The Basin Salinity Management Strategy (BSMS) is a Basin-wide response to the threat that salinity poses to water quality, environmental values, regional infrastructure and productive agricultural land across the Murray-Darling Basin.

The Strategy provides a guideline for communities and governments to work together to control salinity and protect key natural resources. The Strategy partners collaborate in the preparation of an annual report that collates the achievements and activities undertaken to improve salinity management.

The BSMS has established in-stream salinity targets for major tributary valleys and the Murray-Darling Basin as a whole. The Strategy provides an accountability framework to ensure that land and water management activities (or Accountable Actions) complement salinity management objectives.

This brochure summarises the work undertaken by the Strategy’s partners, detailing progress towards meeting salinity targets and improving accountability for salinity management over the 2005–06 year.
Key achievements for 2005–06

The 2005–06 year has built significantly on past achievements in salinity management, setting a solid foundation for the future. Outcomes in 2005–06 include:

Salt kept out of the Murray
The two new salt interception schemes and seven existing ones have increased the amount of salt diverted away from the river to 1,370 tonnes/day in 2005–06, compared to 1,100 tonnes/day in 2004–05. The cumulative total of salt intercepted is now approximately 500,000 tonnes/year. Salt interception schemes (those operating, under construction or approved for construction) will achieve an estimated reduction in the salinity at Morgan, South Australia, of approximately 40 EC.

River Murray salinity levels
The recorded salinity at Morgan during the 2005–06 year was 484 EC or less for 95 per cent of the time. There are a number of reasons for these low salinity levels. Improved irrigation efficiency and the impact of the drought have combined with the salt interception schemes to keep salinity low.

End-of-valley targets
End-of-valley targets are the key indicators of how catchment actions achieve improved salinity management over the long-term. All four Basin states now have end-of-valley targets.

Improved governance and reporting
The Strategy’s governance and reporting arrangements require a coordinated and cooperative approach between Strategy partners. These processes were significantly improved in 2005–06, culminating in the application of improved data sets to re-assess salinity outcomes from Accountable Actions across the Basin.

More robust Registers
The BSMS Salinity Registers provide the basis for ensuring that activities which lead to river salinity costs are offset by activities that reduce these costs. Significant improvements in the data on which the Registers are based have meant that the Registers are now more robust, providing greater confidence in entries. The Registers have also been adjusted to preserve the agreed benefit to New South Wales and Victoria that had been affected by the new method of calculating the Registers under the Basin Salinity Management Strategy.

Rolling five-year reviews
In addition, the Registers have been improved through the completion of reviews of the technical work underpinning several Register entries. Under the Strategy, Accountable Actions must be reviewed on a five-yearly basis. Queensland completed reviews for the Border Rivers and Moonie catchments while New South Wales focused on updating the Salinity Audit for upland catchments. Victoria completed the Shepparton Irrigation Region review and South Australia made significant progress on the Mallee region reviews.
The Basin Salinity Management Strategy

**Strategy objectives**
The Basin Salinity Management Strategy (BSMS) is a response to the significant threat that salinity poses to the Murray-Darling Basin. This threat impacts on water quality, environmental values, regional infrastructure and productive agricultural land. The Strategy provides a guideline for communities and governments to work together to control salinity and protect key natural resources in the Basin. It has established accountability arrangements and adopted river salinity targets. The Strategy will:

- maintain the water quality of the shared water resources of the Murray and Darling rivers for all beneficial uses – agricultural, environmental, urban, industrial and recreational
- control the rise in salt loads in all tributary rivers of the Murray-Darling Basin and, through that control, protect their water resources and aquatic ecosystems at agreed levels
- control land degradation and protect important terrestrial ecosystems, productive farm land, cultural heritage, and built infrastructure at agreed levels Basin-wide
- maximise net benefits from salinity control across the Basin.

**Roles and responsibilities**
The Murray-Darling Basin Commission (MDBC) is the executive arm of the Murray-Darling Basin Ministerial Council. The Council is a partnership of six governments — Queensland, New South Wales, Victoria, South Australia, Australian Capital Territory and the Australian Government. The Commission is responsible for the implementation of the Strategy. While the overall task is to promote and coordinate implementation of the Strategy, the Commission’s primary responsibilities are the Salinity Registers, coordination of joint investment in the salt interception schemes, and monitoring and reporting provisions.

State and territory governments, in collaboration with their regional bodies, have primary carriage of setting and managing the end-of-valley targets, salinity and catchment plans, redesigning farming systems and undertaking targeted vegetation management. These in-valley activities impact on the end-of-valley flow and salinity outcomes. Activities include developing, implementing and reporting on salinity and catchment plans, building capacity needed for implementation, identifying assets and values at risk and making trade-offs as required. There is a high level of cooperation and collaboration between the jurisdictions and the Commission in implementing the nine elements of the Strategy.

The Australian Government continues to provide funding support through the National Action Plan for Salinity and Water Quality (NAP) and the Natural Heritage Trust (NHT). Bilateral agreements between the Australian Government and state and territory governments support salinity and natural resource management objectives in natural resource management plans.
Current status

River Murray salinity levels
Basin Salinity Management actions continue to have real impacts on river salinity every year. Figure 1 shows the recorded salinity levels at Morgan during the 2005–06 year. The red line shows the actual recorded salinity for the year while the blue line shows what salinity levels would have been without salt interception schemes or dilution flows. The blue line therefore describes what is commonly referred to as a ‘without intervention’ scenario.

* Salinity effects range between 80 EC and 265 EC for this period.

‘Without intervention’ results are attained by using the accredited Murray River hydrological computer model, which simulates river salinities that would have occurred if salt interception works were not operating. During 2005–06, the effect of salinity management (in Figure 1 the difference between the red and blue lines) ranged from approximately 80 EC in late October 2005 to approximately 265 EC in June 2006.

Basin Salinity Target

The agreed Basin Salinity Target is to maintain the average modelled daily salinity at Morgan at a level of less than 800 EC for at least 95 per cent of the time over a period considered to represent the normal range of climatic variability. At the time of the development of the BSMS, the period 1975 to 2000 was considered suitable to reflect typical climatic variability because it incorporated both wet and dry periods. This period is referred to as the Benchmark Period.

While salinities in the river are relatively low at present, modelling shows that, if climatic conditions experienced over the period 1975 to 2000 returned, the long-term salinity at Morgan would exceed the Morgan target by approximately 70 EC, increasing the risk of the Strategy not achieving its objectives.

The impact of the drought
The higher salinities predicted over longer term typical climatic conditions are not currently apparent in the recorded salinity at Morgan because, in periods of drought:
• there is a decline in rainfall and irrigation infiltration entering the groundwater system. More salt therefore remains in the landscape rather than discharging to tributary rivers and irrigation drains as occurs in wetter years.
• salt accumulates in lower Murray floodplains such as Chowilla, rather than regularly being flushed to the river by floods.
Actions for salinity outcomes – Basin-wide

The success of the Basin Salinity Management Strategy relies upon a shared vision and partnership between the six governments coordinated through the Murray-Darling Basin Commission. On-ground salinity actions are largely achieved through actions at the state and territory level. Regional catchment strategies set priorities for works at a catchment and sub-catchment scale.

Accountability is maintained for any actions that will have a significant impact on the River Murray for each state and territory under the Salinity Registers. Actions with either a positive or a negative impact on salinity are recorded in the Registers. For example, the benefits of salt interception schemes (joint works) offset the salinity costs arising from past and future land use changes in the Basin that increase the amount of salt entering rivers.

Salt interception schemes

The Commission operates nine salt interception schemes along the River Murray from Pyramid Creek in Victoria to Waikerie in South Australia. These schemes intercept saline groundwater and surface drainage flows before they enter the river.

In 2005–06, a number of significant milestones were achieved under the Salt Interception Program, including commissioning two new salt interception schemes and augmentation of an existing scheme. Stage 1 of the new Pyramid Creek scheme, commissioned in April 2006, will provide a benefit of 3.5 EC to the River Murray. A unique feature of this scheme is the incorporation of commercial salt harvesting into its design and operation. This feature contributed to the scheme winning the 2006 Engineers Australia National Salinity Prize.

Completion of the Bookpurnong scheme, will provide a total benefit at Morgan of 17.9 EC, while rehabilitation of the Buronga scheme, means another 0.6 EC. Other progress includes the continued construction of the Loxton scheme, which is expected to reduce salinities in the River Murray by 18.7 EC.
The BSMS Salinity Registers

The Salinity Registers provide a consistent currency through which Accountable Actions can be managed transparently. The Registers track the effect of these activities as salinity benefits and costs along the River Murray and express the predicted outcomes as millions of dollars per year.

A summary of the status of the Salinity Registers for 2005–06 is presented in Table 1.

Table 1 Summary of Salinity Registers A and B as at 15 December 2006 for actions prior to 30 June 2006 (benefits $m/year).

<table>
<thead>
<tr>
<th>Actions</th>
<th>NSW</th>
<th>Vic</th>
<th>SA</th>
<th>Qld</th>
<th>ACT</th>
<th>Transfers to Register B</th>
<th>River</th>
<th>Total</th>
<th>Aust Govt contribution (EC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;DS joint works &amp; measures</td>
<td>1.921</td>
<td>1.921</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>6.404</td>
<td>10.246</td>
<td>23.2</td>
</tr>
<tr>
<td>BMS joint works &amp; measures</td>
<td>0.415</td>
<td>0.600</td>
<td>0.415</td>
<td>0.0</td>
<td>0.0</td>
<td>1.288</td>
<td>0.0</td>
<td>2.718</td>
<td>3.7</td>
</tr>
<tr>
<td>Shared state works &amp; measures</td>
<td>0.205</td>
<td>0.205</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.410</td>
<td>0.0</td>
</tr>
<tr>
<td>Individual state works &amp; measures</td>
<td>2.232</td>
<td>1.716</td>
<td>7.071</td>
<td>tbd**</td>
<td>tbd</td>
<td>0.0</td>
<td>0.229</td>
<td>11.248</td>
<td>1.0</td>
</tr>
<tr>
<td>Total Register A</td>
<td>4.773</td>
<td>4.442</td>
<td>7.486</td>
<td>tbd**</td>
<td>tbd</td>
<td>1.288</td>
<td>6.632</td>
<td>24.622</td>
<td>27.9</td>
</tr>
<tr>
<td>Total Register B</td>
<td>0.272</td>
<td>–0.357</td>
<td>–0.903</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>–0.987</td>
<td>0.0</td>
</tr>
<tr>
<td>Balance Register A &amp; B</td>
<td>5.045</td>
<td>4.085</td>
<td>6.584</td>
<td>0.0</td>
<td>0.0</td>
<td>1.288</td>
<td>6.632</td>
<td>23.634</td>
<td>27.9</td>
</tr>
</tbody>
</table>

‡ The numbers in black indicate a credit entry. Negative numbers in red indicate a debit entry.
** to be determined.

Joint works & measures
The first two lines of Table 1 summarise the economic benefits to the river arising from joint works and measures. Joint works and measures refer to salt interception schemes constructed as part of the 1988 Salinity and Drainage Strategy (S&DS) or those under the current BSMS. These lines also demonstrate the benefits of the joint schemes between the investing states. The Australian Government provides significant financial input to the schemes, which is reflected in the right-hand side column showing a salinity benefit equivalent to this contribution.

Shared state works & measures
Some states have carried out actions such as adopting targeted river operating rules that provide downstream salinity benefits. These benefits are shown as ‘shared state works & measures’ in Table 1.

Individual state works & measures
The individual state actions reflect the salinity costs and benefits to the river relating to land use change and water use. Typical examples of activities that increase salinity costs include new irrigation developments, the construction of new drainage schemes and wetland flushing, all of which mobilise salt to the river. Offsetting activities include improved irrigation efficiencies and improved river operations.

Total Registers A & B
The overall cumulative accountability for salinity impacts on the river in 2005–06 is summarised in the lines termed Total Register A & Total Register B. Register A maintains accountability for actions arising after 1 January 1988 for New South Wales, Victoria and South Australia, and 1 January 2000 for Queensland. Total Register A reflects the sum of the salinity cost of the state actions offset by joint works and measures or shared works and measures shown in the preceding lines. Total Register B accounts for actions that occurred before the above dates but where the impacts were not experienced until after the year 2000 because of the slow movement of groundwater to the river.
Balance of Register A & B
The ‘Balance of Register A & B’ provides an overall assessment of whether each Basin partner is in net credit or debit. Assessment of this balance needs to be considered in light of different levels of confidence in individual register entries, and different methodologies used to calculate the A and B Registers.

Rolling five-year reviews
Under the Strategy, each major tributary valley has an end-of-valley target and each Accountable Action has an entry in the Salinity Registers. The Strategy requires that each Register entry and each valley which has an end-of-valley target be regularly reviewed through a five-yearly audit. These are known as rolling five-year reviews. The reviews provide an opportunity for the Strategy to improve its predictions of salinity impacts, leading to progressive improvements in the confidence of each Register entry over time.

Actions for salinity outcomes – within valleys
The Australian Government has made a large investment to manage salinity at a regional scale through the National Action Plan for Salinity and Water Quality (NAP) and the Natural Heritage Trust (NHT). Under these programs, in 2005–06, joint partnerships between the Australian, state and territory governments continued to provide significant investment aimed at improving salinity management in catchments. Key outcomes within catchments during 2005–06 included:

Queensland
- The coordination of information management, monitoring and evaluation strategies by all three regional bodies included a Community Salinity Monitoring Program. This program supports improving salinity knowledge, particularly for base flows, location of shallow groundwater areas and sources of salt.
- The Condamine Alliance completed salinity risk mapping for the upper Condamine catchment, identifying known salinity expressions and high-risk areas. In addition, industry engagement has led to improved water use efficiency, saving 420 megalitres per year through improved management practices.

New South Wales
- An airborne electromagnetic (AEM) survey of the lower Macquarie River in the Central West region has been initiated at a cost of $4.6 million. This will map the occurrence and extent of salt deposits and inform future decision-making processes for land and water management, including the Macquarie Marshes.
- A total of $12.6 million over five years has been committed to the Murrumbidgee Irrigation Area and Districts EnviroWise program. Priority on-farm actions include water use monitoring and irrigation scheduling. When combined with other on-farm activities, the program will increase profitability and lower the risks of water logging and of soil and water salinity. The Program also includes re-collecting, recapturing and reusing irrigation drainage water to return it to the stream without environmental impact. This will reduce drainage borne salt and its impacts on downstream users.

Victoria
- In the Goulburn-Broken region, the surface and subsurface drainage program continued. This program funds the planning and construction of surface drainage systems as well as private and public groundwater pumps to protect agriculture and horticulture from land salinisation.
- In the Wimmera region, a program targeting salt-affected dryland continued. This program targets the establishment of over 120,000 saltbush plants and 15,000 trees to manage salinity and restore productivity to salt-affected land, and will also identify potential options for the use of saline land and water in the project area.

South Australia
- The FloraSearch project, conducted through the CRC for Plant-based Management of Dryland Salinity, is developing native woody perennial plants (suitable for large scale commercial revegetation) to aid the control of dryland salinity. This project will provide more options and flexibility for existing industries and provide the foundation for viable new industries.
- A $1.3 million program has also been initiated for water-use efficiency measures to reduce drainage from irrigated horticulture. This included assistance to farmers to implement sustainable practices through improved watering regimes as well as increasing skills, building knowledge and providing improved data and equipment. Revegetation work has also continued in both dryland farming and irrigation areas.
End-of-valley outcomes
Under the BSMS, the jurisdictions monitor flow and salinity data for the end-of-valley target sites. Figure 2 and Figure 3 show the salt load and in-stream salinity (EC) for 2005–06 respectively. The 2005–06 data continues to reflect the extended dry conditions. In mid- and lower- catchments, lower groundwater levels have reduced salt accessions to rivers.

Figure 2. Salt load for the period 2005–06 and end-of-valley baseline.
The recorded levels are shown as a percentage portion (greater or lesser) of the baseline salinity level or salt load for that valley, measured at the nominated end-of-valley target site. In general, the 2005-06 in-stream salinities reflect low salt mobilisation due to the drought. However, where flows are greatly reduced over a lengthy period, local groundwater inflows can have a greater impact on stream salinity than during more normal higher flow conditions.

Figure 3. In-stream salinity for the period 2005–06 and end-of-valley baseline.
Strategy implementation links

Coordinating implementation of the BSMS involves Strategy partners working together, responding to the recommendations of the Independent Audit Group for Salinity and progressing priority activities under the Strategy. With the development of other Basin-wide programs that have salinity implications, there is an ongoing need for coordination and linkages between programs. Key linkages being established within current activities are listed:

The Living Murray – Basin Salinity Management Strategy links

The Living Murray (TLM) program aims to recover water for the environment and includes a Works and Measures Program to provide the systems and structure required to deliver environmental flows to improve the health of the six River Murray icon sites. TLM will have important interactions with the BSMS because changed river operations and additional watering of the floodplain has the potential to impact on salt movement to the river. Coordination between the programs is therefore essential.

Impacts of water trade

The Commission plays an important role in coordinating water entitlement transfer between states and between valleys in the Murray-Darling Basin. As new irrigation developments have the potential to cause river salinity impacts, an irrigation salinity accountability framework is being developed to provide a consistent approach to the assessment of irrigation salinity impacts across the Basin. This framework will consider the salinity impacts of changing patterns of water use across the Riverine Plains and Mallee regions.

Catchment planning and implementation

End-of-valley targets are the key in-stream indicators to assess Programs of Actions within Basin catchments which address the long-term diffuse causes of salinity. A partnership approach is required to integrate and align national funding initiatives and reporting (such as NAP) with regional catchment strategies that reflect BSMS targets and priorities across the Basin.

Buronga SIS outfall at Mourquong Basin, NSW.
Taking the Strategy into the future

While Strategy implementation to date provides a sound basis for tackling salinity over the long term, some key challenges remain. These include addressing both short-term threats and long-term causes of salinity. Priority activities aimed at addressing these matters in 2006–07 include:

- **Mid-Term Review**: An important component of the BSMS is a Mid-Term Review to assess the usefulness of the Strategy for effective salinity management across the Basin. The review, now under way, focuses on the achievements of the Strategy to date and the implications of changes in knowledge and related policies. It will also provide recommendations aimed at enabling the Strategy to meet its objectives by 2015.

- **Basin Salinity Target**: The Mid-Term Review will consider whether modelling river salinity outcomes over the 1975–2000 period is the best way of showing if the Strategy is meeting its objectives.

- **Floodplain management and post-flood salt accession**: There are short-term economic and environmental threats from salt that is accumulating in lower Murray floodplain areas. Following the next major flood, some of this salt will drain to the river, potentially causing a significant increase in salinity over a number of months. Investigations are under way to provide improved understanding of the risks to the river, with the aim being to improve floodplain health and to develop options to manage the impact of mobilised salt on the river.

- **Catchment actions**: End-of-valley salinity targets are the basis for establishing Programs of Actions to address the diffuse sources of salt from the landscape. While impressive achievements have been made in implementing catchment strategies, there is a need for the Strategy partners to work together to coordinate funding programs to reflect BSMS targets and priorities across the Basin.

- **Continued salt interception**: The Strategy incorporates a works program of salt interception and drainage disposal targeted to offset a predicted 61 EC future increase in average salinity at Morgan, South Australia. With existing and approved works already providing an estimated 40 EC reduction to salinity in the river, an investigation program is under way to identify options to achieve the remaining 21 EC by 2010.

- **Ongoing improvements to the Registers**: As the Salinity Registers are the primary mechanism of accounting for actions that have a positive or negative salinity impact on the River Murray, robust, well-documented Registers are a critical part of effective governance. A major program for the future is the establishment of a Registers database, which will be undertaken in collaboration with the partner governments. The database will contain the supporting documentation underlying each entry in the Salinity Registers.

Further information on these issues, as well as others raised in this summary brochure, can be found in the *Basin Salinity Management Strategy Annual Implementation Report 2005–06*. The *Report of the Independent Audit Group—Salinity 2005–06* provides a comprehensive overview of matters undertaken by the independent auditors within the provisions of Schedule C to the Murray-Darling Basin Agreement. These documents are available on the MDBC’s website [www.mdbc.gov.au](http://www.mdbc.gov.au).
Further Information

For further information, please contact the MDBC on (02) 6279 0100 or visit the website at www.mdbc.gov.au

This report may be cited as:
Basin Salinity Management Strategy 2005–06
Annual Implementation Report – Summary
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ISBN 1 921257 25 3
MDBC Publication No. 15/07

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