
REVIEW OF IRRIGATION SALINITY MANAGEMENT POLICY IN SOUTH AUSTRALIA

CONSULTATION PAPER



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Acknowledgements

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The Water Policy Branch of DEWNR would like to acknowledge and thank the members of the Review Panel for their contribution to the review and this paper:

- Sharon Starick- Presiding member, SA MDB NRM Board
- Peter Duggin - Chair of River Murray Advisory Committee and Renmark Irrigation Trust
- Roger Wickes - Murray-Darling Basin Salinity Management Consultant
- Peter Forward - Former Principal Engineer, Salt Interception, SA Water
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1. Getting Involved

This paper has been developed to inform a consultation process that seeks feedback on options to improve the operation of the current South Australian River Murray Salinity Zoning Policy.

Formal submissions may be lodged online at www.yoursay.sa.gov.au or forwarded to:

Joel Vandeppeer
GPO Box 1047
Adelaide SA 5000
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Submissions in response to the consultation paper are requested by **Monday 20 November 2017**.

Please indicate clearly if you would like your submission, or any part of it, to be treated as 'confidential'. Submissions will not be published unless with prior written consent or unless required by law.

Background information on the causes, implications and management of salinity is available at www.naturalresources.sa.gov.au

If you would like further information or to discuss any of the options outlined in the paper please contact:

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2. Executive Summary

The availability of low salinity water from the River Murray underpins the health of the environment, productivity of the \$2.2 billion Murraylands and Riverland food and wine industry and is critical to providing good quality drinking water to up to 90% of the State's population.

South Australia has an obligation to manage its salinity impacts under the Murray-Darling Basin Agreement and ongoing effort is needed even with the implementation of the Basin Plan and significant improvements to irrigation efficiency.

The River Murray Salinity Zoning Policy is a key element of South Australia's salinity management program as it minimises salinity impacts from new irrigation development. The salinity zoning policy is implemented through site use approvals that specify the maximum volume of water that can be applied for irrigation on defined land parcels.

Stakeholders have raised concerns that the current policy may be unnecessarily restricting new development in high salinity impact zones and that it provides limited flexibility for irrigators to respond to changing market conditions (e.g. changing to a crop type with higher water requirements).

As a result of stakeholder feedback, changes have been explored to better support new irrigation development within South Australia's existing available capacity on the Basin Salinity Register and to make it easier for irrigators to change to higher water use crops.

After considering a range of possible approaches along with advice from stakeholders and an expert review panel, two options for change have been identified.

Option 1 – Create new 30 year fixed term site use approvals

This option proposes to create new 30 year fixed term site use approvals for irrigation development, and allow increases to the volumes on existing site use approvals to enable conversion to higher water use crops within a specified, irrigated area. Key features include:

- No change to existing site use approvals that specify a maximum volume that can be applied to a defined land parcel.
- Creation of new 30 year fixed term site use approvals for irrigators who apply for approval for new or increased water use.
- Crop type change can occur through application to increase a site use approval volume within a specified maximum area.
- The 30 year fixed term site use approvals can be retired as they expire if necessary to meet the State's Basin compliance obligations.

Option 2 – Replace volumetric limits on site use approvals with a maximum irrigated area

This option proposes to free up currently un-used site use approval volumes for new irrigation by converting actively utilised site use approval volumes to an approved irrigated area. The area would be based on the maximum annual irrigated footprint over the last six years. Key features include:

- Existing site use approvals are converted to a maximum area that can be irrigated rather than a maximum volume that can be used.
- New site use approvals can be issued for new or increased water use without fixed term conditions.
- Crop type change can occur without the need to apply to change a site use approval (as long as the maximum irrigated area does not increase).
- The allocation of new site use approvals can be restricted if necessary to meet the State's Basin compliance obligations.

Option 1 can be implemented relatively quickly should it be supported. Option 2 provides a simpler arrangement but is a more substantial change and would require amendment of the Water Allocation Plan for the River Murray Prescribed Watercourse (River Murray WAP) as well as time to re-issue site use approvals. This could take more than 12 months.

Option 1 is seen as the preferred policy option as it can be implemented immediately but stakeholder feedback is also sought on whether to investigate and consult on more substantial reform under Option 2 as part of the development of the next River Murray WAP.

The Department is seeking feedback about these options and proposal to change the River Murray Salinity Zoning Policy, which are outlined in more detail in Chapter 7.

Key questions for consideration

- **Do you support the proposal to proceed with option 1 as a preferred option for implementation?**
- **Do you see any issues with implementing or administering option 1?**
- **Do you believe there is merit in further considering and consulting on the conversion of site use approval volumes to a maximum irrigated area under option 2 in the future?**
- **Do you have any suggestions as to how either option could be improved?**

3. Introduction & Objectives

The salinity zoning policy is a key element of South Australia's broader salinity management program. The policy aims to minimise the salinity impacts from new irrigation development and assist South Australia to meet its obligations under the Murray-Darling Basin Agreement.

Stakeholders have raised various concerns with the current salinity zoning policy including that it unnecessarily restricts new development and limits the ability of irrigators to effectively respond to shifting market conditions by changing crop types.

Supporting sustainable irrigation development is a Government priority and a review of irrigation salinity management policies was initiated in late 2016 in response to the concerns raised.

This paper outlines options and a proposal for amending the South Australian River Murray Salinity Zoning Policy. It has been informed by advice from an expert review panel and feedback from stakeholders on an issues paper released in April 2017. The issues paper is available at www.naturalresources.sa.gov.au.

The key objectives that have guided the development and assessment of options to amend the policy are:

- Enable new irrigation development while maintaining obligations under the Murray-Darling Basin Agreement.
- Make it easier for irrigators to change to higher water use crops.
- Ensure that salinity impacts from irrigation are not increased beyond those accounted for and offset on the Basin Salinity Register.

4. Background

4.1. The Salinity Problem

The availability of low salinity water from the River Murray underpins the health and productivity of the \$2.2 billion Murraylands and Riverland food and wine industry¹.

Salinity emerged as a significant problem for irrigated agriculture, water supplies and the environment in the Murray-Darling Basin in the 1960s when drought and elevated salinity levels caused significant irrigated crop damage.

Salinity begins to have an impact on sensitive irrigated crops above 400 EC and drinking water palatability when levels approach and exceed the Basin Plan targets for managing water flows of 800 EC at Morgan and 830 EC at Murray Bridge.

The degree to which horticulture is susceptible to salinity is a function of crop sensitivity to salt, irrigation method, soil type, growth stage, rootstock, rainfall and leaching.

To maintain crop productivity salt must be removed from the root zone. Leaching is the most common approach to removing salt and is achieved by applying more water than is needed by the crop. This results in drainage of water (and salt) past the root zone and eventually to the groundwater table.

The potential value of lost production to major irrigated crops grown along the South Australian River Murray due to increased salinity of irrigation water is shown in Figure 1. The actual value of lost production will be dependent on how well salt is leached from the root zone. A range of theoretical leaching requirements to maintain maximum productivity of various crops in the Riverland region are provided at Appendix A.

REMEMBER WHEN?

The salinity level at Morgan was above 800 EC for 31 months between January 1965 and June 1968, and peaked at 1400 EC in February 1968. The impact of high salinity emerged again in the early 1980's with salinity at Morgan remaining above 800 EC for 18 consecutive months, with a peak of 1400 EC in July 1982

¹ RDA Murraylands and Riverland Agricultural Production Overview www.rdamr.org.au

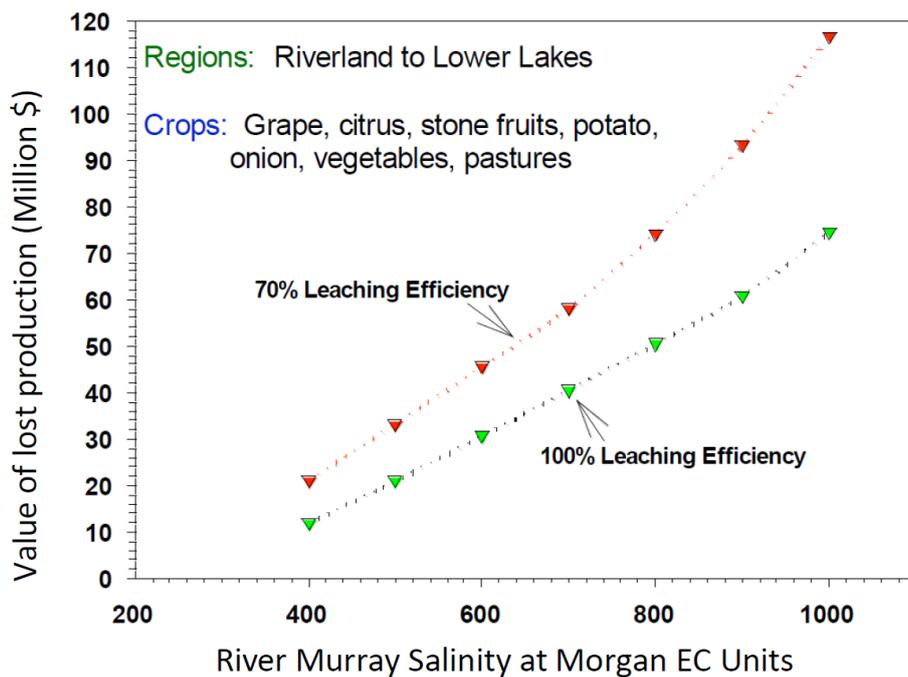


Figure 1-Value of lost production of major crops along the South Australian River Murray due to increasing River Salinity (Biswas et al. 2007)

Within South Australia, saline groundwater that is generally saltier than seawater naturally flows towards the river channel where it enters floodplains and the River Murray.

The flow of irrigation drainage water below the root zone to the groundwater table creates pressure which increases the rate which naturally saline groundwater discharges salt into the river and floodplains. Groundwater mounds grew significantly in the 1970s to early 1990's due to excessive drainage under irrigation areas. Today advances in irrigation technology result in significantly less water draining below irrigation areas; however, there is still an effect particularly as leaching is required to remove salt from the root zone of crops.

In some areas it can take over 50 years from the commencement of irrigation, for drainage water to reach the groundwater table. This means that the effect of current irrigation on salinity in the River Murray may not be observed for many years.

Without further intervention, salt loads from irrigation are predicted to increase from 560 tonnes per day in 2015 to 850 tonnes per day in 2050 and 1,000 tonnes per day in 2100.

4.2. Basin-wide Salinity Management

For the past 30 years the salinity threat has been successfully and jointly managed via a collaborative salinity management program established under the Murray-Darling Basin Agreement. Management initiatives that have been implemented to reduce salt loads entering the River Murray include:

- Improved irrigation systems and irrigation management practices that increase application efficiencies and reduce drainage.
- Construction and operation of salt interception schemes that divert saline groundwater away from the River Murray to disposal basins (www.mdba.gov.au).
- A Basin wide salinity accountability framework, including the Basin Salinity Register, that requires adverse salinity impacts from future actions to be fully offset.
- State based policies and programs to manage salinity impacts from irrigation development.

The Basin Plan will further contribute to the management of salinity by increasing dilution flows through the recovery and use of environmental water. However, even with the Basin Plan, management action is still required to protect water users from elevated levels of salinity.

4.3. The South Australian River Murray Salinity Zoning Policy

The River Murray Salinity Zoning Policy is a key element of South Australia's salinity management program as it minimises salinity impacts from new irrigation development within defined salinity management zones.

The current salinity zoning policy establishes different zones that reflect different levels of salinity impact: a high salinity impact zone, a low salinity impact zone and high (salt interception) zones that are located behind salt interception schemes (Figure 2).

In the high salinity impact zone water use is 'capped' while in the low and high (salt interception) salinity impact zones increased water use is allowed where the salinity impacts can be offset by assigned salinity credits.

Site use approvals are used to control water use on land and hence the associated salinity impact on the River Murray. A site use approval currently permits the holder to apply a maximum annual volume of water for irrigation on specified land parcels.

An irrigator can increase the volume of water on a site use approval in the high salinity impact zone by

What is 'maximum irrigation volume'?

*Site use approvals include a **maximum volume** of water which can be used annually for irrigation on the land parcels listed on the site use approval. This volume may be different to that recorded on other water authorisations such as a water entitlement or water allocation.*

transferring some volume from another site use approval holder as part of a conjunctive application.

The salinity zoning policy does not apply within the Qualco-Sunlands Ground Water Control Trust Scheme Area. The *Groundwater (Qualco-Sunlands) Control Act 2000* supports a separate salinity offset system that applies within this area.

Key points

- **High River Murray salinity is a significant risk to irrigated crops and the environment.**
- **Irrigators manage salinity by leaching salt past the root zone of crops. This drainage increases saline groundwater flow into the River Murray.**
- **Salt interception schemes and improved irrigation practices have successfully reduced the amount of salt entering the River Murray.**
- **Ongoing management of salinity is required even with the Basin Plan.**
- **The salinity zoning policy minimises salinity impacts from new irrigation development within defined salinity management zones.**

River Murray Salinity Impact Zones

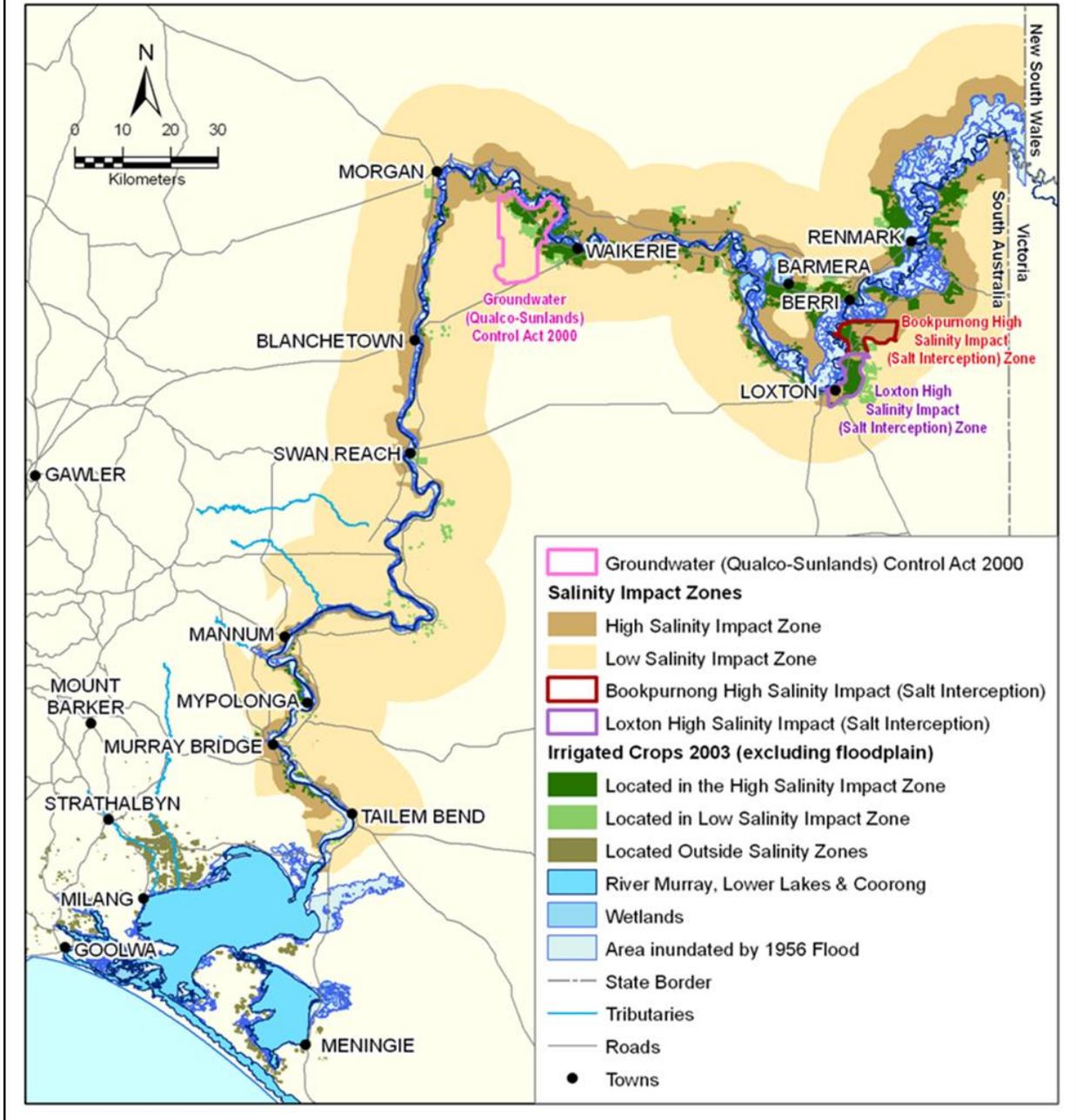


Figure 2- River Murray Salinity Impact Zones

5. Opportunity for Reform

Basin Salinity Register credits and debits are the method of accounting for a Basin State's salinity impact on the River Murray and confirming that a state remains compliant with its obligations under the Murray-Darling Basin Agreement.

Under the Agreement, Basin States are required to maintain Basin Salinity Register entries in balance or in surplus by offsetting any actions which will increase salinity impacts (debits) such as irrigation, with actions that reduce salinity impacts (credits) such as salt interception schemes.

Increasing irrigation development beyond that currently offset on the Basin Salinity Register would increase the need for further investment in salinity mitigation actions such as salt interception schemes. There are also very few opportunities left to cost effectively generate more salinity credits from salt interception schemes and increased disposal of saline groundwater to Noora and Stockyard Plain Basins may have an impact on adjacent landholders.

As a result opportunities to free up capacity for irrigation development without new investment in salinity mitigation, but in a way that ensures South Australia does not adversely affect its Basin Salinity Register balance have been explored.

Within the salinity impact zones, South Australia has offset 56,200 hectares (ha) of irrigation that has been accounted for on the Basin Salinity Register. In comparison the 2017 estimate of actual irrigated area shows that there is approximately 42,000 ha of irrigation within the salinity impact zones.

This unused potential is also reflected in unused Site Use Approval volumes. The total volume currently registered on site use approvals within all salinity impact zones is around 526 GL, while maximum annual water use for irrigation (based on data from 2011-2015) is approximately 330 GL.

This indicates that there is capacity for approximately 14,200 ha or 196 GL of new irrigation development without exceeding the volumes currently approved on site use approvals or the salinity impact currently accounted for on the Basin Salinity Register.

The available capacity is likely to be sufficient to provide for irrigation development in the medium term.

Capability exists within the current salinity zoning policy to free up this capacity for new development through the transfer of site use approval volumes through the conjunctive application process. However feedback from stakeholders and the expert review panel has been that this process is not particularly efficient or effective as a mechanism to support significant new development or changes to higher water use crops.

To date conjunctive applications have been relatively uncommon which may be due to a range of factors including:

- a lack of understanding about the process
- limited accessible information on the availability or cost of site use approval volumes on the market
- the high costs of purchasing site use approval volumes

The review has therefore explored other mechanisms to free up available capacity.

In the past the volume of water used to produce a crop was considered indicative of the likely salinity impact. The more water applied the greater the impact. The analysis undertaken as part of the review indicates that this may no longer be an accurate measure of the salinity impact that may result from irrigation. This is because theoretical leaching rates and estimated drainage rates under irrigation are unlikely to vary significantly under different irrigated crop types and irrigation systems (see appendix A). Further information on this analysis can be found in the report, 'A Review of Theoretical Leaching Requirements for the South Australian Murray Darling Basin' conducted by Primary Industries and Resources SA (Skewes, 2017).

As a result of these opportunities, policy options have been explored to enable new irrigation development within the existing available capacity on the Basin Salinity Register and to make it easier for irrigators to change to higher water use crops where it is unlikely to result in an increased salinity impact.

Other issues identified in the issues paper and during consultation that have been considered during the development of options or will be considered as part of implementation include:

- Need for improved communication about salinity policies and management.
- Third party impacts arising from the disposal of saline groundwater from salt interception schemes to Noora and Stockyard Plain Basins.
- Transparency around the scientific basis for salinity management, including how climate change and improved irrigation water use efficiency are considered.
- Operation and cost of the conjunctive application process.

Key points

- **South Australia is obligated to offset salinity impacts from irrigation.**
- **There is approximately 14,200 ha or 196 GL of capacity within existing site use approvals and Basin Salinity Register entries for new irrigation while maintaining obligations under the Murray-Darling Basin Agreement.**
- **Unused capacity is not currently readily available for new irrigation development.**

6. Key Considerations

6.1. Key considerations

There are a number of important factors that were considered as part of the options development.

Compliance with Schedule B of the Murray-Darling Basin Agreement

All policy options should enable South Australia to meet its salinity obligations under Schedule B of the Murray-Darling Basin Agreement. This includes keeping the total of any salinity credits in excess of, or equal to the total of any salinity debits by 2050 and enabling effective monitoring, evaluation and reporting of irrigation salinity impacts.

Existing Site Use Approval Holders

Policy options should maintain opportunities for existing site use approval holders to increase their water use in line with their development requirements.

It is unlikely that all existing site use approval holders will require all of their currently approved volume, particularly within a 10 year planning timeframe.

Providing for new irrigation development

The benefits of providing for new development where there is no existing site use approval should also be considered in developing options.

Many factors such as commodity prices, availability of land and water, and input costs (e.g. power and infrastructure) will influence irrigation development. These influences mean it is unlikely that irrigation development will exceed the proposed available capacity during the life of any new policy.

To ensure that irrigation along the River Murray in South Australia can respond to market conditions it is important that policy options remove any unnecessary barriers to irrigation development while maintaining salinity management obligations.

Salinity Zones

The existing salinity zoning policy applies different rules to water use in the high salinity impact zone, low salinity impact zone and high salinity impact (salt interception) zones.

As the zones are important for understanding salinity impact and ensuring that site use approvals do not move from the low to high salinity impact zone it is proposed that they will be retained.

However, to simplify the policy and provide for unused capacity to be activated, consideration will be given to applying similar rules across all salinity impact zones, while retaining the Qualco-Sunlands zone which is managed under separate legislation.

Measuring salinity impact of irrigation

A more realistic indicator used to estimate salinity impacts is the irrigated crop area. Groundwater models that are used to calculate Basin Salinity Register entries currently use irrigated area as a key model input. The models apply an average irrigation recharge rate (e.g. 100mm/y) under irrigated areas, which is validated against theoretical leaching rates (appendix 1) and regional water balances.

Accordingly, consideration should be given to adopting irrigated area as a management limit in policy options to better manage irrigation salinity impacts.

Water Allocation Plan for the River Murray Prescribed Watercourse

The salinity zoning policy is contained within the Water Allocation Plan for the River Murray Prescribed Watercourse (River Murray WAP). A review of the River Murray WAP will be required to address Basin Plan accreditation requirements in 2018-19.

Consideration needs to be given to the timeframes required to implement policy options that address the objectives of the review, and whether they can be implemented within the current River Murray WAP. If not, implementation is likely to be delayed by at least 12 months.

Ten Year Review

Any policy change should specify a review point. It is proposed to review the policy in 2027 following a review of the Basin Salinity Management 2030 strategy planned for 2026. This will allow any changes to Basin wide management to be considered.

A review of the policy will consider South Australia's current and projected future compliance with the Murray-Darling Basin Agreement and provide an opportunity to revise the policy to ensure there is a balance between irrigation development, South Australia's Basin Salinity Register compliance, and future salinity risks to other users.

Other review points should also be considered where potential for adverse salinity impacts may occur.

Key points

- **Aim is to provide for irrigation development within the available capacity accounted for on the Basin Salinity Register.**
- **Salinity zones will be retained but policies simplified.**
- **Any impacts from a change in policy on existing site use holders and new developers will be considered.**
- **Irrigated area is a better indicator of potential salinity impact than water use.**
- **Timeframes to implement a new policy should avoid delays and provide for a smooth transition.**

7. Policy Options

7.1. Process to develop policy options

The options development process included assessing a number of different options for suitability against the objectives and considerations listed above and stakeholder feedback on the issues paper.

An expert review panel comprised of representatives from the irrigation industry, irrigation trusts, Primary Industries and Regions SA and salinity management expertise, provided advice to guide the review of salinity policy and shortlist options for public consultation.

The two shortlisted options are discussed below and a table outlining what the changes may mean for individual irrigators is included at appendix B.

7.2. Option 1 - Create new 30 year fixed term site use approvals

Existing site use approval holders

This policy option does not require any changes to existing site use approvals. Existing conditions will be maintained and the maximum volume that can be used for the purpose of irrigation will continue to be transferable through the conjunctive application process.

New development

Irrigation development will be enabled through new site use approvals which will permit the use of a maximum irrigation volume for a 30 year fixed term period.

Conditions on fixed term site use approvals will also define the area and location that can be irrigated, to ensure that the maximum volume for irrigation is not transferred to another location. This is to avoid the stockpiling and transfer of 30 year fixed term site use approvals for a financial gain.

A review will be conducted 10 years prior to the expiry of conditions on fixed term site use approvals to determine whether a renewal can be approved. This should provide irrigators sufficient time to source site use approval volumes through the conjunctive application process if necessary.

Applications for fixed term site use approvals will need to provide evidence demonstrating a commitment to develop new irrigation (e.g. business plan, land purchase, plant orders) to avoid speculative applications and new site use approvals may lapse if irrigation development does not occur within a defined review period.

The opportunity to gain a more permanent site use approval through transferring volume from another site use approval holder as part of a conjunctive application will still be available (as it is under the current salinity zoning policy).

Crop type change

Existing site use approval holders will be able to increase their maximum irrigation volume to change crop types from a low water use crop like grapes to a higher water use crop like almonds on application. This maximum irrigation volume will not be subject to a 30 year fixed term period.

As part of the application an additional condition will be included on the site use approval to define the maximum area and the location that can be irrigated (based on maximum crop area over the last five years). The additional condition is proposed to ensure that site use approval holders do not use crop type change as a mechanism to increase irrigated area.

If following an increase to the maximum irrigation volume to meet higher crop water requirements, a site use approval holder wishes to transfer volume to another site use approval holder as part of a conjunctive application it is proposed that they could revert back to their original maximum site use approval volume to enable this to occur.

Managing salinity impacts and compliance

If the sum of existing and new fixed term site approvals resulted in development beyond the available capacity accounted for on the Basin Salinity Register there would be a significant increase in salinity impact.

If required, increased salinity risk from new irrigation development can be managed by retiring fixed term site use approvals as they expire. For example, if a review identified that the available capacity for irrigation development had been or was likely to be exceeded and there were no other reasonable compliance measures. This would minimise the likelihood that other management such as restrictions on use would be required.

Salinity Zones

The current high, high (salt interception) and low salinity impacts zones will be retained. The policy will not apply within the Qualco-Sunlands scheme area where existing legislative arrangements will continue to apply.

Implementation and review

This option can be implemented under the River Murray WAP in a relatively short time frame which would minimise uncertainty and delays to irrigation developments.

A formal review of the policy would commence in 2027. However a review may be triggered earlier if monitoring identifies that:

- total irrigated area within the salinity impact zones is approaching 50,000 ha (this allows a 6,000 ha buffer as the total area offset is 56,000 ha)
- maximum irrigated area included on fixed term site use approvals reaches 5,000 ha
- total irrigation water use is approaching 500 GL (allows for a 26 GL buffer)
- South Australia's Basin Salinity Register balance is projected to go into debit prior to 2050.

These thresholds for review are set at levels which are approaching the limits of available capacity but with sufficient buffer to enable irrigation development to continue to occur while the review is undertaken.

A review of the policy will consider South Australia's current and projected future compliance with the Murray-Darling Basin Agreement and provide an opportunity to revise the policy to ensure there is a balance between irrigation development, South Australia's Basin Salinity Register compliance and future salinity risks to other users.

Key points

- **No change for existing site use approval holders.**
- **30 year fixed term site use approvals to provide for new development.**
- **Allows changes to higher water use crop types without reducing current irrigated area.**
- **If both current and new site approval volumes are utilised there could be a significant increase in salinity impact.**
- **If required, salinity risk from new irrigation development can be managed by retiring fixed term site use approvals as they expire.**

7.3. Option 2 - Replace volumetric limits on site use approvals with a maximum irrigated area

Existing site use approval holders

This policy option would convert the maximum volume of water that can be used for irrigation on existing site use approvals, to a maximum area of land that can be irrigated based on irrigation footprint. This will free up available capacity of approximately 14,000 ha.

It is proposed that the basis for converting conditions on existing site use approvals would be the maximum irrigated footprint documented on aerial photography or satellite imagery for the period 2012 to 2017.

New development

Existing site use holders and new developers wishing to increase water use for any new development can apply for a new site use approval.

The difference between the total irrigated area on re-issued site use approvals and the available capacity (already accounted for on the Basin Salinity Register) will be made available for allocation to both existing and new site use approval holders to support new development without a fixed term.

A prior commitment process is not currently proposed as valid new applications will be approved as long as they remain within the available capacity.

To avoid speculation and to maximise access to the available capacity, area based site use approvals will not be transferable to a new location and applications will need to provide evidence demonstrating a commitment to develop new irrigation (e.g. business plan, land purchase, plant orders). New site use approvals may also lapse if irrigation development does not occur within a defined review period.

Crop type change

Site use approvals with maximum irrigated area as a condition rather than a maximum volume will allow irrigators to change crop types within their area of irrigated land without having to apply for a variation to their site use approval.

Managing salinity impacts and compliance

The option will reduce the risk that irrigated area could exceed the available capacity causing a significant increase in salinity impact. This is because site use approvals will better reflect irrigated footprint.

For example, if a review identified that the available capacity for irrigation development was likely to be exceeded and there were no other reasonable compliance measures, then the issuing of new site use approvals could be restricted.

Salinity Zones

The current high, high (salt interception) and low salinity impacts zones will be retained. The policy will not apply within the Qualco-Sunlands scheme area where existing legislative arrangements will continue to apply.

Implementation and review

As this option requires a change from volume to area as the basis for managing salinity impacts, it is unlikely that this option can be implemented under the River Murray WAP without amendments being made.

Amendments to the River Murray WAP and conversion of conditions on existing site use approvals will take a significant amount of time and it is likely that this option could take at least 12 months to implement following approval of the policy.

A formal review of the policy would commence in 2027. However a review may be triggered earlier if monitoring identifies that:

- maximum irrigated area endorsed on site use approvals has reached 50,000 ha (this allows a 6,000 ha buffer as the total area offset is 56,000 ha)
- South Australia's Basin Salinity Register balance is projected to go into debit prior to 2050.

These thresholds for review are set at levels which are approaching the limits of available capacity but with still sufficient buffer to enable irrigation development to continue to occur while the review is undertaken. Volumetric triggers are not included as site use approvals will include area based conditions.

A review of the policy will consider South Australia's current and projected future compliance with the Murray-Darling Basin Agreement and provide an opportunity to revise the policy to ensure there is a balance between irrigation development, South Australia's Basin Salinity Register compliance and future salinity risks to other users.

Key points

- **Maximum volume conditions on existing site use approvals will be converted to a maximum area of land that can be irrigated.**
- **All site use approval holders and new developers will have the same opportunity to develop new irrigation.**
- **Crop type change can occur without application.**
- **Implementation of the policy is likely to take in excess of 12 months.**

7.4. Comparison of options

Both policy options align with the key objectives and considerations and address the issues identified with the current salinity zoning policy.

Compared to the current salinity zoning policy the options provide more capability for new irrigation development and improve flexibility to change to higher water use crops. The options do this by freeing up available capacity that is currently not readily accessible through the conjunctive transfer of site use approval volumes under the existing salinity zoning policy.

However, the implementation timeframes and the mechanism to free up available capacity are significantly different between the two options.

Option 1 can be implemented relatively quickly and without amendment to the River Murray WAP should it be supported. Other advantages are that:

- There is no change to existing site use approvals. Irrigators that have surplus capacity on their existing site use approvals can increase water use without application (as they do under the current policy).
- New developers can access 30 year fixed term site use approvals for new or increased water use. The current option of more permanently transferring volume from another site use approval holder as part of a conjunctive application is also still available.
- Crop type change can occur through application to increase an existing site use approval volume within a specified maximum area.
- The commitment of the South Australian Government to meet its obligations under the Murray Darling Basin Agreement is demonstrated by providing a clear pathway for compliance through retirement of 30 year fixed term approvals if necessary.

Option 2 is a more substantial change and would require amendment of the River Murray WAP as well as time to re-issue site use approvals. This could take more than 12 months. However, there are advantages in this option including:

- Existing site use approval conditions are converted from a maximum irrigation volume to a maximum area that can be irrigated.
- The unused capacity currently on site use approvals is freed up to enable new irrigation development for both new developers and existing site use holders (without a fixed term).
- Crop type change can occur without the need to apply to change a site use approval (as long as the maximum irrigated area does not increase).
- Potential salinity impacts can be understood from the irrigated area approved on site use approvals and compliance can be managed by restricting the issuing of new site use approvals, if necessary.

8. Proposal for change

On the basis that it can be implemented relatively quickly and minimises changes for existing site use holders, Option 1 is the preferred policy option.

At the same time stakeholder feedback is sought on whether to investigate and consult on more substantive reform to convert existing site use approval volumes to an approved irrigated area as proposed under Option 2. This could be done as part of the process to amend the River Murray WAP in 2018 to achieve Basin Plan compliance.

Other alternatives could be to proceed with Option 1 only or to not proceed with Option 1 at all and explore Option 2 as part of the development of the next River Murray WAP. The latter would delay any changes to the policy to enable new irrigation development.

Once stakeholder feedback has been received and considered, any necessary changes will be made to the proposal to amend the River Murray Salinity Zoning Policy. A recommendation will be developed by the Department in consultation with the expert review panel and South Australian Murray-Darling Basin Natural Resources Management Board for consideration by the Minister for Water and the River Murray.

Following endorsement further work will be undertaken as part of implementation of amendments to the River Murray Salinity Zoning Policy to:

- improve communication about salinity policies, management activities and the underlying science
- consider opportunities to improve the conjunctive application process.

Key questions for consideration

- **Do you support the proposal to proceed with option 1 as the preferred option for implementation?**
- **Do you see any issues with implementing or administering option 1?**
- **Do you believe there is merit in further considering and consulting on the conversion of site use approval volumes to a maximum irrigated area under option 2 in the future?**
- **Do you have any suggestions as to how either option could be improved?**

9. References

Biswas T, Schrale G, Stephens R, Sanderson G, Bourne J, Mclean G 2007, Salinity Impact on lower Murray Horticulture Land & Water Australia Project DEP 15 Final Report 15pp

Peters, K (2014) *Industry Perspectives Report: What Future Primary Industries*, report prepared for the RDA Murraylands and Riverland, Australia

Skewes, M (2017) A Review of Theoretical Leaching Requirements for the South Australian Murray Darling Basin (SAMDB), Primary Industries and Resources SA.

10. Glossary

DEWNR - Department of Environment, Water and Natural Resources

EC - Electrical Conductivity is a measure of the concentration of ions- $\mu\text{ S cm}^{-1}$ EC

GL - Gigalitre (1 000 000 000 litres)

Groundwater mound – Where the water table in the aquifer forms a mound, due to recharge occurring at a higher rate than water flows horizontally through the aquifer.

Maximum irrigation volume – The volume recorded on each site use approval with a purpose of irrigation. Application of water to the land parcels listed on the site use approval is permitted up to this volume.

ML - Megalitre (1 000 000 litres)

Recharge – a hydrologic process where water moves downward from surface water to groundwater.

Root Zone Drainage- is the amount of water draining past the root zone of crops.

SA MDB NRM Board- South Australian Murray-Darling Basin Natural Resources Management Board

Salinity- is the measure of salts dissolved in solution. Salinity is usually measured in milligrams per litre (mg/L) or in Electrical Conductivity (EC).

Site Use Approval- A site use approval is a permission to use water at a particular location for a specified purpose

WAP - Water Allocation Plan

Appendix A- Leaching Requirements

Crop	ET _c (mm)	P _E (mm)	NIR (mm)	EC _E (dS/m)	EC _w (dS/m)	LR	IR (mm)	LD (mm)	D (mm)	
Almond	1366	178	1204	1.5	0.4	0.06	1276	72	88	
						0.6	0.09	1318	114	130
						0.8	0.12	1367	163	179
Citrus	1027	178	849	1.7	0.4	0.05	893	44	44	
						0.6	0.08	919	70	70
						0.8	0.10	947	98	98
Lucerne Pasture	1314	178	1135	2	0.4	0.04	1185	50	50	
						0.6	0.06	1213	78	78
						0.8	0.09	1244	109	109
Grass Pasture	1193	178	1060	2	0.4	0.04	1106	46	91	
						0.6	0.06	1132	72	117
						0.8	0.09	1161	101	146
Winegrape	803	178	688	1.5	0.4	0.06	729	41	104	
						0.6	0.09	754	66	129
						0.8	0.12	782	94	157

Source- Skewes, M (2017) *A Review of Theoretical Leaching Requirements for the South Australian Murray Darling Basin (SAMDB), Primary Industries and Resources SA.*

The calculation of water requirements, leaching requirements and drainage volumes followed a specific process, as outlined in Skewes (2017). The terms included in the table are explained below.

Crop Evapotranspiration (ETC) represents the total water required by a crop for evaporation and transpiration under given growing conditions, and is defined by Doorenbos and Pruitt (1977) as *“the depth of water needed to meet the water loss through crop evapotranspiration of a disease free crop, growing in large fields under non*

restricting soil conditions including soil water and fertility and achieving full production potential under the given growing environment; includes water loss through transpiration by vegetation, and evaporation from the soil surface and wet leaves”.

Net Irrigation Requirement (NIR) is defined by Doorenbos and Pruitt (1977) as “the depth of water required to meet evapotranspiration minus contribution by effective rainfall, ground water, stored soil water; does not include operational losses and leaching requirement”.

Leaching Requirement (LR) is defined by Doorenbos and Pruitt (1977) as “fraction of the irrigation water entering the soil that effectively must flow through and beyond the root zone in order to prevent salinity build-up”.

Irrigation Requirement (IR) is defined by Doorenbos and Pruitt (1977) as “*the depth of irrigation water required for meeting evapotranspiration minus contribution by effective precipitation, groundwater, stored soil water, required for normal crop production plus leaching requirement and water losses and operational wastes”.*

Leaching Depth (LD) under each irrigation water salinity scenario was calculated as the difference between NIR and IR as calculated by the crop water requirement spreadsheet. This figure represents the additional water calculated as required to maintain soil salinity below the critical EC_E figure for each crop type, using irrigation water of the specified salinity.

Drainage (D) under each scenario was calculated as the difference between the annual depth of water applied ($IR + P_E$) and the annual depth of water used by the crop (ET_C).

Appendix B – How the Options May Apply to Individual Irrigators

	Status quo- Current salinity zoning policy	Option 1- Create new 30 year fixed term site use approvals	Option 2- Replace volumetric limits on site use approvals with a maximum irrigated area
Can I continue irrigating using my existing site use approval?	Yes.	Yes. There are no changes to existing site use approvals and conditions.	Yes. Your site use approval will have a maximum area of land than can be irrigated rather than a maximum volume of water that can be applied. It is proposed that the maximum area of land would be based on the area of land you irrigated between 2012 and 2017.

	Status quo- Current salinity zoning policy	Option 1- Create new 30 year fixed term site use approvals	Option 2- Replace volumetric limits on site use approvals with a maximum irrigated area
Can I increase my water use for a new development if I do not have an existing site use approval?	<p>Yes.</p> <p>You can apply for a site use approval in the low or salt interception impact zones if the salinity impacts will be offset by available salinity credits; or</p> <p>You can apply for a conjunctive transfer* of site use volumes in the high impact zone.</p>	<p>Yes.</p> <p>You can apply for a new 30 year fixed term site use approval; or</p> <p>You can apply for a conjunctive transfer* of site use volumes.</p>	<p>Yes.</p> <p>Un-used capacity would be freed up and available for those who wish to apply to for a site use approval.</p>
Can I increase my irrigated area or change to a higher water use crop with the spare volume I have on a site use approval?	<p>Yes.</p> <p>The area you irrigate and the amount of water you use can be increased until you reach the maximum volume listed on your site use approval.</p>	<p>Yes.</p> <p>The area you irrigate and the amount of water you use can be increased until you reach the maximum volume listed on your site use approval.</p>	<p>Yes.</p> <p>Un-used capacity would be freed up and available for those who wish to apply to increase their irrigated area.</p> <p>If you wish to change to a higher water use crop you can do so as long as your maximum irrigated area does not change,</p>
<p>* This is where your site use approval volume is offset by a reduction on another site use approval within the same salinity impact zone.</p>			

	Status quo- Current salinity zoning policy	Option 1- Create new 30 year fixed term site use approvals	Option 2- Replace volumetric limits on site use approvals with a maximum irrigated area
Can I develop a new irrigated area if I don't have any spare volume on a site use approval?	<p>Yes.</p> <p>You can apply for additional volume on a site use approval in the low or salt interception impact zones if the salinity impacts will be offset by available salinity credits; or</p> <p>You can apply for a conjunctive transfer* of site use volumes in the high impact zone.</p>	<p>Yes.</p> <p>You can apply for a new 30 year fixed term site use approval; or</p> <p>You can apply for a conjunctive transfer* of site use volumes.</p>	<p>Yes.</p> <p>You can apply to increase the maximum area to be irrigated.</p>
Can I change to a higher water use crop if I don't have any spare volume on a site use approval?	<p>Yes.</p> <p>You can apply for additional volume on a site use approval in the low or salt interception impact zones if the salinity impacts will be offset by available salinity credits; or</p> <p>You can apply for a conjunctive transfer* of site use volumes in the high impact zone.</p>	<p>Yes.</p> <p>You can apply to increase the volume on your existing site use approval subject to a maximum irrigated area being specified in your approval.</p> <p>Other options include applying for a new 30 year fixed term site use approval or a conjunctive transfer of site use volumes.</p>	<p>Yes.</p> <p>If your maximum irrigated area does not change, you can change your crop type without lodging an application.</p> <p>You can also apply to increase the maximum area to be irrigated if necessary.</p>
<p>* This is where your site use approval volume is offset by a reduction on another site use approval within the same salinity impact zone.</p>			

	Status quo- Current salinity zoning policy	Option 1- Create new 30 year fixed term site use approvals	Option 2- Replace volumetric limits on site use approvals with a maximum irrigated area
Can I transfer my site use approval volume through a conjunctive application?	<p>Yes.</p> <p>The volume on your site use approval is transferable to another site use approval in the same salinity impact zone through a conjunctive application.</p>	<p>It depends on the type of site use approval you hold.</p> <p>For existing site use holders the volume on your site use approval is transferable to another site use approval in the same salinity impact zone through a conjunctive application.</p> <p>If you are a holder of a 30 year fixed term site use approval or have already increased your crop water needs and have a specified maximum irrigated area – this approval would not be transferable.</p> <p>This is to avoid the stockpiling and/or transfer of 30 year fixed term site use approvals for a financial gain and to ensure that volumes granted to allow for a change of crop type are not used to increase irrigated area instead.</p>	<p>No.</p> <p>It is proposed that approved irrigated area is not transferable to avoid the stockpiling and/or transfer of approvals for a financial gain and to ensure that approvals are actively utilised.</p> <p>It is anticipated that there is sufficient capacity available for new irrigation development without transfers in the medium term.</p> <p>However, if a review indicated that available capacity was nearing full allocation, consideration would be given to allowing transfers.</p>



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