land and Water Management Plan (2007)

The emphasis of this plan shifted to addressing irrigation induced salinity by:

- reducing groundwater recharge wherever practically and economically feasible
- using engineering options to reduce the water table in saline areas where -
 - protection of high value assets will take too long via recharge control methods or
 - high value assets will not be protected through recharge control methods
- giving preference to using pumped groundwater on farm rather than disposing directly to rivers and the lakes
- ensuring the disposal of groundwater to rivers and/or lakes will not have significant adverse environmental impacts on downstream diverters or the receiving waters
- supporting 'living with salinity' measures when other options are not feasible
- considering the social, economic and environmental (including nutrients) costs and benefits when taking decisions to implement specific salinity control measures
- building the capacity of landowners and the community to recognise and understand the problem and aid in implementing cost-effective solutions.

Macalister Irrigation District Modernisation (2013)

The Macalister Irrigation District modernisation project (MID2030) to replace the district's ageing channel irrigation network with a modern piped system began in 2013 and is ongoing. The project was broken into phases to focus on work that brings the greatest value in water savings and service improvements.

The benefits of MID2030 include:

OFFICIAL

- reducing water losses from the channel network and converting these losses into new water shares
- reducing groundwater recharge from the channel network
- modernised automated regulators and outlets allowing improved water delivery (i.e. more consistent flow rates and higher flow rates)
- more efficient farm irrigation and productivity enabled by improved water delivery
- reducing outfalls to the drain systems, which will also mean fewer nutrients entering waterways and the Gippsland Lakes
- improved operator safety by removing manual handling of regulator drop bars.

MID2030 was not part of the land and water management plans but underpinned land and water management plan outcomes by reducing groundwater recharge from leaky channels and by providing service levels that supported improved farm water use efficiency.