Australian Government

MURRAY–DARLING BASIN AUTHORITY

Basin Salinity Management Strategy

2010-2011 Annual Implementation Report

January 2012

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Published by Murray–Darling Basin Authority.

MDBA Publication No 21/12

ISBN 978-1-922068-29-3 (print) ISBN 978-1-922068-28-6 (online)

Prepared by the Murray–Darling Basin Authority, Canberra, pursuant to the requirement of Schedule B of the Murray–Darling Basin Agreement (Schedule 1 of the *Water Act 2007* (Commonwealth)).

Cover Image: Salt resistent plants in an evaporation pond at Buronga salt interception scheme. Photo by Arthur Mostead.

FOREWORD

I have pleasure in releasing the 2010-11 Annual Implementation Report of the Basin Salinity Management Strategy (BSMS).

In September 2001, the Murray—Darling Basin Ministerial Council released a 15-year strategy to manage salinity in the Basin. Key obligations of partner governments contained within the strategy are given effect through Schedule B of the Murray—Darling Basin Agreement. This annual report complies with the reporting requirements for the Murray—Darling Basin Authority (MDBA) under the Agreement and provides a summary of other aspects of BSMS implementation. Broader salinity management activities conducted by the BSMS partner governments are reported in the BSMS annual implementation reports of New South Wales, Victoria, Queensland, South Australia and the Australian Capital Territory.

The BSMS has contributed to the long-term reduction in river salinity over the last 11 years through investment in salt interception schemes and improved land and water management practices. These investments have been aimed at achieving the Basin salinity target to maintain the average daily salinity at Morgan, South Australia, at less than 800 EC for at least 95% of the time, simulated over a period that represents the occurrence of both wet and dry climatic sequences.

The land and water management actions, as reported at 30 June 2011, are currently meeting the Basin salinity target of less than 800 EC at Morgan for 95% of the time. This achievement reflects the successful operation of significant salt interception works and measures, and the other salinity management activities of partner governments. These BSMS framework activities provide for long-term increases in river salinity to be offset by works or measures that will lead to a compensatory reduction in salinity.

The Independent Audit Group for Salinity (IAG-Salinity) conducted the ninth audit of the strategy in November 2011. The auditors reviewed the implementation of the strategy by the MDBA and the partner governments in accordance with Schedule B and the associated Basin Salinity Management Strategy Operational Protocols. Included in this report is the executive summary of the Report for the IAG-Salinity 2010-11.

Implementation of the Basin Salinity Management Strategy would not be possible without the cooperation of the partner governments and the dedication of their policy and program officers. The commitment of partner governments to the delivery of salinity management activities in the valleys across the Basin and the cooperation extended to the Murray—Darling Basin Authority in maintaining a rigorous salinity accountability framework is greatly appreciated.

Rhondda Dickson

Chief Executive

Murray—Darling Basin Authority

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ABBREVIATIONS

AWRC	Australian Water Resource Council
BSMS	Basin Salinity Management Strategy
BSM AP	Basin Salinity Management Advisory Panel
CEWH	Commonwealth Environmental Water Holder
CSG	Coal seam gas
Cwlth	Commonwealth
DERM	Department of Environment and Resource Management
DFW	Department of Water
DSE	Department of Sustainability and Environment
EC	Electrical conductivity unit (measured as µS/cm)
EM1	Eastern Mallee version 1 model
EWSAC	Environmental Watering Scientific Advisory Committee
EWSA-TF	Environmental Watering Salinity Accountability Taskforce
IAG-Salinity	Independent Audit Group for Salinity
MDB	Murray–Darling Basin
MDBA	Murray–Darling Basin Authority
MDBC	Murray–Darling Basin Commission
MSM-BIGMOD	Daily flow and salinity model for the River Murray
MTR	Mid-term review (of Basin Salinity Management Strategy)
NAP	National Action Plan for Salinity
NRM	Natural resource management
SIS	Salt interception scheme
WQSMP	Water quality and salinity management plan

EXECUTIVE SUMMARY

Basin status during 2010-11

Over the 2010-11 year significant rainfalls across the Murray–Darling Basin brought an end to the millennium drought. This drought was a major contributor to reduced salt mobilisation across the Murray–Darling Basin and lower River Murray salinities above Lock 1 over the last decade.

Whilst the widespread rainfall and subsequent flooding during 2010-11 has led to a partial recovery in shallow water tables within some areas, it is likely to take an extended wet period before salts are mobilised across the Basin as experienced during the 1990s.

The exception is perhaps the lower Murray floodplain where flooding events would be expected to have recharged the saline groundwater system underlying the river floodplain, potentially mobilising substantial salt loads. The extent to which these mobilised salts impact upon in-river water quality is determined by the extent to which the river flow regime is able to dilute salt accessions. During 2010-11, inundation of the floodplain occurred in the latter part of 2010; however, following the flood peak and recession, sustained high flows were maintained within the Murray until June and beyond, such that any floodplain salt discharge to the river has been extensively diluted. Accordingly, the daily average salinity at Morgan in South Australia during the 2010-11 year was just 309 EC with a peak salinity of 466 EC, well below the 800 EC target.

Despite these low in-river salinities, the return to wet conditions in 2010-11 is a poignant reminder of the on-going salinity threat which will materialise when salt mobilisation is initiated and followed by low river flows. The Murray–Darling Basin Authority (MDBA) through a coordinated partnership between Commonwealth, state and territory governments is committed to managing the long-term salinity threat within the Basin. This partnership to deliver the Basin Salinity Management Strategy (BSMS) is supported by agreed obligations explicitly set out in the Murray–Darling Basin Agreement.

Coordination of the BSMS is supported by the Basin Salinity Management Advisory Panel (BSM AP) that comprises representatives from the six partner governments, Queensland, New South Wales, the Australian Capital Territory, Victoria, South Australia and the Australian Government.

The Basin Salinity Management Strategy

The BSMS and its forerunner the Salinity and Drainage Strategy (MDBC 1988) have been effective in the long-term management of land and water salinity through catchment works or measures, and through explicit accountability arrangements that require that actions that increase River Murray salinity are offset by actions which decrease salinity elsewhere in the system.

The BSMS (MDBC 2001), established in 2001 as a 15 year strategy, is now nearing maturity with the salt interception program close to completion and the accountability arrangements highly effective in ensuring that the river salinity impacts of changes to the landscape are assessed and reported.

Key achievements of the BSMS

Throughout 2010-11, the Murray–Darling Basin Authority (MDBA) has concentrated upon the key tasks of constructing salt interception schemes and reviewing and updating the salinity registers and associated modelling tools. Considerable effort has also been applied to improving knowledge and understanding of salinity processes within the lower Murray floodplain that determine salt accessions following flooding events, and the understanding of the irrigation recharge regime across the Mallee Region, which is a major driver of salt loads to the River Murray.

Improving the knowledge of salinity processes in the lower Murray floodplain associated with salt accessions following flooding events, is a recommendation arising from the 2008-2009 IAG-Salinity report (MDBA 2010) and was also a recommendation for 2009-10 as described within Table 10.

Other highlights for 2010-11 include:

- achievement of the Basin salinity target of an average daily salinity of less than 800 EC for at least 95% of the time at Morgan in South Australia
- diversion of approximately 324,162 tonnes of salt away from the River Murray through the operation of salt interception schemes.

Details of these and other MDBA achievements and reporting requirements (Schedule B of the Murray–Darling Basin Agreement) are provided in this report. In addition, companion reports for 2010-11 are available for Basin state and territory governments. These separate reports provide information on the substantial contribution to salinity management made by jurisdictions, particularly in the areas of catchment planning and on-ground works.

A summary of BSMS achievements is also provided in the Basin Salinity Management Strategy 2010-11 Summary Brochure.

Key priorities for 2011-12

During 2011-12, the MDBA will continue to coordinate implementation of the BSMS. The priorities for 2011-12 include:

1. completion of Schedule B obligations, specifically:
    - annual reporting
    - the annual independent audit by the IAG-Salinity
    - the reviews of accountable actions that are itemised on the salinity registers, and the assessment of new actions that may require inclusion on the salinity registers
    - on-going review and improvements of hydrological models that underpin in-river salinity assessments.
2. harmonisation of the BSMS with significant water management policy changes within the Basin, including:
    - developments in accountability arrangements for salinity impacts of the evolving environmental watering programs (The Living Murray, Commonwealth and state actions)
    - further development of the irrigation salinity assessment framework to include changes in irrigation footprint, intensity and infrastructure changes in the Riverine Plains

3. continued knowledge development on salt mobilisation risks from the floodplains, and the development of high-level principals to guide operational arrangements to manage the impacts of sustained in-river salinity spikes
4. review of Schedule B under clause 152 of the Murray–Darling Basin Agreement
5. finalisation of the 61 EC joint works and measures program (the salt interception schemes) established under the BSMS and review of future salinity risk across the Basin to inform future management strategies
6. update of the MDBA river model (MSM-BIGMOD) to facilitate improved modelling of salinity impacts due to environmental watering activities on the Basin Target and to inform the BSMS salinity register.

Noora drainage disposal scheme and evaporation basin near Loxton, SA. Photo by Arthur Mostead.

1. THE BASIN SALINITY MANAGEMENT STRATEGY

The Basin Salinity Management Strategy (BSMS) provides a framework for communities and governments to work together to implement salinity control activities to protect assets and natural resource values across the Murray–Darling Basin. This strategy provides clear and transparent accountability arrangements for partner governments, with mandatory elements incorporated into Schedule B of the Murray–Darling Basin Agreement (Schedule 1 to the Water Act 2007 (Cwlth)).

1.1 Objectives and elements

The objectives of the strategy are to:

- maintain water quality of 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 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.

The BSMS brings together nine elements to manage salinity and achieve these objectives. These elements are deliberately broad to cover Basin-scale coordination and accountability and provide a joint approach to large-scale works and measures for in-stream salinity management such as the salt interception schemes. They also include regional-scale priorities, such as improving catchment planning, farming systems and vegetation management.

The nine BSMS elements are:

1 Developing capacity to implement the strategy.

2 Identifying values and assets at risk.

3 Setting salinity targets.

4 Managing trade-offs with the available within-valley options.

5 Implementing salinity and catchment management plans.

6 Redesigning farming systems.

7 Targeting reforestation and vegetation management.

8 Constructing salt interception works.

9 Ensuring Basin-wide accountability: monitoring, evaluating and reporting.

1.2 Governance of BSMS

The partner governments have agreed to share responsibility for actions to meet the end-of-valley salinity targets at various valleys and the Basin salinity target at Morgan in South Australia. Specific responsibilities have been assigned to the Murray—Darling Basin Authority (MDBA) and state and territory governments within the Basin.

On behalf of state and territory governments, the MDBA is responsible for whole-of-Basin issues and outcomes associated with implementing the strategy.

In partnership with catchment management organisations, state and territory governments are responsible for implementing state and regional components of the strategy and are accountable for catchment actions, assessment and monitoring. Accountabilities are explicit in relation to actions that are expected to have a significant salinity impact upon the river.

Together they deliver:

- within-valley actions and tools to control and predict salinity and salt load trends
- on-ground investment to address salinity risks and their impacts
- assessments of the effects and trade-offs associated with salinity management options
- monitoring and assessment of salinity as part of reporting progress against targets.

The mid-term review of the BSMS was undertaken in 2007. The mid-term review report documented significant successes in BSMS implementation during the first seven years of the strategy's 15-year life (MDBC 2008). Recommendations from the review covered policy and operational issues as well as the scientific and technical understanding of salinity processes in the Basin. However, the review did not contemplate a change in governance arrangements.

The Murray—Darling Basin Agreement was incorporated into the Water Act 2007 (Cwlth) leading to the establishment of the MDBA. The MDBA is a statutory body accountable for administering the Murray—Darling Basin Agreement, included as Schedule 1 of the Water Act 2007 (Cwlth). Under this legislation, the MDBA has coordinating responsibilities for the BSMS prescribed within Schedule B of the Murray—Darling Basin Agreement including responsibilities for:

- construction and operation of joint works and measures and the coordination of other actions to reduce or limit the rate at which salinity increases in rivers, tributaries and landscapes within the Basin
- setting salinity targets
- establishing and maintaining registers to record salinity impacts and to allocate salinity credits and salinity debits to contracting governments
- monitoring, assessing, auditing and reporting on progress in implementing the strategy.

The Australian Government's role in the BSMS and Schedule B is to report on investment programs that may have an impact on salinity management in the Basin.

1.3 BSMS into the future

A key requirement of the Water Act 2007 (Cwlth) is the development of the Basin Plan, which is to include a water quality and salinity management plan (including objectives and targets), an environmental watering plan and a monitoring and evaluation program. Water resource planning (prepared at the regional level) is also to include water quality and salinity objectives and management requirements.

A draft Basin Plan had been released at the time of the preparation of this report, but the interface between the existing BSMS and the new Plan is not yet explicit. However, it is generally understood that the existing Basin Salinity Target and BSMS accountability arrangements will be carried forward. The Murray—Darling Basin Agreement requires that the MDBA must review Schedule B prior to the Basin Plan coming into effect to identify

any inconsistencies between the new Plan and the existing Strategy. Proposed changes to Schedule B considered necessary or desirable to improve consistency with the Basin Plan must be recommended to Ministerial Council.

1.4 BSMS Annual Implementation Report objectives

The BSMS Annual Implementation Report is a Basin-wide progress report for the financial year 2010-11. A draft of this report was presented to the Independent Audit Group for Salinity (IAG-Salinity) in November 2011, to enable an assessment of the MDBA's progress in coordinating salinity management across the Basin.

This report also fulfils the statutory reporting requirements of Schedule B (clause 32) including:

- a consolidated summary of results and recommendations from the Report of the IAG-Salinity
- a program setting out the timetable for rolling five-year reviews
- updated versions of the salinity register as at 30 November of each year
- details of other activities which have been taken to meet the objectives of the strategy since the last annual report
- a report on the operation and implementation of existing joint works and measures as well as progress of newly approved works
- results of each five-year review carried out by state governments within the reporting period
- a list of MDBA reports related to the management of salinity in the preceding financial year.

In meeting their own reporting obligations the Commonwealth, state and territory governments produce companion salinity reports. The partner governments have provided these reports to the MDBA as follows:

- South Australia's 2010-11 Report to the Basin Salinity Management Strategy
- Murray—Darling Basin Salinity Management Strategy: Victoria's 2010-11 Annual Report
- Murray—Darling Basin Salinity Management Strategy: NSW Annual Implementation Report 2010-2011
- Basin Salinity Management Strategy Annual Report 2010-2011: Queensland Murray—Darling Basin
- ACT Annual Salinity Report 2010-11
- Basin Salinity Management Strategy 2010-11: Independent Audit Group for Salinity (Australian Government)

2. THE NINE BSMS ELEMENTS

Basin-scale salinity management under the BSMS is guided by nine elements (Section 1.1). These elements provide a basis for assessing progress in implementing the strategy during 2010-11.

2.1 Element 1: Capacity to implement

The capacity to implement the BSMS requires Basin-wide and within-valley planning and resources to address salinity. Well supported and resourced, the BSMS has and will continue to contribute substantially to the knowledge of biophysical and socio-economic processes, Basin-scale salinity management strategies and the operation of salinity accountability arrangements.

In 2010-11, emphasis was placed upon future planning, including input to the Basin Plan, to ensure that salinity management in the Basin continues to progress. The direction and recommendations from the BSMS mid-term review (MDBC 2008) and IAG-Salinity (MDBA 2010) were incorporated into this planning and considered in the prioritisation of activities to ensure effective strategy implementation.

Key Element 1 projects progressed in 2010-11 relate largely to the development of Basin-wide knowledge and assessment frameworks, and information dissemination. These are discussed below.

2.1.1 Flood-recession salt mobilisation risks

An implication of the low Basin flow regime and absence of flooding during the decade long millennium drought was the accumulation of salt, particularly in the lower Murray. The highly saline nature of groundwater within the Mallee, and its natural propensity to discharge to the floodplain and river, places lower River Murray water quality at risk during the post flood recession period.

The BSMS mid-term review (MDBC 2008) and reports of the IAG-Salinity (MDBA 2009-10) emphasised the potential salinity threat arising from such events.

As a first step towards responding to this risk, the IAG-Salinity recommended that the MDBA develop a conceptual model of flood-recession processes for the lower Murray floodplain and prepare an operational response plan to manage salinity following flood events.

Accordingly, such a study was commissioned with the project overseen by a technical advisory panel (involving river operators and modellers) and a project advisory panel (comprising jurisdictional members and an independent reviewer).

Phase one of the project was completed in November 2010 with the preparation of a report documenting a conceptual model identifying the river reaches with higher risk of salt mobilisation. These reaches have some commonality with those contained within MSM-BIGMOD where salt loads are uncertain, but have been added to calibrate the river salinity model. The report also provides preliminary advice on potential river management options to mitigate river salinity spikes following flood recession.

In response to the imminent threat of salinity spikes after the extended flooding period during 2010 and early 2011, two additional projects were instigated to capture the surface, backwater and groundwater salinity data during and after the events. This data is yet to be evaluated, but will inform the further development of the river management operation principles to cope with the potential for high salinity events following flood periods.

2.1.2 Assessing environmental watering salinity impacts

The Living Murray program, the states, and, more recently, the Commonwealth Government water buy back scheme, have purchased or recovered through water use and/or efficiency measures a significant share of water within the Murray—Darling to maintain and improve the Basin's water-dependent ecosystems. Such a shift in water use from irrigation to environment creates temporal and spatial impacts that will lead to changes in salt movement and the dilution regime within valleys and the Basin as a whole.

In 2010-11, the MDBA completed a case-study into managing the salinity impacts of environmental watering of The Living Murray Initiative icon sites. The outcome of this work was provided to the partner governments through the BSMS Environmental Watering Salinity Accountability Taskforce (EWSA TF). Deliberations are required on how to progress these management arrangements further, including procedures for the inclusion of such impacts on the MDBA salinity register.

As the Basin's environmental watering arrangements and schedules evolved in 2010-11, the MDBA continued to work closely with the BSM AP to further develop procedures to account for the salinity impacts of environmental watering actions on the MDBA salinity register.

2.1.3 Irrigation salinity assessment framework

The BSMS salinity register (Appendix II) indicates that irrigation-related actions within the Basin are responsible for economic impacts as both credits (reducing river salinity, generally as a result of reductions in saline drainage arising from improvements in irrigation efficiency) and debits (increasing river salinity, generally as a result of saline drainage generated by irrigation development). As the estimated values associated with these impacts are significant, it is important to ensure that the assessment process is technically rigorous and applied consistently across the Basin.

Accordingly, a process to establish a consistent irrigation salinity assessment framework was initiated several years ago and a draft framework has been developed for application in the irrigation regions of the Mallee zone. However, extension of this draft framework for application in the Riverine Plains irrigation regions has been delayed due to significant shortages of appropriate data, resources and uncertainty regarding the changes that may be brought about by the proposed Basin Plan. Once the Basin Plan is finalised and the implications for irrigation are understood, further development of the framework can be progressed.

Some progress has been achieved in the assumptions on irrigation root zone drainage in the Mallee region, which is a critical factor in the quantum of recharge that displaces saline groundwater to the river. In 2009-10 the MDBA commissioned a project to develop district-scale root zone drainage estimates for irrigated areas of the Basin's Mallee zone. This project was completed in 2010-11 however, further refinement of the report is required before the dataset can be used for future salinity modelling.

2.1.4 Information coordination and dissemination

A key role for the MDBA is to coordinate Basin-scale information on progress towards BSMS implementation. This role includes the publication of BSMS annual reports and other technical reports, and to provide opportunities to further disseminate information about salinity management in the Basin to the scientific and broader community.

A number of key reports were produced during 2010-11 and distributed by the MDBA and its partner governments, including:

- Report of the Independent Audit Group for Salinity 2009-10
- BSMS 2009-10 Annual Implementation Report
- BSMS 2009-10 Annual Implementation Report Summary

2.2 Element 2: Values and assets at risk

Protecting key values and assets at risk of salinity is fundamental to how salinity is managed within the Basin. Maintaining the water quality of rivers, controlling land degradation and protecting important terrestrial ecosystems, productive farm land, cultural heritage and built infrastructure are integral components of the four BSMS objectives. At the local catchment scale, Basin partner governments work with communities to identify values and assets that require protection from the impacts of salinity.

This element is largely a responsibility of the BSMS partner governments and further information can be found in each state's 2010-11 salinity annual report.

2.3 Element 3: Setting salinity targets

Under the BSMS and Schedule B to the Murray—Darling Basin Agreement, water salinity targets have been established for the Basin (at Morgan in South Australia) and for major tributary valleys (End-of-Valley targets).

The Basin salinity target is to maintain the average daily salinity at Morgan in South Australia at a simulated level of less than 800 EC for at least 95 % of the time, modelled over the benchmark period (1975-2000) under the current land and water management regime. This benchmark period provides a mechanism for consistently assessing water salinity outcomes over a climatic sequence that includes both wet and dry periods.

The concept of end-of-valley targets for major tributary valleys arose from the 1999 salinity audit and as part of the overall approach to a Basin-wide salinity strategy. This concept was incorporated into the BSMS primarily as a means of assessing progress towards achieving the strategy's objectives and to provide the impetus for catchment actions within the valleys to contribute to achieving the Basin salinity target at Morgan. The Murray—Darling Basin Ministerial Council adopted all the state-based end-of-valley targets in 2004-05, and the Australia Capital Territory end-of-valley target in 2010-11.

2.3.1 End-of-valley targets

Progressing end-of-valley outcomes through catchment actions is a long-term initiative, with results unlikely to be apparent over the short-term. Hence, the complex modelling associated with an assessment of such progress is not warranted on an annual basis. The reported annual jurisdictional activities associated with the targets largely relate to implementation of monitoring programs at end-of-valley sites to assist in the five-yearly reviews of progress against targets. Data from these monitoring programs is summarised and presented in Section 3. In addition, details of the work achieved by the partner governments during 2010-11 can be found in their individual salinity annual reports.

However, to ensure the end-of-valley targets continue to be aligned with the objectives of the BSMS, the MDBA, under clause 9 (1) of Schedule B of the Murray—Darling Basin Agreement

"must at intervals of not more than 5 years, review the adequacy and appropriateness of each end-of-valley Target" (Commonwealth of Australia 2009).

As reported in the 2009-10 Annual Implementation Report (MDBA 2011b), the MDBA commissioned the salinity targets review project to meet the clause 9 obligations. The final report of this project was published on the MDBA website in 2010-11 and documented up-to-date information about the existing salinity targets. This report and other companion reports published by the MDBA also assisted in developing salinity objectives and targets for the proposed Basin Plan.

2.3.2 River salinity outcomes

Whilst progress against salinity targets is based upon modelled assessment of river salinity outcomes over the benchmark period, a series of salinity management actions undertaken over several years under the BSMS and its predecessor, Salinity and Drainage Strategy (MDBC 1999), have a notable impact on the in-river salinity outcome that occurs in a given year. In addition, the Basin community has an interest in understanding the in-river salinity outcome on an annual basis as the duration and extent of peak salinity levels can affect aquatic ecosystems and use of river water for drinking and irrigation purposes. This section provides an overview of the in-river salinity outcome for the year compared to long-term river salinities.

Table 1 summarises salinity levels recorded at Morgan over four time intervals (1, 5, 10 and 25 years) to June 2011 and enables a comparative assessment of average, median, 95 percentile and peak salinity outcomes for 2010-11 with each of the other time intervals.

Collectively the results presented in Table 1, indicate that the average, median, 95 percentile salinity for 2010-11 was significantly lower than the respective salinities for the 5, 10 and 25-year intervals. Other points of interest are that the 95 percentile salinity has not exceeded 800 EC at Morgan over any of the assessment periods, and the peak river salinity at Morgan has not exceeded 800 EC in the last decade.

Whilst the low salinity outcome over the 10 year period is an expected result given the drought conditions that existed between 2001 and 2010 (low salt mobilisation), the rainfall and flooding regime was high in 2010-11. The salinity outcomes at Morgan (a peak of just 466 EC) were not commensurate with greater salt mobilisation during 2010-11. Rather, it is a consequence of sustained high flows in excess of 500,000 ML/month from around September 2010 until the end of the reporting period (June 2011). In other words, the low river salinity outcome arises because the river has not been subjected to low flows following the extreme flooding event. The fact that a post-flood salt spike has not been realised demonstrates the need to incorporate into planning regimes the full suite of contributing factors that extend beyond the extent and location of floodplain inundation, to the dilution attributes of post-flood regulated and unregulated flow conditions.

Table 1: Summary of salinity levels (EC) recorded at Morgan, South Australia

Period	Time interval	Average	Median (EC)	95th percentile (EC)	Peak	% time > 800 EC
1 year	July 2010 - June 2011	309	331	419	466	0%
5 years	July 2006 - June 2011	432	426	696	785	0%
10 years	July 2001 - June 2011	444	430	693	785	0%
25 years	July 1986 - June 2011	511	484	797	1160	5%

2.3.3 Impacts of salinity management actions

In addition to climatic factors, low salinity levels over the last decade, as illustrated by Table 1, also reflect the cumulative benefits of salinity mitigation works and measures such as salt interception schemes and, improvements of irrigation practices and delivery systems. Some of these activities, particularly salt interception schemes, have been shown to be highly effective during extended periods of low flows.

Figure 1 presents mean daily salinity levels recorded at Morgan and simulated (modelled) salinity levels representing a 'no further intervention' scenario for the same period. The 'no further intervention' scenario simulates river salinity levels that would have occurred if post-1975 salt interception works, improved land and water management actions and dilution flows were not undertaken. The word 'further' is used because a number of salt interception schemes were operating before 1975 and their effects are not included in the simulation.

The difference between observed and the simulated 'no further intervention' salinity levels are assumed to be the result of management interventions. During 2010-11 this difference is estimated to vary between 672 and 0 EC. Figure 1 also shows that the impact of the management interventions was greater during the earlier part of 2010-11 when flows were lowest (before the floods arrived) rather than when flows were high during the spring period and beyond.

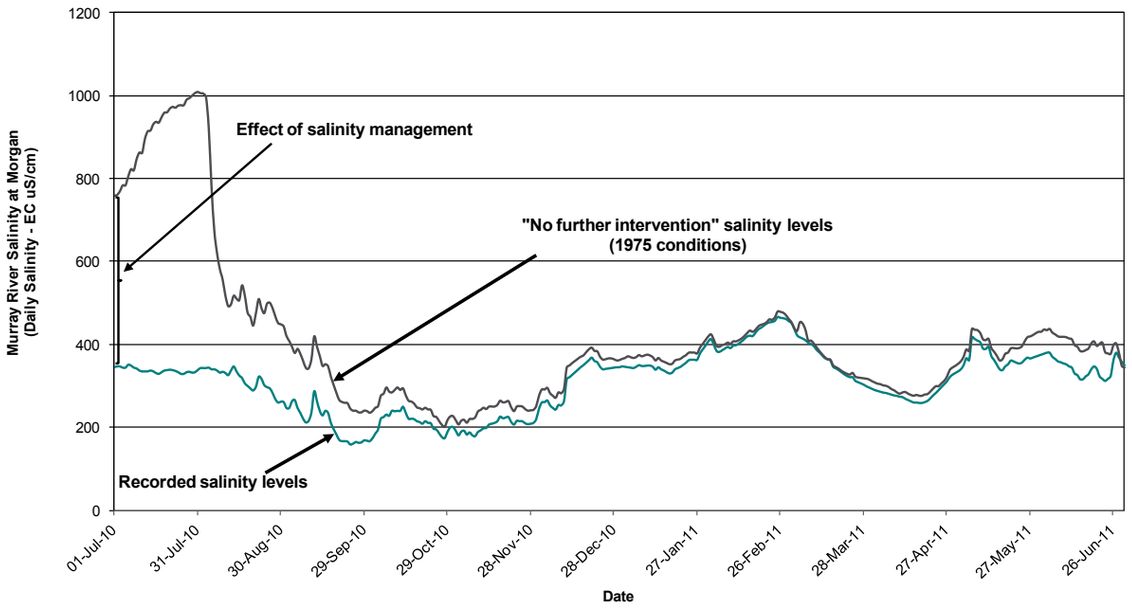


Figure 1: Comparison of mean daily salinity levels at Morgan from July 2010 to June 2011 to modelled 1975 'no further intervention' salinity levels. Actual daily salinity levels are compared to modelled salinity levels without salt interception schemes, improved land and water management actions and additional dilution flows ('no further intervention' scenario). The difference is assumed to be the effect of salinity management.

Figure 2 shows the long-term difference, over 25 years (July 1986 to June 2011), between recorded or observed mean daily salinity and simulated salinity under the 'no further intervention' scenario. The progressive increase in the difference between the observed and simulated salinity indicates a long-term reduction in salinity (both average trend and peak levels) linked to a number of management interventions (salt interception schemes, improved land and water management actions and dilution flows).

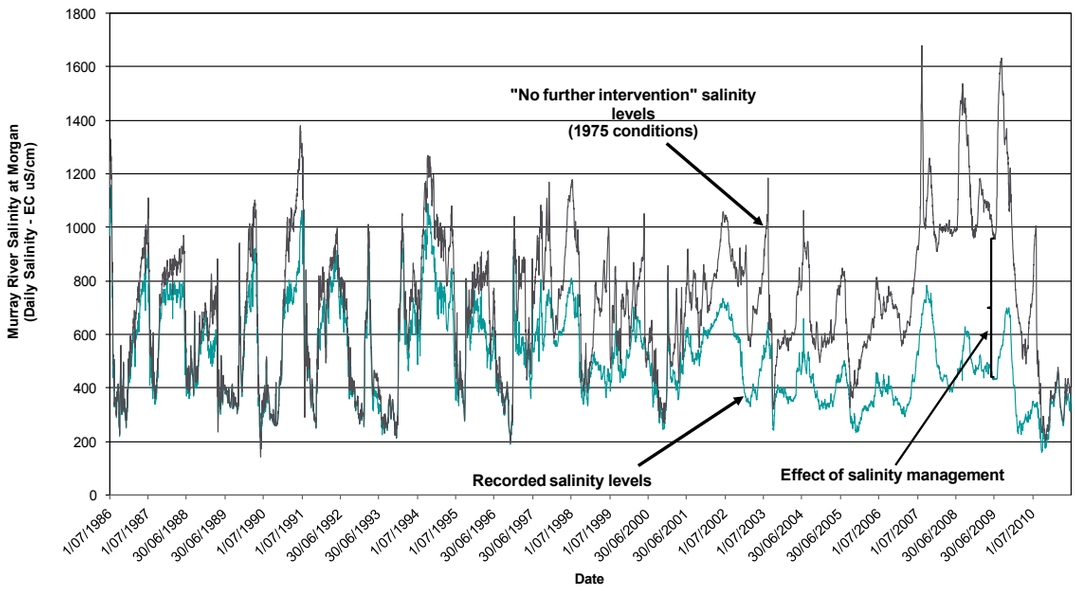


Figure 2: Effect of salinity management in the Murray—Darling Basin at Morgan, South Australia. Comparison of recorded mean daily salinity levels and modelled salinity levels without salt interception schemes, land and water management actions and additional dilution flows over a 25-year period (July 1986 to June 2011).

River salinity levels increased progressively downstream (as shown in Figure 3), due to both natural groundwater discharge to the river and accelerated salt mobilisation due to human development activities. The cumulative effects of these combined factors result in the higher salinity in the lower River Murray. Figure 3 demonstrates this progressive increase in salinity downstream with four datasets at specific points along the River Murray. The baseline median line is made up of simulated median values using the baseline conditions for the year 2000. These are baseline salinity levels at Morgan that were set at the beginning of the BSMS against which future progress could be assessed. For South Australia, New South Wales and Victoria, baseline conditions are set at 1 January 1988, while for Queensland and the Australian Capital Territory, baseline conditions are set at 1 January 2000. Also provided in Figure 3 is median recorded salinity for the last three years.

The data illustrates that the median salinity for 2010-11 is lower than the 2000 simulated levels at Morgan, South Australia where the Schedule B Basin salinity target is set. However, salinity below Morgan, and in particular below Murray Bridge, can vary significantly depending on the prevailing salt concentration within the lower lakes and flow conditions upstream of Lock 1. The median salinity in Lake Alexandrina recovered back to 1017 EC in 2010-11 from the extremes of the previous two years (5446 EC in 2009-10 and 4406 in 2008-09) due mainly to substantially higher river flows that refilled the lower lakes and flushed salt from the system to the Murray Mouth.

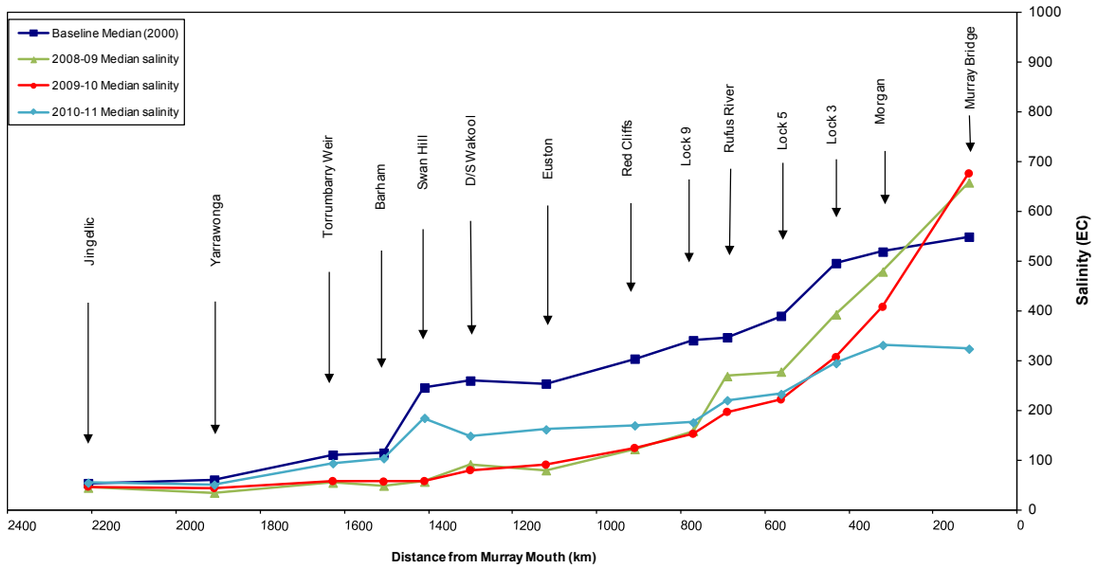


Figure 3: River Murray salinity profile: comparison of median salinity levels of 2010-11 with that of recent past years and the baseline median salinity level for the benchmark period (1975-2000).

2.3.4 Performance against the Basin Salinity target

As indicated previously, progress against the BSMS objectives is in part measured by assessing the impact of current land and water management actions upon the salinity outcome at Morgan with the intention to maintain salinity below 800 EC for 95% of the time, modelled over the benchmark period (1975 to 2000). Improvements in the management of salinity over the life of the strategy to date, can be assessed by modelling outcomes over the benchmark period for levels of development and salinity mitigation at the baseline date in 2000 (prior to the commencement of the strategy), and comparing them with outcomes based on 2010-11 levels of development and salinity mitigation.

As the climatic regime is the same for both simulations, the difference in EC outcome between the two levels of development reflects the effects of management actions between the years 2000 and 2010-11 on salinity at Morgan (Table 2).

Table 2 indicates that based upon 2010-11 levels of land and water use (including salinity mitigation), in-river salinity at Morgan is less than 800 EC for 96% of the time. A comparison of this result with baseline conditions demonstrates that when taking into account variable climatic conditions, the exceedance of 800 EC at Morgan has decreased substantially compared with the year 2000 land and water management conditions. These model outcomes, as well as observed salinity levels recorded at Morgan (Figure 2), reflect the significant long-term benefits that salinity mitigation activities bring to the Basin.

Table 2: Simulated salinity levels (EC) summary statistics at Morgan, South Australia for Baseline and 2011 conditions over the 1975 to 2000 climatic period

	Time interval	Average	Median (EC)	95th percentile (EC)	% TIME 800 EC	% time < 800 EC
25 years	Modelled Baseline* conditions (1975-2000 climatic period)	665	666	1058	28	72
25 years	Modelled 2011 conditions (1975-2000 climatic period)	505	483	786	4	96

*** Baseline conditions are set at year 2000. However, salinity impacts arising from development activities between 1988 and 2000 in New South Wales, Victoria and South Australia are accountable under the BSMS and have been excluded from the Baseline.**

2.3.5 Modelling challenges

The BSMS uses the climatic dataset from 1975 to 2000 (Benchmark Period) to evaluate long-term salinity effects on the River Murray based on the current land and water management regime. However, significant changes in the water management regime in the Basin are proposed through the recovery of more water for environmental purposes. To assess the salinity impacts of evolving environmental watering actions within the Basin, updates to the River Murray model (MSM-BIGMOD) will be required, as will the development of local salt mobilisation models. While some progress has been made on modelling the impacts of environmental watering actions under The Living Murray Program, significant effort is required to model the impacts of other proposed environmental watering actions.

The use of the benchmark period to evaluate long-term salinity effects and end-of-Basin predictions may also not adequately reflect the climate variability experienced in the last decade, especially in the context of the millennium drought and future changes in climate. To address the risks of climate change on the Basin salinity dynamics and mobilisation, MDBA undertook a study in 2010 that was completed in 2011. Key recommendations of the work included the need for a targeted study to evaluate the value in updating the benchmark period.

Progress in other aspects of the BSMS salinity modelling program is reported within Section 2.6.3.

2.4 Elements 4 to 7

Primarily elements 4 to 7 are state and territory governments' responsibilities where progress against end-of-valley targets and catchment salinity management actions are reported. The following paragraphs provide a guide to the key directions intended to be achieved through these elements; however, the reader is referred to each state or territory governments' report for 2010-11 for information on progress to date.

Element 4: Managing trade-offs with available within-valley option

State and territory governments' are expected to analyse and review the best mix of land management, engineering, river flow, and 'living with salt' options to achieve salinity targets while meeting other catchment health objectives and social and economic needs. These activities include providing assistance to communities to understand salinity management options, and reaching agreement on options with affected groups, industries and people through best-practice planning processes.

Element 5: Implementation of salinity management plans

This element encompasses the recognition that communities have made significant contributions to improved land and water management through the development of plans for regions and catchments. Nevertheless, plans and actions that have significant effects on land or water management require assessment and reporting against the end-of-valley and Basin targets and must be recorded on the salinity register. Continuing support by Commonwealth, state and territory governments' for land and water management plans in irrigation regions, and the development and implementation of salinity and catchment management plans in dryland regions, is required for successful implementation of the BSMS.

Element 6: Redesigning farming systems

This element considers the improvements needed in farming and forestry to control groundwater recharge in dryland cropping and pastoral systems. It also acknowledges the need for research and development to improve farming systems and reduce salinity risk without jeopardising the viability of farming enterprises.

It is also worth noting that the BSMS mid-term review (MDBC 2008) stated that "a major emphasis should be on irrigated land since it is these areas that are likely to have the greatest impacts on salinity targets. Opportunities for proactive intervention to influence salinity outcomes from new developments and retirement of irrigation should also be contemplated for implementation under this element." Investments on irrigation practices and improved irrigation delivery infrastructure have delivered significant salinity benefits where there is a large irrigation footprint.

Element 7: Targeting reforestation and vegetation management

This element refers to partner governments' recognition that landscape changes specifically targeted at salinity control may be required in addition to changes to farming systems. Such landscape changes may include native vegetation management, rehabilitation and land stewardship. Commercial planting of short-rotation tree crops may also be considered under this element.

2.5 Element 8: Salt interception works

The Joint Works and Measures program provided for under Schedule B has focused on the commitment to construct salt interception schemes to maintain water quality in the River Murray for agriculture, environmental, urban, industrial and recreational uses. The BSMS's intention to achieve a 61 EC reduction in average salinity at Morgan by 2007 comprised 31 EC to offset the impact of past actions (pre-1988) and 30 EC shared equally between New South Wales, Victoria and South Australia to offset state accountable actions (post-1988).

New South Wales, Victoria and South Australia, together with the Commonwealth Government, have funded the construction of nine salt interception schemes. In addition, the following work is underway:

- construction of a further four salt interception schemes
- investigation of two new interception opportunities that could be constructed in the future.

The total expenditure under the investigations and construction program for the 2010-11 year was just over $8,500,000.

The complexity of planning, investigations and construction prevented achievement of the 61 EC program by 2007 as was envisaged in the strategy. However, with funding committed by the Commonwealth Government in 2005-06, completion of the program is expected to be achieved by 2011-12. The following sections provide a summary of these investigations and works that are currently underway.

2.5.1 Joint Works investigations

Woolpunda Extension

The focus for 2010-11 was to finalise a business case to extend the existing Woolpunda Scheme in South Australia's Riverland. This project completes the agreed salt interception investigations program.

2.5.2 Design and construction of new schemes

Upper Darling (near Bourke)

Construction of the upper Darling salt interception scheme (near Bourke, New South Wales) is now complete. However, as a result of flooding in the Darling River, the formal commissioning of this scheme will now occur in 2011-12.

Loxton

At the Loxton salt interception scheme in the South Australian Riverland, all construction works have been completed with the scheme declared effective in April 2011.

Pyramid Creek

Following the completion of a program of pump optimisation, the final stage of the Pyramid Creek salt interception scheme in Northern Victoria was declared effective in October 2010.

Pike River

The detailed design of the Pike River salt interception scheme was progressed and a phased approach to construction proposed and supported by the MDBA. This phased approach was put forward by South Australia in October 2010 together with a proposal to construct a limited package of works utilising funding made available through the National Action Plan for Salinity and Water Quality (NAP) program. The first phase of works commenced early in 2011 as state works, which are anticipated to be completed by the end of 2011.

Murtho

Progress in construction of the Murtho salt interception scheme during 2010-11 was slowed substantially due to the extensive flooding in the lower Murray. Flooding delayed completion of the aquifer testing and analysis of the constructed borefield. However, the mechanical and electrical contract for the design and fabrication of bore headworks, switchboards and

the Disher Creek pump station has been let and fabrication of components is underway. It is expected that construction of the scheme will be nearing completion by the end of 2011-12.

2.5.3 Scheme operation and maintenance

Operation of the various salt interception schemes has continued to be highly successful in terms of in-river outcomes as illustrated in Figures 1 and 2. As detailed in Table 3, the currently commissioned salt interception schemes diverted approximately 324,162 tonnes of salt away from the River Murray in 2010-11.

In 2010-11, operation and maintenance of the existing MDBA salt interception scheme assets continued to focus on minimising running costs, in particular the energy costs associated with pumping. Due to careful monitoring, it has been possible to maintain target groundwater levels while scheduling pumping times to coincide with periods of lower power tariffs. As a consequence, significant cost reductions have been achieved.

A number of production bores located on the floodplain of the River Murray were shut down during the year as a result of floodwater inundation. Although most were restarted once the floodwaters receded, considerable works are required at Pyramid Creek to repair a number of bores and their associated switchboards. It is not expected that this scheme will be fully operational again until mid 2011-2012.

Table 3: Joint salt interception scheme performance report 2010-11

Salt interception scheme	Volume pumped (ML)	Salt load diverted (tonnes)	Average salinity (EC units)	Performance achieved (percentage of time)	Total power consumption (kWh)
Pyramid Creek	488	6,590	38,980	100	189,600
Barr Creek	2,287	6,884	3,293	100	41,974
Mildura-Merbein	1,276	18,183	43,963	63	66,538
Mallee Cliffs	1,650	47,150	52,571	74	511,729
Buronga	2,390	60,540	43,830	90	444,314
Bookpurnong	595	14,513	38,265	95	252,188
Loxton	1,266	15,325	23,347	98	342,210
Woolpunda	3,825	74,916	31,800	98	3,524,931
Waikerie	3,179	69,928	35,300	95	1,381,652
Rufus River (RR)					
Line 1	71	581	14,149	100	5,412
Line 2	50	1,886	56,220	100	8,583
Line 3	50	2,441	70,444	100	13,252
Line 4	33	1,036	48,319	100	13,187
Minor Pump Station	0	0			0
Major Pump Station	198	4,189	34,085	100	950
Total Rufus River diversions	402	10,133		100	41,384
Total water and salt diverted	**17,358**	**324,162**	**-**	**-**	**-**

2.6 Element 9: Basin-wide accountability: monitoring, evaluating and reporting

Element 9 covers Basin-wide accountability, focusing on the MDBA's responsibility to maintain the salinity register which record the salinity effect and salinity costs of accountable actions and delayed or 'legacy-of-history' salinity impacts. This element also ensures that salinity is monitored appropriately, progress on salinity targets at a Basin-wide scale is reported, and an independent audit of the registers and contracting governments' progress on meeting salinity targets and implementing BSMS is undertaken.

The MDBA is supported in this role by significant work by state and territory governments carrying out rolling five year reviews of salinity register entries, and annual reporting, which together enable the MDBA to effectively update the salinity registers and provide the background information for the independent auditors.

2.6.1 Independent audit of the BSMS

Schedule B requires that an IAG-Salinity be appointed by the MDBA to carry out an annual audit. Auditing is an integral part of the BSMS, ensuring a fair and accurate annual assessment of the contracting governments' and MDBA's performance against provisions of Schedule B of the Murray—Darling Basin Agreement.

The IAG-Salinity undertook the ninth BSMS audit in 2010-11 and provided the report to the MDBA (MDBA 2011a). The report included an assessment of the state and territory governments and the MDBA's implementation of the strategy and provided recommendations to support continuous improvement. The executive summary of the 2010-11 IAG-Salinity report (MDBA 2012), including the auditors' recommendations are at Appendix I. Progress on activities in response to these audit recommendations will be reported to Ministerial Council during the 2011-12 year.

2.6.2 The BSMS salinity registers

The salinity register is a critical aspect of the BSMS and a working example of an effective environmental accountability framework. The registers provide a primary record of jurisdictional accountability for actions that affect river salinity.

The salinity register is an accounting tool providing a record of the debit and credit balance of accountable actions that significantly affects salinity at Morgan (i.e. that would result in a change of average daily salinity by at least 0.1 EC within 100 years). This accounting system provides a transparent basis for making decisions on Basin-wide trade-offs on salinity management actions and investments in joint works and measures.

Actions that reduce river salinity are recorded as credits, while actions likely to increase river salinity are recorded as debits. Actions such as new irrigation developments can generate a debit on the salinity register because in some areas they may result in increased salt loads to the River Murray. Actions such as constructing salt interception schemes and improving irrigation practices can generate a credit on the salinity register.

State and territory governments report annually to the MDBA, providing new or updated information on accountable actions. This information is collated and the registers are re-calculated each year. The updated registers are then reviewed by the IAG-Salinity. Updating of the credits and debits to the River Murray enables the changes in salinity river impacts to be tracked over a consistent climatic period. It also provides estimates of the economic costs and benefits arising from these salinity effects.

There are two salinity registers, Register A and Register B.

- Register A records the impacts of each accountable action that occurred after the baseline date (1988 for New South Wales, Victoria and South Australia, 2000 for Queensland) and includes jointly funded works and measures.
- Register B accounts for 'legacy of history' or delayed salinity impacts, which have an effect on salinity levels after 2000 but which are the result of actions taken before 1988 (2000 for Queensland).

Joint works and measures refer to salt interception schemes constructed as part of the 1988 Salinity and Drainage Strategy (MDBC 1988) and those constructed more recently under the current BSMS. State shared works and measures refer to actions carried out by the states, such as adopting targeted river operating rules that provide downstream salinity benefits. These benefits are shown as 'shared measures' in the salinity registers. Individual state actions are land and water management actions which affect river salinity levels at Morgan, South Australia.

The updated salinity register including new and updated entries to November 2011 is provided in Appendix II and summarised in Table 4.

New entries or updates on Register A

The MDBA, during 2010-11, approved the following changes to the Register A entries:

- update of the Loxton SIS entry to include the highland component of the scheme
- removal of three entries in the 2010 Register; Irrigation development behind Bookpurnong SIS, Irrigation development behind Loxton SIS and Irrigation development behind Waikerie Lock 2 SIS. These salinity impacts are now incorporated into the following three entries in the 2011 Register:
  a. Irrigation development with water trade with SA 1988 to 2002-03
  b. Irrigation development with water trade with SA 2003-04 to 2008-09
  c. South Australia Irrigation Development Site Use Approved 2009-10 to 2010-11.
- update of the following register entries based on updated groundwater models:
  d. South Australia Improved Irrigation Efficiency Reg A
  e. South Australia Irrigation Scheme Rehabilitation Reg A.
- amend the Shepparton Salinity Management plan entry to reflect discontinuation of winter disposal from private groundwater pumps to the regional surface drainage system
- amend Woorinen Irrigation District Excision and Campaspe West Salinity Management Plan to reflect the findings of the respective five-year reviews.

New entries or updates on Register B

The MDBA, during 2010-11, approved the following changes to the Register B entries:

- update of the following register entries based on updated groundwater models:
  a. South Australia Mallee Legacy of History – Dryland
  b. South Australia Mallee Legacy of History – Irrigation
  c. South Australia Improved Irrigation Efficiency Reg B
  d. South Australia Irrigation Scheme Rehabilitation Reg B.

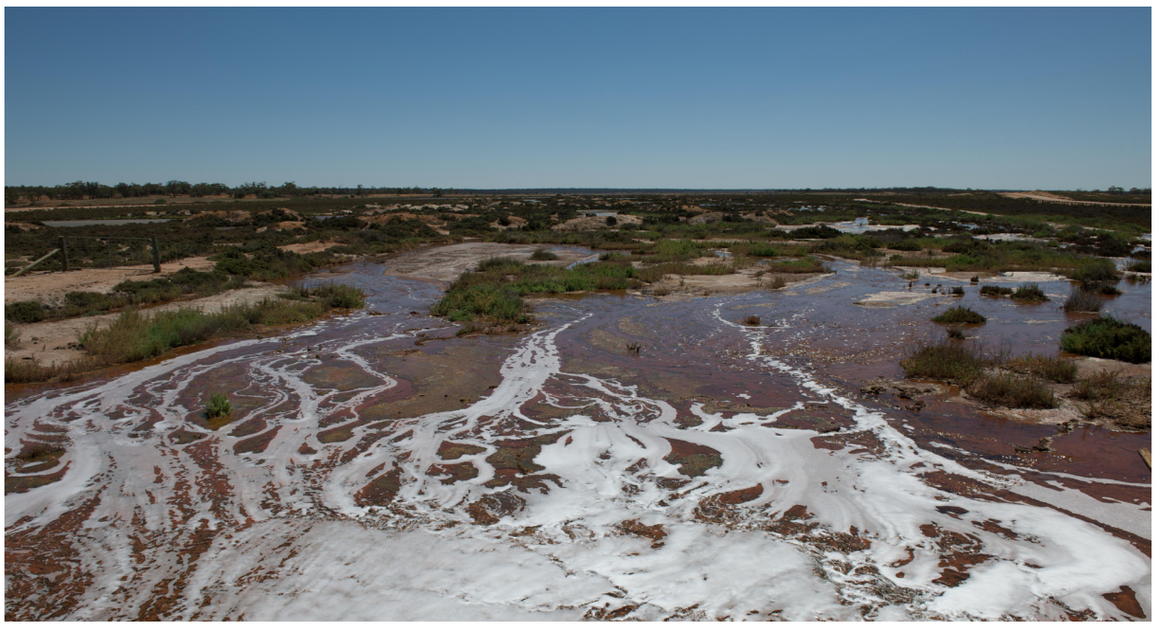
Table 4: Summary of the 2011 salinity register

Actions	NSW ($m/yr)	VIC ($m/yr)	SA ($m/yr)	QLD ($m/yr)	ACT ($m/yr)	Commonwealth contibution (EC)
Joint works & measures	2.712	2.712	0.840	0.000	0.000	33.1
State shared works & measures	0.191	0.191	0.000	0.000	0.000	0.0
State actions	2.656	2.151	2.632	tbd	tbd	1.0
Total Register A	5.559	5.054	3.472	tbd	tbd	34.1
Transfers to Register B*	0.634	0.506	1.467	0.000	0.000	0.0
Total Register B*	0.411	-0.064	1.217	0.000	0.000	0.0
Balance - Registers A & B	**5.970**	**4.990**	**4.689**	**0.000**	**0.000**	**34.1**

***Total includes transfers from Register A**
Green numbers indicate a credit entry. **Negative red number indicate a debit entry**
tbd = to be determined

Rolling reviews

Schedule B requires that each accountable action incorporated into the salinity registers undergo a rolling five-year review to provide for progressive improvement in the estimate of the salinity and cost impact of actions in both the short and long term. Independent technical peer review of each rolling five-year review is also undertaken to provide rigour to any changes recommended to the salinity register through the rolling review process. Tables 5 and 6 summarise the status of rolling five-year reviews and is followed by an overview of specific progress on rolling reviews for both Register A and Register B.



Salt interception scheme near Buronga, NSW. Photo by Arthur Mostead.

Table 5: Status of rolling five-year reviews for all Salinity Register A entries as at 14 October 2011

Authority register accountable actions	Last review	Review deadline	Status of review
JOINT WORKS and MEASURES			
Former Salinity and Drainage Works			
Woolpunda SIS	2007	2012	Scheduled to be completed in 2012-13
Improved Buronga and Mildura-Merbein interception scheme	2005	2010	Buronga re-built - five yr review expected to be completed in 2011-12; Mildura-Merbein being rebuilt - five yr review expected following investigations.
New operating rules for Barr Creek pumps	2005	2010	Scheduled to be completed in 2011-12
Waikerie interception scheme	2007	2012	Scheduled to be completed in 2012-13
Waikerie SIS Phase 2A	2007	2012	Scheduled to be completed in 2012-13
Changed MDBC River Operations 1988 to 2000	2005	2010	Operational arrangements have not changed since 2005
Mallee Cliffs SIS	2005	2010	Scheduled to be completed in 2011-12
Changed operation of Menindee and Lower Darling	2005	2010	Operational arrangements have not changed since 2005
Changed MDBC River Operations 2000 to 2002	2006	2011	Operational arrangements have not changed since 2006
Basin Salinity Management Strategy			
Changed MDBC River Operations after 2002	2005	2010	Operational arrangements have not changed since 2005
Pyramid Creek Stage 1 (Joint scheme)	2010	2015	Scheduled to be completed in 2014-15
Bookpurnong Joint salt interception scheme	2006	2011	Review report submitted to the Authority in 2011, requires peer review
Improved Buronga scheme	2006	2011	Scheduled to be completed in 2011-12
Loxton SIS	2008	2011	Review report submitted to the Authority in 2011, requires peer review
Waikerie Lock 2 SIS	2010	2015	Scheduled to be completed in 2012-13
STATE WORKS and MEASURES			
Shared New South Wales and Victoria			
Permanent Trade Accounting Adjustment - NSW to Victoria	2006	2011	No Permanent Trade since 2006
Barmah-Millewa Forest Operating Rules	2006	2011	Operational arrangements have not changed
New South Wales			
Boggabilla Weir	2007	2012	Review not currently required
Pindari Dam Enlargement	2007	2012	Review not currently required
Tandou pumps from Lower Darling	2005	2010	Scheduling of review not advised
NSW MIL LWMPs	2010	2015	Review not currently required

Authority register accountable actions	Last review	Review deadline	Status of review
NSW Changes to Edward-Wakool and Escapes	2005	2010	Scheduling of review not advised
Permanent Trade Accounting Adjustment - NSW to SA	2005	2010	No Permanent Trade since 2006
NSW Sunraysia Irrigation Development 1997-2006	2007	2012	Formal submission of final documentation to be updated
NSW SandDS Commitment Adjustment	n/a	n/a	One-off adjustment - five year review not required
Reduced Irrigation Salinity Impacts - NSW	2010	2015	Review not currently required
Victoria			
Barr Creek Catchment Strategy	2006	2011	Review initiated, will be submitted in 2011
Tragowel Plains Drains at 2002 level	2006	2011	Review initiated, will be submitted in 2011
Shepparton Salinity Management Plan	2008	2013	Review not currently required
Nangiloc-Colignan Salinity Management Plan	2008	2013	Review not currently required
Nyah to SA Border Salinity Management Plan - Irrigation Development	2008	2013	Review not currently required
Kerang Lakes/Swan Hill Salinity Management Plan	2003	2008	This register entry, known as the Lake Charm outfall channel, 5 year review was submitted to the MDBA in 2010. It is anticipated that this entry will be superseded by a new Mid-Murray Storages Register A entry.
Campaspe West Salinity Management Plan	2010	2015	Review not currently required
Psyche Bend	2000	2005	Report submitted to the Authority, requires peer review.
Permanent Trade Accounting Adjustment - Victoria to SA	2005	2010	No Permanent Trade since 2005
Woorinen Irrigation District Excision	2010	2015	Review not currently required
Sunraysia Drains drying up	2003	2008	Report submitted to the Authority, requires peer review.
Lamberts Swamp	2004	2009	Report submitted to the Authority, requires peer review.
Churchs Cut decommissioning	2010	2015	Review not currently required
Mallee Drainage bore decommissioning	2008	2013	Review not currently required
Reduced Irrigation Salinity Impacts - Vic	2010	2015	Review not currently required
Victorian SandDS Commitment Adjustment	n/a	n/a	One-off adjustment - five year review not required.
South Australia*			
SA Irrigation Development 1988 to 2002-03 (MODFLOW)	2011	2016	Review not currently required

Authority register accountable actions	Last review	Review deadline	Status of review
SA Irrigation Development Trade 2003-04 to 2008-09 (SIMRAT)	2003	2008	Assessment methodology to be replaced with MODFLOW models when updated for five year review
SA Irrigation Development Site Use Approval 2009-10 to 2010-11 (SIMRAT)	2011		Assessment methodology to be replaced with MODFLOW models when updated for five year review.
SA Component of Bookpurnong scheme	2006	2011	Review report submitted to the Authority in 2011, requires peer review.
SA Component of Loxton SIS	2008	2011	Review report submitted to the Authority in 2011, requires peer review.
SA irrigation scheme rehabilitation	2005	2010	Loxton/Bookpurnong component of this entry to be updated once five year review is accepted. The update is schedule for 2012.
Waikerie Lock 2 SA Component	2010	2015	Review not currently required
Qualco Sunlands GWCS	2007	2012	Review not currently required
SA Improved Irrigation Efficiency Reg A	2005	2010	Loxton/Bookpurnong component of this entry to be updated once five year review is accepted. The update is scheduled for 2012.

***All South Australian Register A entries, except SIMRAT based irrigation development entries, are comprised of multiple MODFLOW model outputs accredited at various times. As such these entries are not updated in their entirety in one year but the component models are updated in line with their five year review dates.**

Table 6: Status of rolling five-year reviews for all Salinity Register B entries as at 14 October 2011

Authority Register Accountable Actions	Last review	Review deadline	Status of review
New South Wales			
Darling Catchment Legacy of History - Macquarie			
Darling Catchment Legacy of History - Macintyre	1999	2004	Final Report to be submitted to the Authority
Darling Catchment Legacy of History - Gil Gil Creek	1999	2004	Final Report to be submitted to the Authority
Darling Catchment Legacy of History - Gwydir	1999	2004	Final Report to be submitted to the Authority
Darling Catchment Legacy of History - Namoi	1999	2004	Final Report to be submitted to the Authority

Authority Register Accountable Actions	Last review	Review deadline	Status of review
Darling Catchment Legacy of History - Castlereagh	1999	2004	Final Report to be submitted to the Authority
Darling Catchment Legacy of History - Bogan	1999	2004	Final Report to be submitted to the Authority
Lachlan Legacy of History	1999	2004	Final Report to be submitted to the Authority
Murrumbidgee Catchment Legacy of History	1999	2004	Final Report to be submitted to the Authority
NSW Mallee Legacy of History - Dryland	2010	2015	Review not currently required
NSW Mallee Legacy of History - Irrigation	2010	2015	Review not currently required
Victoria			
Campaspe Catchment Legacy of History	2003	2008	Review in progress. Estimated timing for submission to Authority is 2012.
Goulburn Catchment Legacy of History	2003	2008	Review in progress. Estimated timing for submission to Authority is 2012.
Loddon Catchment Legacy of History	2003	2008	Review in progress. Estimated timing for submission to Authority is 2013.
Kiewa Catchment Legacy of History	2003	2008	Review in progress. Estimated timing for submission to Authority is 2012.
Ovens Catchment Legacy of History	2003	2008	Review in progress. Estimated timing for submission to Authority is 2012.
Victoria Mallee Legacy of History - Dryland	2010	2015	Review not currently required
Victoria Mallee Legacy of History - Irrigation	2010	2015	Review not currently required
South Australia*			
SA Mallee Legacy of History - Dryland	2011	2016	Loxton/Bookpurnong component of this entry to be updated once five year review is accepted. The update is scheduled for 2012.
SA Mallee Legacy of History - Irrigation	2011	2016	Loxton/Bookpurnong component of this entry to be updated once five year review is accepted. The update is scheduled for 2012.
SA Improved Irrigation Efficiency Reg B	2011	2016	Loxton/Bookpurnong component of this entry to be updated once five year review is accepted. The update is scheduled for 2012.
SA Irrigation scheme Rehabilitation Reg B	2011	2016	Loxton/Bookpurnong component of this entry to be updated once five year review is accepted. The update is scheduled for 2012.
Queensland			
Queensland Legacy of History - irrigation and land use change prior to 1 Jan 2000	2007	2012	Estimated timing for submission to Authority is November 2012
Queensland Irrigation Development post 1 Jan 2000	--	2011	Estimated timing for submission to Authority is November 2011.

***All South Australian Register B entries are comprised of multiple MODFLOW model outputs accredited at various times. As such these entries are not updated in their entirety in one year but the component models are updated in line with their five year review dates**

Register A

Victorian reviews

In 2011, MDBA approved Victoria's five-year reviews of the Woorinen Irrigation District Excision and Campaspe West Salinity Management Plan.

The MDBA also endorsed revised salinity impact of the Shepparton Salinity Management Plan reflecting the decision to discontinue winter disposal from groundwater pumps to the regional surface drainage system. However, this endorsement is conditional upon a full technical assessment and documentation as part of the formal five year review that is required under the schedule.

Victoria submitted rolling review reports associated with Psyche Bend, Sunraysia Drains drying up and Lamberts Swamp register entries however, these reports require peer review prior to Authority approval.

South Australian reviews

Several register entries were partially reviewed as outlined in Table 5 in seeking accreditation of the following groundwater models: Berri to Renmark, Pyap to Kingston and Morgan to Wellington.

In July 2011, South Australia also submitted an update to the Loxton-to-Bookpurnong groundwater model in accordance with five-year review requirements. However, a peer review is required before the MDBA accepts these model updates. Approval of model updates by the MDBA will result in completion of rolling review of several South Australian Register A entries as outlined in Table 5.

Register B

Victorian reviews

No rolling review reports were submitted to the Authority in 2010-11.

New South Wales reviews

No rolling review reports were submitted to the Authority in 2010-11.

South Australian reviews

Several register entries were partially reviewed as outlined in Table 6: Berri-to Renmark, Pyap to Kingston and Morgan to Wellington groundwater models. However, these entries will again be updated in 2012 when revisions of Loxton to Bookpurnong updates are approved by the MDBA.

Queensland Reviews

No rolling review reports were submitted to the Authority in 2010-11.

2.6.3 Salinity models

The MDBA's salinity registers are underpinned by a suite of models that assist in assessing progress against end-of-valley salinity targets and the Basin salinity target at Morgan and in estimating salinity impacts of accountable actions. These models require periodic review and approval of the MDBA as 'fit-for-purpose' to ensure continuous improvement in predictions of impacts of land and water management actions and progress against in-stream salinity targets.

Jurisdictional surface water and groundwater models and other analytical techniques are used to generate estimates of salinity, salt load and flow to the River Murray. Some of these models are used to determine the salinity, salt load and flow regimes at the end-of-valley sites (discussed in Section 2.6.5) and have established baseline conditions for the Basin catchments (Appendix III). The MDBA uses these datasets as input to MSM-BIGMOD (the River Murray model). MSM-BIGMOD is used in the assessment of all register entries. With the aid of cost functions, the MDBA is also able to provide estimates of the salinity cost effect of progressive increases in salinity along the river. The costs appear in the salinity registers as a $m/y figure for each entry, and are used by the jurisdictions and the MDBA to assess the benefit/cost of investment in salinity mitigation works and measures.

As the groundwater and surface water processes are of variable complexities across the Basin, a model may be required to be highly complex to accurately predict salt loads or flow regimes to the river. While models are generally independently reviewed to ensure that they are 'fit-for-purpose', the BSMS Operational Protocols (MDBC 2005) provide some guidance as to the level of complexity required for a modelling tool, with "the effort required for the assessment of proposals" being "commensurate with the likely extent of potential salinity impacts and their associated uncertainty".

Achievements in salinity modelling during the 2010-11 are summarised below.

- Consistent with independent peer review recommendations, the MDBA approved the Pyap to Kingston, Berri to Renmark and Morgan to Wellington groundwater model updates as 'fit-for-purpose' for modelling the scenarios of:
  a. South Australia irrigation development (post 1988) (Register A)
  b. South Australia Mallee legacy of history - irrigation and dryland (Register B)
  c. South Australia irrigation scheme rehabilitation (Register A and B)
  d. South Australia improved irrigation efficiency (Register A and B).

As previously stated in Section 2.6.2, South Australia has also submitted updates to the Loxton to Bookpurnong groundwater model to the Authority. This model is currently being peer reviewed.

2.6.4 Salinity register governance

The continued focus on improved accountability includes the governance arrangements for the salinity registers. Potential entries or entries undergoing review are vigorously assessed by groundwater and hydrological models using the most recent data available. The process, supported by appropriate documentation, includes notification of actions, modelling the expected impacts, and the formal decision making which oversees model accreditation and the endorsement of changes to the registers.

This process will be greatly enhanced by the use of a customised database, the development of which has been an on-going task. In 2010-11 some updates were made to the initial version.

When the database is populated with up-to-date documents, it will enable the relationships between decisions, correspondence and technical documentation associated with each register entry. This will enable the tracking of the changes to the register over time and so improve transparency and the auditing process.

2.6.5 Monitoring

Stream monitoring is a key aspect of BSMS implementation. The data collected at the end-of-valley target sites provide salt concentration, salt load and flow information for the Basin's catchments, or in some cases a series of interpretation sites along the river. Interpretation sites are used to monitor salinity levels for shared rivers or valleys that cross state boundaries.

Over time, data from both end-of-valley sites and interpretation sites will inform the review of end-of-valley targets and the Register B 'legacy of history' impacts from tributary valleys.

Monitoring involves the collection, analysis, reporting and use of information to improve BSMS implementation. Monitoring of flow and salinity is critical to assessing real-time salinity levels and current progress towards salinity targets (see Section 2.3).

Table 7 summarises the progress in monitoring at BSMS sites over the last 12 years (2000-11). The second column provides the percentage of days salinity (EC) measurements have been monitored for each site. The available daily salinity measurements over the last 12 years have significantly increased and remains between 81-85% since 2009.

The third column represents the percentage of time that salt load can be calculated for all monitoring stations. The slight reduction in the percentage of time between the second and third column reflects occasions when only EC or flow is recorded. Salt load is unable to be computed without both parameters.

Table 7: Availability of monitoring data 2000-11

Year	Aggregate % of days with EC records	Aggregate % of days with flow and EC records
2000	48%	42%
2001	51%	45%
2002	68%	64%
2003	78%	74%
2004	84%	79%
2005	85%	81%
2006	85%	82%
2007	82%	80%
2008	82%	80%
2009	81%	75%
2010	85%	83%
2011	83%	81%

Table 8 provides a list of BSMS sites for which data gaps in either flow or EC for specific end-of-valley and interpretation sites have been identified for the 2010-11 year.

Data gaps are deemed to have occurred where EC or flow is recorded less than 95% of the time over the 2010-11 year. Data gaps arise as a consequence of equipment malfunction, flood and dry conditions or poor quality data. Salinity is unable to be recorded if the equipment is damaged or inaccessible due to floods or if the water level at a site falls below the measuring probe (a condition indicative of negligible or zero flow).

Table 8: Sites with less than 95% data availability for 2010-11

Site	Measure	No. of days with records	Per cent of year
Avoca at Quambatook[&&]	salinity	0	0%
Broken at Casey's Weir[&&]	salinity	0	0%
River Murray at Murray Bridge[&]	flow	0	0%
River Murray at Redcliffs[~]	flow	0	0%
Campaspe at Campaspe Weir[&]	flow	0	0%
River Murray at Redcliffs[~]	salinity	50	14%
Wimmera at Horsham Weir	salinity	85	23%
Moonie at Fenton	salinity	186	51%
River Murray at Lock 4	flow	188	52%
Ballandool at Hebel Bollon Rd	salinity	192	53%
Loddon at Laanecoorie	salinity	193	53%
Campaspe at Campaspe Weir[&]	salinity	200	55%
Murrumbidgee at Hall's Crossing[#]	salinity	243	67%
Bokhara at Hebel	salinity	269	74%
River Murray at Lock 6	salinity	287	79%
Briarie at Woolerbilla-Hebel Rd	salinity	331	91%
Murrumbidgee at Balranald	salinity	332	91%
Namoi at Goangra	salinity	333	91%
Loddon at Laanecoorie	flow	342	94%

[#] Missing data relate to lightning strikes and flood damage
[&] Site with no flow
[&&] Site with no salinity
[~] Flow data stops in October 1994

3. VALLEY REPORTS

As performance against end-of-valley targets requires complex modelling over the benchmark period, such progress is only required to be reported in rolling five-year reviews of valleys for which an end-of-valley target has been set. However, it is deemed useful to provide an indication of actual salinity outcomes over the reporting year for each of the valley sites.

Table 9 provides a summary 'report card' and so contains flow and salinity data for each end-of-valley site (see Figure 4 for site locations). The full details of partner government valley actions are provided in the individual governments reports. Appendix IV presents real time salinity and flow data.

Appendix V provides a comparison of the salinity levels and salt loads for 2010-11 against long-term records. The length of the record may vary from site to site. Owing to extended dry conditions across much of the Basin over the last decade, there are some sites where river flows ceased for long periods of time. At these times measurements of salinity and flow are not accurate and therefore salinity and salt load records may be incomplete.

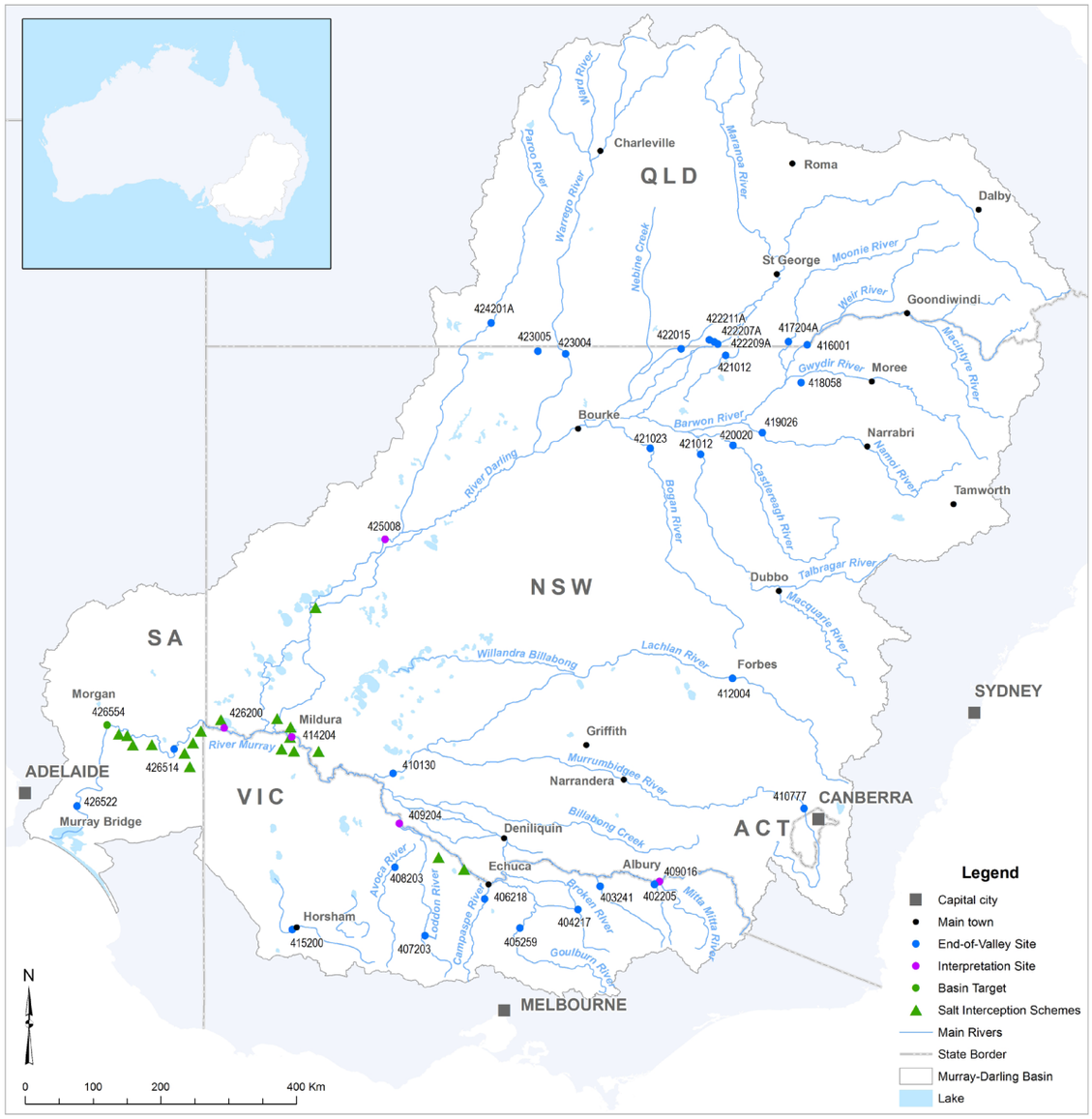
Tree plantings in saline soil near Kerang in Victoria. Photo by Arthur Mostead.

Table 9 - End of Valley Summary Report Card

Site	AWRC no.	No. of days with salinity records	No. of days with flow records	Days with flow above zero	Salinity (µS/cm)				Flow (ML/day)			
					Mean	Median	80%ile	Peak	Mean	Median	80%ile	Peak
South Australia												
River Murray at Lock 6	426510	287	365	365	205	196	256	365	41176	34080	69672	86795
River Murray at Lock 4	426514	365	188	188	213	219	258	328	19277	20250	31320	47300
River Murray at Morgan*	426554	365	360	360	310	333	602*	465	38163	32700	65820	79000
River Murray at Murray Bridge[&]	426522	361	NA	NA	323	324	367	486	NA	NA	NA	NA
New South Wales												
Murrumbidgee at Balranald	410130	332	365	365	229	225	271	330	6645	5361	271	24583
Lachlan at Forbes	412004	365	365	365	599	621	722	1005	2534	760	2760	28023
Bogan at Gongolgon	421023	365	365	365	347	321	442	839	1058	149	1128	15747
Macquarie at Carinda	421012	365	365	365	474	461	525	729	888	331	1425	10717
Castlereagh at Gungalman Bridge	420020	365	365	360	569	447	817	1527	2170	191	1679	63371
Namoi at Goangra	419026	333	365	325	394	401	457	645	3839	103	4616	60106
Mehi at Bronte	418058	365	365	211	403	305	437	1283	50	9	94	525
Barwon at Mungindi	416001	363	365	365	258	227	360	446	3821	1284	7302	27461
River Murray at Heywoods	409016	365	365	365	54	55	60	95	11093	9847	20924	42316
Darling at Wilcannia	425008	363	363	363	331	306	396	1551	15513	10900	30360	38500
River Murray at Redcliffs~	414204	50	NA	NA	174	170	212	310	NA	NA	NA	NA
Victoria												
Wimmera at Horsham Weir	415200	85	365	352	1334	1247	1449	2377	830	139	436	32242
Avoca at Quambatook[&&]	408203	NA	365	317	NA	NA	NA	NA	303	43	264	12436
Loddon at Laanecoorie	407203	193	342	342	735	602	1324	1913	1099	140	622	68170
Campaspe at Campaspe Weir[&]	406218	200	NA	NA	411	363	520	773	NA	NA	NA	NA
Goulburn at Goulburn Weir^	405259	365	365	365	116	118	133	187	6089	3737	7873	54821
Broken Creek at Casey's Weir[&&]	404217	NA	361	361	NA	NA	NA	NA	11	11	15	59

Site	AWRC no.	No. of days with salinity records	No. of days with flow records	Days with flow above zero	Salinity (µS/cm)				Flow (ML/day)			
					Mean	Median	80%ile	Peak	Mean	Median	80%ile	Peak
Ovens at Peechelba East	403241	352	365	365	51	52	62	121	9421	5873	13832	93574
Kiewa at Bandiana	402205	363	365	365	50	48	60	135	2973	2267	3934	27761
River Murray at Heywoods	409016	365	365	365	54	55	60	95	11093	9847	20924	42316
River Murray at Swan Hill	409204	361	365	365	190	185	274	462	18169	19667	24917	29385
River Murray at Lock 6	426510	287	365	365	205	196	256	365	41176	34080	69672	86795
Queensland												
Moonie at Fenton	417204A	186	365	312	204	186	259	362	1488	16	1749	24913
Ballandool at Hebel—Bollon Rd	422207A	192	365	363	281	252	375	503	1069	126	577	14698
Bokhara at Hebel	422209A	269	365	281	205	185	238	414	1006	220	759	11099
Briarie at Woolerbilla-Hebel Rd	422211A	331	365	191	249	233	265	888	2626	0	907	31847
Culgoa at Brenda	422015	365	365	273	183	199	210	315	6931	594	6096	79066
Narran at New Angledool 2	422030	365	365	322	185	184	205	304	1876	179	3739	12608
Paroo at Caiwarro	424201A	365	365	279	88	81	119	153	1332	91	805	18617
Warrego at Barringun No 2	423004	365	365	365	156	157	177	248	1111	237	1462	8191
Cuttaburra at Turra	423005	365	365	245	186	187	222	709	1228	8	1515	16114
Australian Capital Territory												
Murrumbidgee at Hall's Crossing#	410777	243	365	365	137	107	206	245	3137	1605	3036	86654

*** 95%ile for BSMS Target at Morgan**
^ Used flow data for 405200A (Goulburn River at Murchison)
& Site with no flow
&& Site with no salinity
~ Flow data stops in October 1994
 # Missing data relate to lightning strikes and flood damage
NA Data not available



AWRC No	Site Name	Valley
402205	Kiewa at Bandiana	Kiewa
403241	Ovens at Peechelba East	Ovens
404217	Broken Ck at Casey's Weir	Broken
405259	Goulburn at Goulburn Weir	Goulburn
406218	Campaspe at Campaspe Weir	Campaspe
407203	Loddon at Laanecoorie	Loddon
408203	Avoca at Quambatook	Avoca
409016	Murray at Heywoods	NSW/VIC Upper Murray
409204	Murray at Swan Hill	Vic Riverine Plains
410130	Murrumbidgee at Balranald	Murrumbidgee
410777	Murrumbidgee at Hall's Crossing	ACT
412004	Lachlan at Forbes	Lachlan
414204	Murray at Redcliffs	NSW Riverine Plains
415200	Wimmera at Horsham Weir	Wimmera
416001	Barwon at Mungindi	NSW Border Rivers
417204A	Moonie at Fenton	Moonie
418058	Mehi at Bronte	Gwydir

AWRC No	Site Name	Valley
419026	Namoi at Goangra	Namoi
420020	Castlereagh at Gungalman	Castlereagh
421023	Bogan at Gongolgon	Bogan
422015	Culgoa at Brenda	Condamine Balonne
421012	Macquarie at Carinda	Macquarie
422030	Narran at New Angledool	Condamine Balonne
422207A	Ballandool at Hebel–Bollon Road	Condamine Balonne
422209A	Bokhara at Hebel	Condamine Balonne
422211A	Briarie at Woolerbilla–Hebel Road	Condamine Balonne
423004	Warrego at Barringun	Warrego
423005	Cuttaburra at Turra	Warrego
424201A	Paroo at Caiwarro	Paroo
425008	Darling at Wilcannia	Barwon-Darling
426200	Murray at Lock 7 (flow) Lock 6 (EC)	NSW/VIC Mallee Zone
426522	Murray at Murray Bridge	Below Morgan
426537	Murray at Lock 4 (flow) Berri Pumping Station (EC)	Lock 6 to Berri
426554	Murray at Morgan	Lock 6 to Morgan

* Data not available to report on Salt Load

Figure 4- Map of end-of-valley target site locations

4. RESPONSE TO THE INDEPENDENT AUDIT GROUP FOR SALINITY

In 2011, the MDBA, with the advice from the Basin Salinity Management Advisory Panel (BSM AP), progressed some of the key recommendations contained in the 2009-10 Report of the IAG-Salinity. The audit recommendations which are applicable to the MDBA are itemised and progress reported in Table 10

Some of the audit recommendations will require work over many years especially when uncertainties exist with large-scale changes in water management policies in the Basin. Also a notable issue for 2010-11 is the limited human resources available within the MDBA and the significant resources and time required from jurisdictional personnel for consultation activities related to the preparation of the draft Basin Plan. This process has impacted on the time and resources that would have been allocated for providing advice to the MDBA's BSMS program to progress the recommendations.

Table 10: 2009-2010 audit recommendations and the MDBA's response and progress

IAG-Salinity recommendations	MDBA response to Ministerial Council (March 2011)	Progress September 2011
Recommendation 1: Flood recession salt risks - High Priority That the MDBA Office proceed with its project to facilitate development of a conceptual model of flood recession salt mobilisation in the flood plains, and prepare operational response management plans in preparation for the next high flow event.	MDBA agrees with this recommendation. Basin Salinity Management Strategy program of the MDBA has completed the development of a conceptual model of flood-recession salt mobilisation in the floodplains of the River Murray. Phase one of the project identified river reaches which contribute significant salt inputs into the river following flood events. The next phase of this project will concentrate on development of options for managing high salinity events that may be triggered by flood events.	The MDBA has progressed investigations of flood-recession salt mobilisation through commissioning of two new projects to collect additional data and information on surface water and groundwater salt mobilisation processes following 2010-11 floods. The new information is expected to assist in the development of principles for managing salt mobilised from floodplains following flood events.
Recommendation 2: Accountability for salt mobilisation by environmental watering - High Priority That the MDBA with advice from the Basin Salinity Management Advisory Panel complete a framework for accountability for the salinity effects of environmental watering to enable such actions to be entered onto the salinity registers.	MDBA supports this recommendation. MDBA has established a taskforce to work closely with the MDBA, Basin Salinity Management Advisory Panel and key stakeholders to develop a procedure to account for the salinity impacts of environmental watering actions to the MDBA Salinity Registers. The MDBA will develop procedures for the task force to consider and recommend a procedure agreeable to all contracting governments.	In 2010-11, the MDBA completed a case-study using preliminary salinity assessments of The Living Murray Initiative icon sites. The outcome of this work was provided to the contracting governments through BSMS Environmental Watering Salinity Accountability Taskforce to consider and agree on a procedure to account for environmental watering actions on the MDBA salinity register. As the impacts of Basin's environmental watering actions are interdependent, and the nature of watering arrangements and schedules are evolving`, further work is necessary to include salinity impacts of all environmental watering actions in salinity registers.

Recommendation 3: Reassessing salinity risk in the Basin - High Priority A comprehensive review of the currently projected salinity risk in the Basin for 2050 should be undertaken by the MDBA with advice from the Basin Salinity Management Advisory Panel while the Basin Plan and the environmental watering plans are being developed as a first step in producing the next phase of salinity management. The review should take into account the re-assessment of salt loads from individual catchments, the water buyback and climate change scenarios.	The MDBA supports this recommendation noting that a comprehensive reassessment of projected salinity risk by 2050 requires several preliminary steps. These include reassessment of future salt loads from key catchments in several jurisdictions and salinity impact assessment of future water management policy decisions contained in the Basin Plan. A comprehensive reassessment of future salinity risks may require significant time and resources and is warranted when the preliminary steps have been accomplished.	The MDBA has assessed salinity risks associated with flood recession salt mobilisation from floodplains and the final report is expected to be published in 2011-12. Preliminary assessment of salinity impact of The Living Murray Environmental Watering has also been progressed. However, further work on salinity risks from other parts of the Basin including catchments and future environmental watering is pending until more details of the future water management regime is known.
Recommendation 4: Prioritising catchments and sub-catchments for salinity management - High Priority The MDBA should facilitate assessment of currently available tools that prioritise catchments with high salinity outflows or salinity risk and allow the reduction in salinity outflows from the application of a range of recommended land and water management actions to be measured.	The MDBA would be happy to facilitate an assessment of current available tools for catchment salinity management on advice of the Basin Salinity Management Advisory Panel. However, it has noted that prioritising catchments and sub-catchments for salinity management and monitoring the impacts of application of land and water management actions is a core responsibility of the jurisdictions.	In 2010-11, the MDBA published the Salinity Targets Review project reports that broadly identified catchments where more effort on salinity management is warranted. The assessment of currently available tools for prioritising catchments is expected to be progressed when adequate resources are available within the MDBA as well as in jurisdictions.

Recommendation 6: Joint works and measures program Pike River - High Priority Pike River salt interception scheme construction should be implemented as a precautionary approach to salinity management in the Basin given the predicted 2050 salinity outcome based on current models and the minimal credits available from retiring irrigated lands show that the probability of meeting Morgan basin salinity target into the future is low.	The MDBA notes that this recommendation is dependent on further joint government investment. The construction of the 61 EC program of works agreed to by the Murray—Darling Basin Ministerial Council is now nearing completion. Although the Pike River has been identified as a highly economically viable salt interception scheme, it is not part of the agreed 61 EC. To gain Ministerial Council support to proceed with construction of the scheme, it would need to be necessary to have jurisdictional agreement that there is a need for a joint works and measures program beyond the current 61 EC program which is nearing completion.	Currently the Basin states in the joint program have sufficient development credits in the register. There appears to be a lack of appetite in general to invest in a joint works program beyond the agreed 61 EC program under the current BSMS.
Recommendation 9: Relationship between registers and the target at Morgan - High Priority The consistency between the credit and debits balances of the registers and the target at Morgan needs to be established, taking into account the likely effects of environmental watering and the Basin Plan, given that 2010 is the first year that the target at Morgan has been met while Register A has been in credit for each jurisdiction for some years.	The MDBA can facilitate the linking of the target at Morgan and Registers by calculating the estimated impact on 95 percentile salinity if all credits are used. This will highlight any inconsistencies between the balanced Registers and the Basin Salinity Target at Morgan. Credits generated through the 61 EC joint works and measures program and other state actions of the BSMS program since 2001 were meant to offset the deteriorating salinity impacts of development activities and 'legacy of history' (delayed salinity impacts of past decisions). There were no specific actions in the BSMS to reduce simulated salinity at Morgan to 800 EC for 95% of the time (Basin Salinity Target). However, the salt interception schemes tend to have a bigger impact in reducing peak salinities when river flows are low and have a beneficial effect in reducing 95 percentile salinity at Morgan. Effectively, the salinity Registers are designed to achieve no further deterioration from the Baseline Conditions established in 2000. Therefore, if all available credits in the Registers are used, the modelled river salinity will revert back to 2000 Baseline Conditions.	The MDBA presented to the Independent Audit Group for Salinity the finding of an analysis of the impact on the Basin Salinity Target, if all the development credits in the current Register are used. The analysis indicates that the Basin Salinity Target and credit balance in the registers are in reasonable alignment when modelled for 2010-11 levels of development. The MDBA analysis indicates that a balanced salinity register alone will not translate to the Basin Salinity Target at Morgan being met.

Recommendation 10: Irrigation Salinity Accountability Framework - High Priority The MDBA with advice from the Basin Salinity Management Advisory Panel, facilitate the development of a consistent framework for the accountability or irrigation salinity impacts including improved knowledge of district-scale irrigation related groundwater recharge. MDBA should continue capturing the irrigation improvement measures and unbundling water from lands to inform this process. MDBA should promote irrigation as a special application case in revised groundwater modelling guidelines being prepared by the National Water Commission.	A draft irrigation salinity assessment framework has been developed by the MDBA for irrigation regions in the Mallee zone. The draft framework will be further improved by targeting consistency issues and to include changes in national and jurisdictional policies related to irrigation water use on land. The MDBA will collaborate with the National Water Commission for revising groundwater modelling guidelines.	In 2010-11 the MDBA completed a project to develop district-scale root zone drainage estimates for irrigated areas of the Basin's Mallee zone. This project provided a key dataset for further improvement of draft irrigation salinity assessment framework developed for the Mallee regions. However, extension of this draft framework for application in the Riverine Plains irrigation regions has been delayed due to significant shortages of appropriate data. The MDBA held a workshop and provided advice for groundwater modelling guidelines being prepared by the National Water Commission and continue to do so through MDBA's involvement in the project steering committee.
Recommendation 12: Consistent Basin-wide land use databases - Normal Priority The MDBA should facilitate the development of a set of databases that describes land use at the catchment scale across the Basin for use in prioritising dryland catchments for land management improvement.	The MDBA supports this recommendation in relation to the data required for improving assessment of salinity impacts and costs through BSMS models. Under guidance from the Basin Salinity Management Advisory Panel, the MDBA will continue to build on its current databases to capture changes in land use and irrigation footprint in priority catchments. However, collection of catchment-scale data prioritising dryland catchments for land management improvements is mainly the responsibility of jurisdictions.	The MDBA has continued to develop its datasets on Basin-wide scale land use in 2010-11, however, no specific catchment-scale database was developed for the purpose of prioritising dryland catchments for land management improvements.
Recommendation 13: Science skills audit to support the salinity program - Normal Priority MDBA and the jurisdictions should review their sources of science expertise to support the BSMS and propose strategies to enable the program to be supported with ongoing appropriate skills into the future.	The MDBA supports skills development through its contributions to Corporative Research Centres'. The MDBA would be happy to explore other options with the Basin Salinity Management Advisory Panel.	The MDBA response to the recommendation stands.

Recommendation 14: Updating the valuations in the registers - Normal Priority That the registers reflect the current dollar value of the assets at risk and these updated annually.	In consultation with the Basin Salinity Management Advisory Panel, the MDBA will provide conversion factors necessary for estimating current dollar values from 2005 values reported in the Registers. Currently reported 2005 dollar values could be converted using the change in Consumer Price Index. However, this would affect the stability of the credits and debits on the Registers from year to year.	Salinity Registers will continue to reflect 2005 salinity cost effects for stability across years. Conversion factors have been provided to convert the values in the Registers to the current year.
Recommendation 15: Defining the uncertainty in the register items - Normal Priority Uncertainties in the registers need to be more transparent and the meaning of high, medium and low confidences defined.	The MDBA to progress the definitions of high, medium and low confidence categories in consultation with Basin Salinity Management Advisory Panel.	This recommendation is expected to be addressed in 2011-12.
Recommendation 17: End-of-valley salinity flow interpretations- Normal Priority That the MDBA facilitate a whole-of-basin analysis of salinity-flow hydrographs over the past wet season in order to provide insight into the natural processes that release salt to streams. This could involve synthetic models to demonstrate the key processes.	As obliged under the BSMS, end-of-valley targets are reviewed every five years. In this review process, currently available data is used to further develop an understanding of natural processes that release salt into streams. Datasets and models associated with end-of-valley sites are held and owned by jurisdictions. The MDBA will be able to facilitate a whole-of-basin analysis of end-of-valley datasets depending on the interests of the jurisdictions. However, MDBA does not support involvement of synthetic models as significant modelling work has already been done for the establishment of current end-of-valley targets.	Significant work has occurred through End-of-Valley Targets Review project for the purpose of reviewing current BSMS End-of-Valley targets as well as to assist with development of Water Quality and Salinity Management Plan. Reports of this project have been published on the MDBA website. Further analysis of data at each End-of-Valley target occurs though five year review processes using the models developed by the jurisdictions and approved by the MDBA as required under the Schedule B of the Murray—Darling Basin Agreement.

Recommendation 18: Environmental water and salt export - Normal Priority In developing environmental watering guidelines, multiple objectives such as the export of salt from the Basin and ecological health of the Coorong and Lower Lakes should be considered.	The MDBA supports this recommendation. This recommendation may be addressed through the Basin Plan, Water Quality and Salinity Management Plan, and the Environmental Watering Plan which is implemented by holders of environmental water rather than the BSMS.	The MDBA response to the recommendation stands.

5. KEY PROJECTS FOR 2011-12

Key priorities for the 2011-12 financial year and beyond include completion of the obligations contained in the Schedule B of the Murray—Darling Basin Agreement and continuation of ongoing projects and initiation of new projects to implement the broad objectives set out in the Basin Salinity Management Strategy.

The priorities are aligned with Schedule B obligations, outstanding mid-term review recommendations (excluding those expected to be addressed in the Basin Plan) and the high priority recommendations made by the IAG-Salinity.

In the 2011-12 year, the main priorities for the BSMS program include:

a) completion of Schedule B obligations; specifically:
   - annual reporting
   - the annual independent audit by the IAG-Salinity
   - the reviews of accountable actions that are itemised on the salinity registers, and the assessment of new actions that may require inclusion on the salinity registers
   - on-going review and improvements of hydrological models that underpin in-river salinity assessments;

b) harmonisation of the BSMS with significant water management policy changes within the Basin, including:
   - developments in accountability arrangements for salinity impacts of the evolving environmental watering programs (The Living Murray, Commonwealth and state actions)
   - further development of the irrigation salinity assessment framework to include changes in irrigation footprint, intensity and infrastructure changes in the Riverine Plains

c) continued knowledge development on salt mobilisation risks from the floodplains, and the development of high-level principals to guide operational arrangements to manage the impacts of sustained in-river salinity spikes

d) review of Schedule B under clause 152 of the Murray—Darling Basin Agreement

e) finalisation of the 61 EC joint works and measures program (the salt interception schemes) established under the BSMS and review of future salinity risk across the Basin to inform future management strategies

f) update of the MDBA river model (MSM-BIGMOD) to facilitate improved modelling of salinity impacts due to environmental watering activities on the Basin target and to inform the BSMS salinity register.

These priorities require substantial resources within the BSMS program and from the partner governments. Current capacity within the BSMS program as a whole may not be sufficient to deliver all of these priorities simultaneously within one financial year.

6. REFERENCES

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APPENDIX I: EXTRACT FROM THE REPORT OF THE IAG-SALINITY 2010-11

Executive summary and recommendations

Introduction

In August 2001, the Murray–Darling Basin Ministerial Council (MDBMC) launched the Basin Salinity Management Strategy (BSMS). In December 2008 the Murray–Darling Basin Commission was succeeded by the Murray–Darling Basin Authority (MDBA). Schedule C to the Murray–Darling Basin Agreement, which set down the legislative framework for the implementation of the BSMS, became Schedule B to the Murray–Darling Basin Agreement, which is Schedule 1 to the Water Act 2007 (Cwlth).

Schedule B provides for the appointment of 'independent auditors for the purpose of carrying out an annual audit', whose task is to review progress on implementing the BSMS. The three members of the present Independent Audit Group for Salinity (IAG-Salinity) were appointed in October 2008.

The terms of reference for the IAG-Salinity and Schedule B require the IAG-Salinity to review progress on the BSMS both broadly and in terms of the steps laid down in the Schedule. The terms of reference also require it to focus on the specific measurement and recording of progress with the BSMS, and the outcomes at 30th June each year.

This report presents the consensus view that the IAG-Salinity has reached in undertaking the audit covering the 2010-11 financial year. The following summarises the most important of our findings. The main text provides context, the findings and recommendations in detail.

The state contracting governments, and the Australian Capital Territory and the MDBA submitted reports on their activities, valley reports, the status of five-year rolling reviews and BSMS salinity register entries or adjustments. These reports contained the necessary information to make an assessment. The Australian Government Department of Sustainability, Environment, Water, Population and Communities also submitted a brief report related to environmental watering activities.

The audit process adopted by the IAG-Salinity included review of these reports and the salinity registers and their supporting documentation. This was followed by meetings with representatives of the jurisdictions and with members of the MDBA. The recommendations were developed with their involvement.

The 2010-11 context for BSMS implementation

In 2010-11, the thinking of the BSMS was influenced by:

- high rainfall across the Basin
- significant flooding and recovery of the water levels in the River Murray and its storages
- a continuing gap in funding and skilled staff
- the expansion in coal seam gas exploration
- development and the purchase of large quantities of water by governments.

This is the second year that the Basin salinity target has been reached (as defined in Schedule B, of 800 EC at Morgan for 95% of the time during the benchmark period). The long continuous flow of water in the rivers transported significant amounts of salt out to sea, without having high salinity peaks, as could have been expected from historical records where high salinities followed a major flood event. Work undertaken to understand post-flood salinity peaks has demonstrated that the salt interception schemes and high flows in the lower end of the river have averted any salinity peaks.

The high flows have reduced salinities in the lower lakes (although Lake Albert salinity is still high). However, the higher rainfalls are again resulting in rises in water tables within dryland catchments, which may increase the area of dryland salinity that was not evident during the drought.

Recent work undertaken by Victoria has confirmed that the dryland salinity occurrences are closely related to naturally occurring salinity. With the rising water tables after the higher rainfall, salt is again being expressed on the surface in high risk salinity catchments. The contracting governments are concluding that the expression of dryland salinity in the landscape is cyclical – related to rainfall.

The purchase of water from irrigators by the Commonwealth, the improvement of irrigation practice, and the use of that water for ecological purposes may have an effect on salinity outcomes within the Basin. A preliminary assessment of the possible salt mobilisation that may occur from watering wetlands by the Commonwealth Environmental Water Holder (CEWH) has been undertaken as a basis for initial discussions. No assessment has been made of the use of environmental water under the Protocols section 3.6.3 as established by the MDB Agreement (Appendix 2). Much more needs to be done, namely:

- An examination into the rate of reduction in salinity risk determined from retiring some irrigation activity from areas where there is a high groundwater mounding.
- Principles for guiding the responsibility for the management of environmental watering and the accounting for salinity register entries under the BSMS need to be agreed upon between the Commonwealth, the MDBA and contracting governments.
- The manipulation of flow regimes with the volumes of water purchased for environmental watering needs to be modelled, to determine the positive impact on in-river salinity that may be gained if the flow is provided at the appropriate time.
- Scenarios should be developed that will help inform the application of the principles.

The priority for catchment action in high risk catchments needs to be further developed to help the natural resource management (NRM) bodies include effective salinity actions in their investment strategies. Most contracting governments have maintained a program in salinity, but it is evident that skilled staff numbers at a jurisdictional level are reducing. The MDBA and the contracting governments have had to reallocate resources from the BSMS to the development of the Basin Plan. It is necessary that to make progress on a number of outstanding issues for the BSMS, the resources need to be returned to the BSMS program.

The BSMS is up for renewal by 2015. It will be a significant undertaking to review the BSMS given the:

- increased knowledge of the salinity risk that has occurred during the life of the BSMS

- change in policy settings following the National Water Initiative and the Basin Plan
- purchase and application of environmental water
- development of the coal seam gas industry
- increasing maintenance cost of the salt interception infrastructure in the Basin.

Since the BSMS concludes in three year's time, it is important that work be commenced as soon as practical to re-assess the predicted salinity impacts and the management actions required.

Progress in implementing Schedule B - items for special mention

Implementation of the BSMS

It is evident that the implementation of the BSMS has progressed in three phases.

The first phase has been the implementation of the works and measures program, where salt interception schemes were investigated and constructed. This, together with intense model development by the partners, has increased the certainty in the salinity registers. The works and measures program and the rehabilitation of irrigated landscapes to reduce salt accessions (and manage for other salinity benefits) has been highly successful and will deliver a salinity reduction of greater than 61 EC at Morgan by 2012. The program is now moving to a focus on the operation and maintenance of the schemes, given the escalating cost of maintenance. Consideration of its overall optimisation is required to ensure that it continues to be value for money.

The second phase consists of the remaining elements of the BSMS which relate to land based salinity mitigation. Further studies of catchments and sub-catchments (particularly the upper catchment areas) have demonstrated that with close analysis, priority catchments which contribute saline water can be selected for remedial investment. Further analysis of data collected during the wet and dry periods over the last decade is required. It should provide more certainty about upland salinity risk for targeted actions for revised end-of-valley targets. The development of the coal seam gas (CSG) industry (which has a by-product of significant amounts of water and salt) will also add another dimension to the prioritisation of catchments at risk.

The third phase has been the consideration of the purchase of large quantities of water by governments and the use of that water for watering of ecological sites. Some progress on the impact of using the water for environmental sites has been made, but the principle and mechanism of accounting for the salinity impacts need to be established.

Current salinity management in the Basin

The modelled salinity levels at the target of Morgan over the benchmark period (i.e. below 800 EC for 95% of the time) has been met for the second year in a row. The salt interception program has contributed to this success in low flow years and dilution from increased flows in wet years.

Table 1 shows that the model predictions for river salinity at Morgan over the Benchmark period (1975-2000) are less than 800 EC for 96% of the time.

Table 1: The simulated salinity levels (EC) summary at Morgan, South Australia for baseline and 2011 conditions over the 1975 to 2000 benchmark period

Time interval	Average (EC)	Median (EC)	95 Percentile (EC)	% time >800 EC	% time <800 EC
Modelled Baseline* conditions over benchmark Period (1975-2000)	665	666	1058	28	72
Simulated 2011 conditions over Benchmark Period (1975-2000)	505	483	786	4	96

***Baseline conditions are set at 2000. However salinity impacts arising from development activities between 1988 and 2000 in NSW, Victoria and South Australia are accountable under the BSMS and have been excluded from the Baseline.**

Figure 1 shows the effect of salinity management in the MDB on salinity at Morgan, based on actual measurements and predicted salinity if management had not occurred. Without salinity management, salinity at Morgan would have exceeded the 800 EC in July 2010 but because of the continuous high river flows through to June 2011, the differences have been marginal. This is demonstrated by comparing Figure 1 with the previous year (Figure 2) where there was a very low river flow. In this circumstance, salinity levels were higher and the impact of salt interception schemes in drawing down river salinities was very strong.

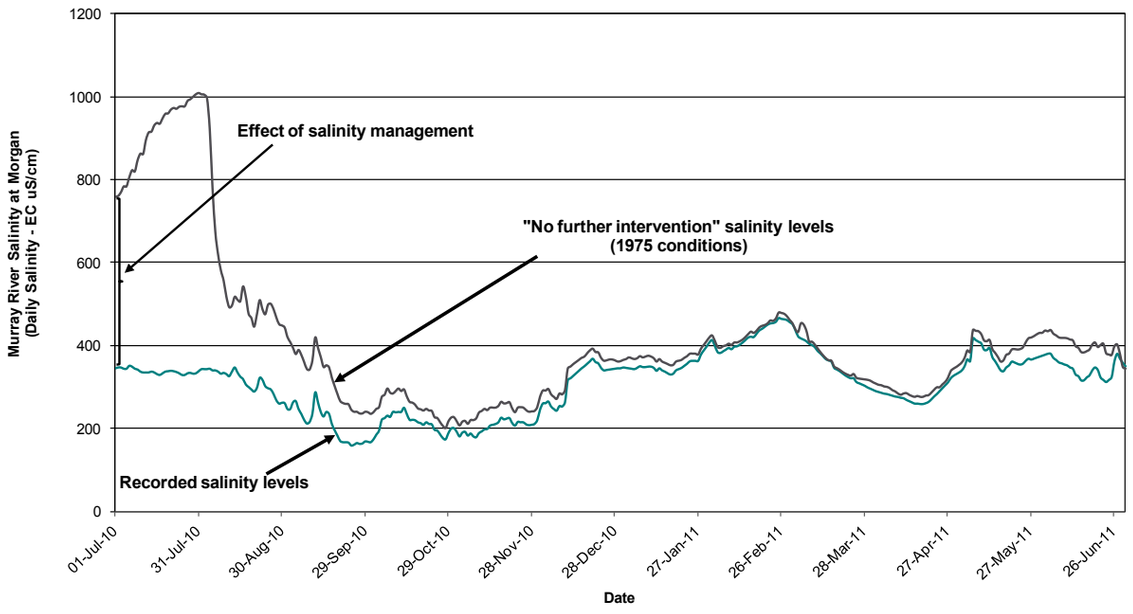


Figure 1: Mean daily salinity levels (July 2010 to June 2011) compared to modelled salinity levels without salt interception schemes, improved land and water management actions and additional dilution flows ('no further intervention' scenario). The difference is assumed to be the effect of salinity management.

These results show the relevance of the BSMS in protecting the assets of the Basin. It is important to continue to monitor these targets as irrigation footprints change and river flows adjust over time.

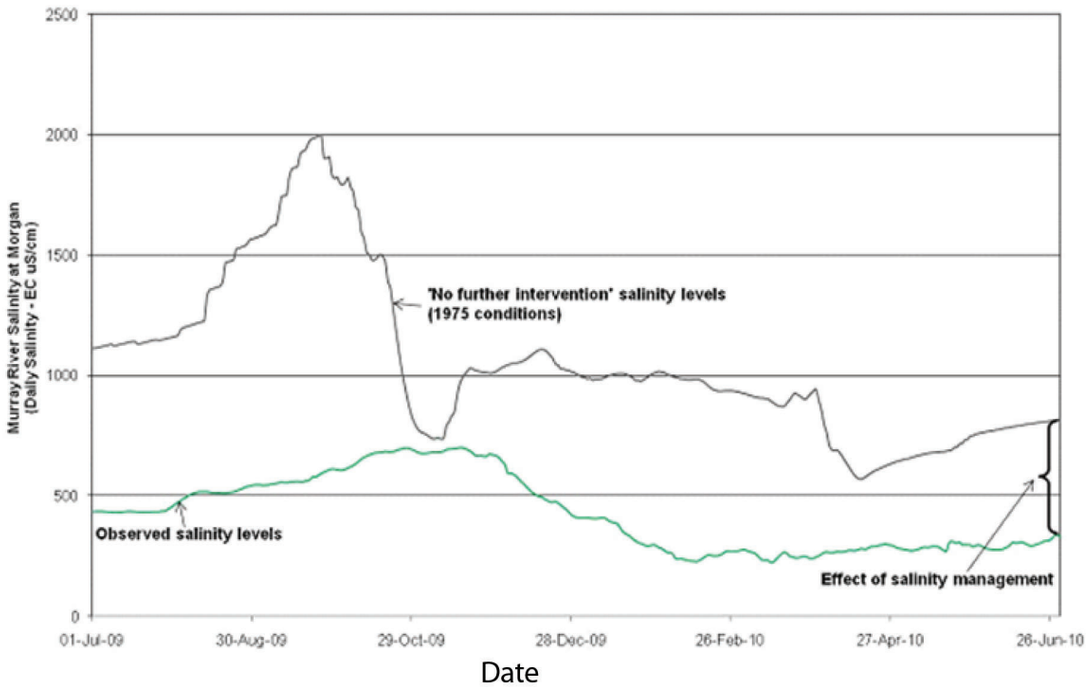


Figure 2: The 2009-10 low-flow year difference between the 'no further intervention' modelled salinity level and the observed salinity level. The difference indicates that in a low flow year the contribution of salt interception schemes to reducing in stream salinities is high.

Flood recession salt risks

Since the last audit, progress has been made in exploring the risks from salt entering the rivers following a flood. The completion of this work is essential as an operational plan and guidelines still need to be developed to manage salinity.

Environmental watering

Progress is being made on the accountability for salinity impacts. However, there has not been an assessment under the MDBA Protocols and the responsibility for the use of environmental water and its accountability on the salinity registers is not clear. A degree of cooperation has been developed between the MDBA, the contracting governments and the Commonwealth. It is important that this collaboration is expanded and the issues worked through using an agreed set of principles for this action; including consideration of the long-term impacts of environmental watering.

Coal seam gas

Queensland and New South Wales have been developing regulatory and compliance monitoring regimes to manage the significant expansion in coal seam gas exploration and

development that is occurring. While it is not known with any certainty how much water will be produced, the potential volume of water extracted to release the gas – in Queensland alone – is expected to be in the order of 2 500 GL over 20 to 30 years, but could be much higher. The amount of salt removed from that water by reverse osmosis is estimated to be about 8 million tonnes over that period (or 395 000 tonnes annually). This is of the same order as is generated by all the salt interception schemes operated by MDBA in the southern connected Basin.

While there has been significant action in both Queensland and New South Wales to manage the storage of brine on the land, if salt does make its way to the waterways, then it will need to be considered as an accountable action under the BSMS salinity registers.

Land management strategies

Conceptual models have continued to be refined for prioritising sub-catchments that yield saline water. Each contracting government is taking a different approach and there would be an advantage if, following the recent wet period, there was a collaborative evaluation of the approaches taken and synergies identified. The recent wet period has confirmed that dryland salinity is a cycling issue related to rainfall and a more consistent approach to this problem should be able to be designed across the Basin.

Salinity outlook

The BSMS forward predictions (made in 2001) of salt mobilisation in the upland catchments are expected to have been an over-estimation. This is because of improved information now available about the upland catchments, the current buy back of water for environmental use and the impending impact of climate change. However, the overall outlook is not fully understood.

It is important to again determine the Basin salinity risk, particularly given the lead up to a revised BSMS as required in Schedule B. This should be progressed in 2012 as a priority. Given the lack of connection between the accountable actions in the registers and the salinity target at Morgan, it remains uncertain whether the credits in the registers should be discounted over time. While it is highly likely that the Morgan target would be breached in future years if all credits were taken up, there is much uncertainty as to the magnitude of the breach.

While the salt interception schemes have been highly successful, further consideration should be given to bore field optimisation to ensure the best outcome for the river and its environments at the lowest operational cost. A revised assessment of the outlook for salinity in the Basin will allow a reassessment of the elements of the BSMS in the future.

The IAG-Salinity's opinion regarding the balance of salinity credits and debits for each state

Schedule B, Clause 16 (1) provides as follows:

16. (1) A State Contracting Government must take whatever action may be necessary:

(a) to keep the total of any salinity credits in excess of, or equal to, the total of any salinity debits, attributed to it in Register A; and

(b) to keep the cumulative total of all salinity credits in excess of, or equal to, the cumulative total of all salinity debits, attributed to it in both Register A and Register B.

Register A currently shows New South Wales, Victoria and South Australia to be in net credit;

while Register B shows New South Wales and South Australia to be in net credit, and Victoria slightly in debit. For the combined registers, all three states are in credit.

Opinion on register balances:

The IAG-Salinity has examined the registers as provided for this audit, and has come to the opinion that New South Wales, Victoria and South Australia are in a net credit position.

Opinion on the Authority's accuracy in maintaining the registers:

The IAG-Salinity found no inaccuracies in the Authority's maintenance of the registers, as provided for incorporation into this report.

The audit did not identify any requirement to update individual entries in the registers incorporated in this report.

Recommendations

The following are the recommendations of the IAG-Salinity in descending order of priority.

The Independent Audit Group-Salinity recommends:

1. Accountability for salinity impacts of environmental watering:

(a) A set of high level principles, consistent with the National Water Initiative and the Basin Plan, be established and agreed to by the Ministerial Council. These will guide the development of the environmental watering plans, the institutional responsibilities and accountability for salinity under those plans.

(b) The potential impacts of environmental watering on Basin salinity be jointly explored through a modelling program of intensive scenario analysis by the Commonwealth Environmental Water Holder (CEWH), the Basin Salinity Management Strategy Advisory Panel (BSM AP) and the MDBA so that an informed application of the policy principles can be made.

2. Planning for the new Basin Salinity Management Strategy (BSMS)

The work program required to review the emerging salinity risks and re-appraise the elements of the BSMS be scoped by the Authority and contracting governments so that a new operational plan can be developed and adopted before the current plan concludes in 2015.

3. Submission of outstanding register reviews

(a) New South Wales should develop a schedule for up-coming salinity register reviews.

(b) Queensland should formally submit the three outstanding salinity register reports.

4. Promotion of the Basin Salinity Management Strategy (BSMS) model success story

The success of the BSMS be promoted to demonstrate how good multi-government programs can work when:

- roles, responsibilities and accountabilities are well developed
- an adaptive management framework is used
- excellent jurisdictional collaboration and commitment to progressing the strategy has occurred.

5. Resourcing the Basin Salinity Management Strategy (BSMS)

The recent shortage of necessary skills in the MDBA Salinity program is limiting progress

of the BSMS and Independent Audit Group-Salinity recommendations. This needs to be remedied as soon as possible.

6. Priority for upland catchment actions

Prioritisation for NRM investment in management actions for high salinity risk sub-catchments should be further developed by: synthesising data from the recent wet and dry periods, reviewing conceptual models and tools and approaches being used and preparing guidelines on preferred approaches and effective management options. The guidelines are to include emerging salinity risks.

7. Targets and Monitoring sites review

A review process be established that combines end-of-valley salinity targets over the benchmark period with real-time targets. These real-time targets must account for local high risk salinity processes operating, and provide feedback to local communities.

8. Salt Interception program review

The salt interception program should be reviewed to consider optimising the system; taking into account the increasing maintenance requirement, the operational costs and capital investment made.

9. Updated economic valuations in the registers and forward projections based on salinity risk

The registers should be interpreted annually for policy makers, providing:

- a current and forward economic valuation, based on the values in the registers, but which are in current dollars
- the level of credits needed into the future, taking into account any increase in credits to meet the target at Morgan.

10. Salinity impact zoning

That New South Wales establish a salinity impact zoning policy for Sunraysia that is consistent with the zoning in Victoria and South Australia.

Determination of priorities

The recommendations in this report were arrived at through a review of the reports of the jurisdictions, the annual BSMS implementation reports, and past IAG-Salinity reports; followed by discussion with representatives of the jurisdictions and the Catchment Management Authorities (CMAs) (where present). Most of the recommendations and their relative priorities were discussed with the relevant jurisdictions.

Recommendations of previous IAG-Salinity reports

There has been some progress towards many of the important recommendations from the 2009/10 review. It is important that progress on these recommendations continue and not be forgotten. Rather than bringing these recommendations forward as new recommendations, they have been classified as continuing, or completed. Where the recommendation forms part of a new recommendation for 2010/11 it has been noted as replaced. The 2011/12 audit will be seeking a report on the continuing recommendations.

Important recommendations from the 2009/10 review not dealt with elsewhere are listed here with an indication of their status:

1. Flood recession salinity risks (Recommendation 1) - *continuing*

The IAG-Salinity were pleased with the progress made with stage 1 of this recommendation. Further work is planned for 2011/12, including developing a river operational plan so that salinity recession risks can be managed.

2. Relationship between registers and the target at Morgan (Recommendation 9) - *completed*

The relationship has been established and is discussed in this report.

3. Irrigation Salinity Accountability Framework (Recommendation 10) - *continuing*

The district scale root-zone drainage values for the Mallee BSMS models were completed, but the Riverine Plains is still to be commenced.

4. Salinity expertise for the Commonwealth Environmental Water Holder (Recommendation 11) - *continuing*

Officers of the Commonwealth Environmental Water group are attending the BSM AP and progress is being made. The IAG-Salinity commends this collaboration and while salinity expertise has been sourced from consultants and providers, having skills on the Environmental Watering Scientific Advisory Committee (EWSAC) is also recommended.

5. Consistent Basin-wide land use databases (Recommendation 12) - *continuing*

This recommendation is supported by most jurisdictions and some action is occurring by the contracting governments in different ways. It requires the BSM AP to establish a way forward and should include temporal and spatial land use changes in the irrigation areas.

6. Science skills audit to support the salinity program (Recommendation 13) - *continuing*

The BSMS program is based on good science but the science base of the organisations is reducing. A skills audit is still required.

7. Updating the valuations in the registers (Recommendation 14) - *replaced with new* Recommendation 9

This is supported by the jurisdictions but updating the valuation each year makes it difficult to compare registers between years. The BSM AP needs to address this recommendation and is part of a new recommendation.

8. Defining the uncertainty in the register items (Recommendation 15) - *continuing*

This is supported and has been undertaken by South Australia in its model run. The BSM AP needs to make it clear to the users of the registers the basis upon which it can be used and interpreted, and the likely uncertainties in the monitoring data and model outputs.

9. Recording the mitigation decisions required during the drought (Recommendation 16) - *continuing*

South Australia has a draft report about the actions that were taken below Lock 1, but not a report about the resilience of the system. Such a report would provide people interested in the Basin with a better understanding of the ecological processes operating below Lock 1.

10. End-of-valley salinity flow interpretations (Recommendation 17) - *replaced with* new Recommendation 7

No progress was made on this recommendation because of unforeseen rainfall and flooding – but it still needs to be addressed.

Important recommendations from the 2008-09 audit report not included above

11. Salinity targets below Morgan (Recommendation 4) - *continuing*

This is a very important recommendation that had support from jurisdictions to provide operational salinity targets below Morgan. IAG-Salinity understands it is included in the proposed Basin Plan. A proposal for targets below Morgan needs to be developed and progressed with BSM AP.

12. Within-valley targets (Recommendation 5) - *replaced with new* Recommendation 6

Some progress has been made in New South Wales, but needs to be rolled out across the Basin, as indicated in the recommendations for 2009/10 and 2010/11 and a new recommendation in this report.

13. Pike River SIS (Recommendation 9) - *continuing*

South Australia has funded a part of this scheme and the remainder of the construction program is on hold until the need for further salinity credits can be demonstrated.

14. Alignment of BSMS with Catchment Action Plans (Recommendation 11) - *continuing*

Some progress has been made in New South Wales and is expected to continue in 2011/2012.

Previous audit recommendations

15. Salinity registers and targets for Queensland (2007/08 Recommendation 16) - replaced with new Recommendation 3

Some progress has been made and is part of a new recommendation in this report related to the registers.

BSMS mid-term review

16. Develop methods to account for and achieve environmental outcomes from salinity mitigation actions through integration across MDBA programs

This is a component of the new recommendation 1 of this report.

17. Support integration and alignment of national funding initiatives and reporting with regional catchment strategies that reflect BSMS objectives and integrated catchment outcomes

With the completion of the National Action Plan for Salinity and Water Quality (NAP) program there is no national program that directly funds salinity management.

18. Increased emphasis on catchment actions to address salt mobilisation and more innovative measures to deal with the effects – such as real-time operation

This recommendation is being progressed through the salt recession risk program and the recommendation in this report looking at priority catchments. The option of real-time targets has not been progressed, but is being considered under the Basin Plan.

APPENDIX II: BSMS SALINITY REGISTER 2011

The BSMS salinity register 2011 shows individual accountable actions as credits and debits and are expressed both in EC impacts and cost effects in dollar values.

Register A includes each accountable action taken after the baseline conditions date (1988 for New South Wales, Victoria and South Australia, 2000 for Queensland) and jointly funded works and measures. Accountable actions that are predicted to cause increases in salinity are referred to as debits and are shown in red. Recorded actions that result in a decrease in salinity levels are referred to as salinity credits and are written in green.

Register B accounts for 'legacy of history' or delayed salinity impacts which continue to appear after the baseline conditions were adopted, but are the result of actions that have occurred before the date of baseline conditions. These salinity debits (in red) can be offset by credits (in green) arising from joint works and catchment management programs of actions.

Explanation of salinity register lines and headings

Joint works and measures

The first line of the table summarises the economic benefits in the river arising from joint works and measures. Joint works and measures refer to salt interception schemes constructed as part of the Salinity and Drainage Strategy (MDBC 1988) and those under the current BSMS. The registers demonstrate the benefits of the shared schemes between the investing states. The Australian Government has provided significant financial input to the schemes, which is reflected in the right-hand column showing a salinity benefit equivalent to this contribution. A proportion of credits generated by the joint works and measures program is assigned to individual states to off-set the debits recorded in Register B. In the registers summary (Table 4), these transfers are shown in the 'Transfers to Register B' column.

State shared works and 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 measures' in the salinity registers.

State actions

The individual state actions reflect the land and water use salinity cost and benefits to the river. Typical examples of activities that increase salinity costs include new irrigation developments and the construction of new drainage schemes that mobilise salt to the river and wetland flushing. Off-setting activities include improved irrigation efficiencies and improved river operations.

Total Registers A and B

The overall cumulative accountability for salinity impacts on the river in 2010-11 is summarised in the lines 'total register A' and 'total register B'. Register A maintains accountability for actions after 1 January 1988 for New South Wales, Victoria and South Australia, and 1 January 2000 for Queensland. The total for 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. 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 and salt to the river.

Balance Register A & B

The register balance provides an overall assessment of whether each Basin partner is in net credit or debit. Interpretation of this balance needs to be considered in light of different levels of confidence in individual register entries on the A and B registers.

Figure 5: 2011 Salinity Register A

Register Database unique no.	Real Register no.		**AUTHORITY REGISTER A** (Accountable Actions)	Type	Date Effective	Provisional Salinity Credit ($m/yr)	Current Impact on Morgan 95%ile Salinity (EC)	Impact on Flow at Mouth (GL/y)	Salinity Effect (EC at Morgan)					
									2000	2015	2050	2100	Modelled Current Conditions (Interpolation to Current Year)	
			JOINT WORKS & MEASURES											
			Former Salinity & Drainage Works											
RU000001	1	1	Woolpunda SIS	SDS	Jan 1991		-87	0	-47.4	-47.4	-47.4	-47.4	-47.4	
RU000002	2	2	Improved Buronga and Mildura/Merbein IS	SDS	Jan 1991		-6	0	-3.0	-3.0	-3.0	-3.0	-3.0	
RU000003	6	3	New Operating Rules for Barr Creek Pumps	SDS	Jul 1991		-8	0	-4.9	-4.9	-4.9	-4.9	-4.9	
RU000004	9	4	Waikerie Interception Scheme	SDS	Dec 1992		-19	0	-12.8	-12.8	-12.8	-12.8	-12.8	
RU000058	18	5	Changed MDBC River Operations 1988 to 2000	SDS	Apr 1993		-1	4	-1.6	-1.6	-1.6	-1.6	-1.6	
RU000005	12	6	Mallee Cliffs Salt Interception Scheme	SDS	Jul 1994		-21	0	-13.3	-13.3	-13.3	-13.3	-13.3	
RU000007	19	7	Changed Operation of Menindee and Lower Darling	SDS	Nov 1997		3	8	0.9	0.9	0.9	0.9	0.9	
RU000026	23	8	Waikerie SIS Phase 2A	SDS	Feb 2002		-14	0	-8.0	-8.2	-10.7	-8.9	-8.2	
RU000059	25	9	Changed MDBC River Operations 2000 to 2002	SDS	Feb 2002		-2	-1	-1.4	-1.4	-1.7	-1.9	-1.4	
			Sub Total - Former Salinity & Drainage Works				-154	11	-91.6	-91.8	-94.6	-93.0	-91.8	
			Basin Salinity Management Strategy											
RU000060	31	10	Changed MDBC River Operations after 2002	BSMS	Dec 2003		1	7	-0.2	-0.2	-0.4	-0.4	-0.2	
RU000115	37	11	Pyramid Ck GIS	BSMS	Mar 2006		-6	0	-5.1	-5.1	-5.2	-5.2	-5.1	
RU000028	40	12	Bookpurnong Joint Salt Interception Scheme	BSMS	Mar 2006		-21	0	-13.6	-11.7	-11.2	-11.3	-12.1	
RU000096	41	13	Improved Buronga Scheme	BSMS	Mar 2006		-1	0	-0.6	-0.5	-0.5	-0.5	-0.5	
RU000108	49	14	Loxton SIS	BSMS	Jun 2008		-19	0	-12.3	-11.5	-9.7	-9.0	-11.7	
RU000114	53	15	Waikerie Lock 2 SIS	BSMS	Jun 2010		-17	0	-12.7	-10.3	-11.3	-11.8	-10.8	
			Sub Total Joint Works under BSMS				-63	6	-44.4	-39.3	-38.4	-38.2	-40.5	
			Joint Works Sub Total				-217	17	-136.1	-131.2	-133.0	-131.3	-132.3	
			STATE WORKS & MEASURES											
			Shared New South Wales and Victorian Measures											
RU000064	20	16	Permanent Trade Accounting Adjustment - NSW to Victoria*	50N50V	Jun 2006		0	0	0.0	-0.1	-0.1	-0.1	-0.1	
RU000066	24	17	Barmah-Millewa Forest Operating Rules	50N50V	Mar 2002		-2	33	-1.9	-2.0	-1.9	-2.3	-2.0	
			Shared Measures Sub Total				-2	33	-2.0	-2.1	-2.0	-2.3	-2.1	
			New South Wales											
RU000009	44	18	Boggabilla Weir	NSW	Dec 1991		0	0	-0.1	-0.1	-0.1	-0.1	-0.1	
RU000010	56	19	Pindari Dam Enlargement	NSW	Jul 1994		0	-17	0.7	0.7	0.7	0.7	0.7	
RU000062	14	20	Tandou pumps from Lower Darling	NSW	Sep 1994		2	-3	-0.1	-0.1	-0.1	-0.1	-0.1	
RU000011	16	21	NSW MIL LWMP's	NSW	Feb 1996		-4	57	-4.0	-4.0	-4.0	-4.0	-4.0	
RU000063	17	22	NSW Changes to Edward-Wakool and Escapes	NSW	Jan 1990		-2	4	-2.0	-2.1	-2.0	-2.0	-2.0	
RU000065	21	23	Permanent Trade Accounting Adjustment - NSW to SA*	NSW	Jun 2006		-2	1	-0.5	-0.4	-0.4	-0.5	-0.4	
RU000067	29	24	NSW Sunraysia Irrigation Development 1997 to 2006	NSW	Jul 2003		1	0	0.0	0.9	4.5	6.1	0.7	
RU000172	55	25	RISI NSW	NSW	Jun 2010		-5	0	-2.7	-3.9	-4.1	-4.1	-3.6	
RU000097	26	26	NSW S&DS Commitment Adjustment	NSW	Nov 2002		0	0	0.0	0.0	0.0	0.0	0.0	
			New South Wales Works and Measures				-11	43	-8.8	-9.1	-5.5	-4.0	-9.0	
			Victoria											

	Salinity Credits (Interpolation to Current Year Benefits								5 Year Rolling Review				Confidence	
	NSW	Vic	SA	Qld	ACT	Total		Commonwealth Contribution (EC)	Latest Review	Next Re-view	Status		Rating	Comment
	0.729	0.729				3.890	1	11.8	2007	2012			High	Based on Salt loads in river
	0.140	0.140				0.748	2	0.8	2005	2010			Medium	Based on Salt loads in river
	0.225	0.225				1.198	3	1.2	2005	2010			High	Rules need to be revisited 2007
	0.198	0.198				1.057	4	3.2	2007	2012			High	Based on Salt loads in river
	0.150	0.150				0.797	5	0.4	2005	2010			High	
	0.603	0.603				3.216	6	3.3	2005	2010			Medium	Little pre-scheme data
	-0.146	-0.146				-0.776	7	-0.2	2005	2010			High	
	0.112	0.112				0.598	8	2.0	2007	2012			High	
	-0.140	-0.140				-0.745	9	0.3	2006	2011			High	
	1.872	1.872	0.000	0.000	0.000	9.983		22.9						
	0.021	0.021	0.021			0.128	10	0.1	2005	2010			High	
	0.227	0.227	0.227			1.382	11	1.3	2010	2015			High	Remodelled 2010
	0.227	0.227	0.227			1.391	12	3.0	2006	2011			Low	Salt load continue to rise with scheme in
	0.021	0.021	0.021			0.126	13	0.1	2006	2011			High	Remodelled 2006
	0.225	0.225	0.225			1.370	14	2.9	2008	2011			High	Floodplain and highland
	0.120	0.120	0.120			0.735	15	2.7	2010	2015			High	Salt loads continue to rise with scheme in
	0.840	0.840	0.840	0.000	0.000	5.128		10.1						
	2.712	2.712	0.840	0.000	0.000	15.111		33.1						
	0.001	0.001				0.003	16	0.0	2006	2011			High	Trade figures updated annualy (2006)
	0.189	0.189				0.379	17	0.0	2006	2011			High	
	0.191	0.191	0.000	0.000	0.000	0.381		0.0						
	0.040					0.040	18	0.0	2007	2012			Medium	Remodelled 2007
	-0.121					-0.121	19	0.0	2007	2012			Medium	
	0.034					0.034	20	0.0	2005	2010			Medium	
	0.684					0.684	21	0.0	2010	2015			High	
	0.367					0.367	22	0.0	2005	2010			High	
	0.107					0.107	23	0.0	2005	2010			High	Trade figures updated annualy (2006)
	-0.148					-0.148	24	0.0	2007	2012			High	
	0.783					0.783	25	0.0	2010	2015			Medium	
	0.910					0.910	26	0.0						
	2.656					2.656		0.0						

Register Database unique no.	Real Register no.		**AUTHORITY REGISTER A** (Accountable Actions)	Type	Date Effective	Provisional Salinity Credit ($m/yr)	Current Impact on Morgan 95%ile Salinity (EC)	Impact on Flow at Mouth (GL/y)	Salinity Effect (EC at Morgan)					
									2000	2015	2050	2100	Modelled Current Conditions (Interpolation to Current Year)	
RU000013	3	27	Barr Creek Catchment Strategy	Vic	Mar 1991		-12	0	-7.7	-7.7	-7.7	-7.7	-7.7	
RU000069	4	28	Tragowel Plains Drains at 2002 level	Vic	Mar 1991		1	1	0.2	0.2	0.2	0.2	0.2	
RU000070	5	29	Shepparton Salinity Management Plan	Vic	Mar 1991		0	24	1.4	1.4	1.5	1.5	1.4	
RU000071	50	30	Nangiloc-Colignan S.M.P.	Vic	Nov 1991		0	1	0.5	0.3	0.4	0.3	0.4	
RU000072	10	31	Nyah to SA Border SMP - Irrigation Development	Vic	Jul 2003		19	0	13.3	13.3	13.2	13.3	13.3	
RU000073	35	32	Kerang Lakes/Swan Hill Salinity Management Plan	Vic	Jan 2000		2	4	1.1	1.6	1.1	0.9	1.5	
RU000074	58	33	Campaspe West SMP	Vic	Aug 1993		1	0	0.4	0.3	0.4	0.3	0.3	
RU000019	15	34	Psyche Bend	50V50C	Feb 1996		-4	0	-2.1	-2.1	-2.1	-2.1	-2.1	
RU000076	22	35	Permanent Trade Accounting Adjustment - Victoria to SA*	Vic	Jun 2006		0	2	-0.7	-0.8	-0.8	-1.0	-0.7	
RU000078	30	36	Woorinen Irrigation District Excision	Vic	Sep 2003		0	-2	1.3	0.8	1.0	1.2	0.9	
RU000034	32	37	Sunraysia Drains Drying up	Vic	Jun 2004		-2	-4	-2.1	-2.2	-2.1	-2.1	-2.2	
RU000077	33	38	Lamberts Swamp	Vic	Jun 2004		-5	0	-3.0	-3.0	-3.0	-3.0	-3.0	
RU000105	36	39	Church's Cut decommissioning	Vic	Mar 2006		1	0	-0.4	-0.3	-0.3	0.0	-0.3	
RU000109	46	40	Mallee Drainage bore decommissioning	Vic	Jun 2008		0	0	-0.1	-0.3	-0.3	-0.3	-0.2	
RU000173	54	41	RISI Vic	Vic	Jun 2010		-7	0	-2.0	-5.5	-6.8	-7.1	-4.7	
RU000098	27	42	Victorian S&DS Commitment Adjustment	Vic	Nov 2002		0	0	0.0	0.0	0.0	0.0	0.0	
			Victoria Works and Measures				-7	26	0.1	-3.8	-5.5	-5.7	-2.9	
			South Australia											
RU000099	28	43	Irrigation Development Due to Water Trade with SA 1988 to 2002/03	SA	Jul 2003		7	0	-3.2	7.4	36.0	55.6	4.9	
RU000185	57	44	Irrigation Development Due to Water Trade with SA 2003/04 to 2008/09	SA	Jun 2006		0	0	0.1	0.4	15.1	45.3	0.3	
RU000187	59	45	SA Irrigation Development Site Used Approved 2009/10 to 2010/11	SA	Jun 2010		0	0	-0.1	0.2	8.2	36.7	0.2	
RU000116	39	46	SA Component of Bookpurnong Scheme	SA	Mar 2006		-4	0	2.6	-4.5	-11.6	-12.3	-2.8	
RU000117	48	47	SA Component of Loxton SIS	SA	Jun 2008		0	0	0.1	-0.1	-1.4	-2.5	0.0	
RU000174	52	48	SA component of Waikerie Lock 2 SIS	SA	Jun 2010		-1	0	-1.2	-0.7	-2.0	-2.6	-0.8	
RU000157	42	49	SA Improved Irrigation Efficiency Reg A	SA	Jan 2000		-32	0	-16.5	-20.4	-21.7	-16.5	-19.5	
RU000158	43	50	SA Irrigation Scheme Rehabilitation Reg A	SA	Jan 2000		-3	0	0.0	-2.6	-5.8	-5.6	-2.0	
RU000038	34	51	Qualco Sunlands GWCS	SA	Sep 2004		-4	0	-1.8	-4.0	-6.5	-7.5	-3.5	
			South Australia Subtotal				-37	0	-20.0	-24.2	10.3	90.4	-23.2	
			Queensland											
RU000175		52	Land Clearing Post 2000	Qld	Jul 2005	TBA								
RU000176		53	Irrigation Development Post 2001	Qld	Jul 2005	TBA								
			Queensland Subtotal				0	0						
			Balance - Register A				-275	119	-166.7	-170.3	-135.6	-52.9	-169.5	

Registers explanatory notes: TBA - to Be Assessed
Salinity Effect - increase or decrease in average salinity at Morgan in EC
Salinity Credits - Unit of account of Salinity and Drainage Strategy = Reduction in Salinity Costs ($m/year March 2005 values)
* No permanent trade since 2006; Some of the totals are affected by rounding.

		Salinity Credits (Interpolation to Current Year Benefits									5 Year Rolling Review				Confidence	
		NSW	Vic	SA	Qld	ACT	Total		Commonwealth Contribution (EC)		Latest Review	Next Re-view	Status		Rating	Comment
			1.963				1.963	27	0.0		2006	2011			High	Reviewed 2006
			-0.022				-0.022	28	0.0		2006	2011			High	Reviewed 2006
			-0.384				-0.384	29	0.0		2008	2013			Low	Exclude private pumps
			-0.101				-0.101	30	0.0		2008	2013			High	Remodelled 2009
			-3.140				-3.140	31	0.0		2008	2013			High	Data updated to 2011
			-0.343				-0.343	32	0.0		2003	2008	In Prog-ress		High	Remodelled 2006
			-0.076				-0.076	33	0.0		2010	2015			High	5 year review
			0.237				0.474	34	1.0		2000	2005			Medium	
			0.182				0.182	35	0.0		2005	2010			High	Trade figures updated annualy (2006)
			-0.251				-0.251	36	0.0		2010	2015			High	5 year review
			0.633				0.633	37	0.0		2003	2008			Medium	Review 2010
			0.623				0.623	38	0.0		2004	2009			High	Review 2010
			0.098				0.098	39	0.0		2010	2015			High	Remodelled 2010
			0.051				0.051	40	0.0		2008	2013			High	
			1.081				1.081	41	0.0		2010	2015			Medium	
			1.600				1.600	42	0.0							
			2.151				2.388		1.0							
				-0.585			-0.585	43	0.0		2011	2016			Low	Used Groundwater figures
				-0.117			-0.117	44	0.0		2003	2008			High	Used SIMRAT results
				-0.029			-0.029	45	0.0		2011	2016			High	
				0.316			0.316	46	0.0		2006	2011			High	
				0.002			0.002	47	0.0		2008	2011			High	
				0.054			0.054	48	0.0		2010	2015			High	
				2.438			2.438	49	0.0		2005	2010			Low	
				0.316			0.316	50	0.0		2005	2010			Low	
				0.236			0.236	51	0.0		2007	2012			High	
				2.632			2.632		0.0							
								52				2012				
								53				2011				
		5.559	5.054	3.472	0.000	0.000	23.168		34.1							

Figure 6: 2011 Salinity Registers B

Register Database unique number	Real Register number		**AUTHORITY REGISTER B** (Delayed Salinity Impacts)	Type	Year of Predication	Provision of Salinity Credit ($m/yr)	Current Impact on Morgan 95%ile Salinity (EC)	Impact on Flow at Mouth (GL/y)	2000	2015	2050	2100	Modelled Current Conditions (Interpolation to Current Year)	
			Transfers from Register A											
			New South Wales											
RU000043	200	54	Darling Catchment Legacy of History - Macquarie	NSW	Jan 2000		0	0	0	0.1	0.3	0.4	0.1	
RU000087	201	55	Darling Catchment Legacy of History - Macintyre	NSW	Jan 2000		0	0	0	0.0	0.0	0.0	0.0	
RU000088	202	56	Darling Catchment Legacy of History - Gil Gil Ck	NSW	Jan 2000		0	0	0	0.0	0.0	0.0	0.0	
RU000044	203	57	Darling Catchment Legacy of History - Gwydir	NSW	Jan 2000		0	0	0	0.0	0.0	0.0	0.0	
RU000042	204	58	Darling Catchment Legacy of History - Namoi	NSW	Jan 2000		0	0	0	0.2	0.4	0.5	0.1	
RU000048	205	59	Darling Catchment Legacy of History - Castlereagh	NSW	Jan 2000		0	0	0	0.0	0.0	0.1	0.0	
RU000047	206	60	Darling Catchment Legacy of History - Bogan	NSW	Jan 2000		0	0	0	0.1	0.2	0.3	0.1	
RU000089	207	61	Lachlan Legacy of History	NSW	Jan 2000		0	0	0	0.0	0.0	0.0	0.0	
RU000046	208	62	Murrumbidgee Catchment Legacy of History	NSW	Jan 2000		0	0	0	0.1	0.2	0.2	0.0	
RU000159	215	63	NSW Mallee - dryland	NSW	Jan 2000		0	0	0	0.3	1.3	3.6	0.2	
RU000160	217	64	NSW Mallee - Pre 88 Irrigation	NSW	Jan 2000		0	0	0	0.4	1.2	2.3	0.3	
			Victoria											
RU000050	209	65	Campaspe Catchment Legacy of History	Vic	Jan 2000		0	0	0	0.1	0.2	0.3	0.1	
RU000051	210	66	Goulburn Catchment Legacy of History	Vic	Jan 2000		0	0	0	0.6	12.3	12.3	0.4	
RU000052	211	67	Loddon Catchment Legacy of History	Vic	Jan 2000		0	0	0	0.3	4.9	10.0	0.2	
RU000091	212	68	Kiewa Catchment Legacy of History	Vic	Jan 2000		0	0	0	0.1	0.0	0.0	0.1	
RU000049	213	69	Ovens Catchment Legacy of History	Vic	Jan 2000		0	0	0	0.0	0.6	1.3	0.0	
RU000161	214	70	Victorian Mallee - dryland	Vic	Jan 2000		1	0	0	0.6	2.2	5.9	0.4	
RU000162	216	71	Victorian Mallee - Pre 88 Irrigation	Vic	Jan 2000		2	0	0	1.4	4.7	8.3	1.0	
			South Australia											
RU000092	218	72	SA Mallee Legacy of History - Dryland	SA	Jan 2000		5	0	0	4.2	14.8	33.7	3.1	
RU000093	219	73	SA Mallee Legacy of History - Irrigation	SA	Jan 2000		63	0	0	45.5	85.5	111.6	34.9	
RU000165	220	74	SA Improved Irrigation Efficiency Reg B	SA	Jan 2000		-67	0	0	-48.6	-92.7	-113.3	-37.3	
			SA Irrigation Scheme Rehabilitation Reg B	SA	Jan 2000		0	0	0	0.0	0.0	-1.2	0.0	
RU000177	221	75	**Queensland**											
RU000167		76	Queensland Legacy of History	Qld	Jan 2000	TBA								
RU000168		77	Queensland Irrigation Development pre 1 Jan 2000	Qld	Jan 2000	TBA								
			Balance - Register B			0.000	6	0	0	5.3	36	76.3	4.1	
			Balance - Registers A and B				-269	119	-166.7	-165.0	-99.66	23.44	-161.55037	
			Basin Salinity Target (Morgan) - Modelled Current Status				786	5,090	498	507	582	708	508	
							5							

Registers explanatory notes: TBA - to Be Assessed
Salinity Effect - increase or decrease in average salinity at Morgan in EC
Salinity Credits - Unit of account of Salinity and Drainage Strategy = Reduction in Salinity Costs ($m/year March 2005 values)
* No permanent trade since 2006; Some of the totals are affected by rounding.

		Salinity Credits (Interpolation to Current Year Benefits $m/yr)														
		NSW	Vic	SA	Qld	ACT	Total		Commonwealth Contribution (EC)		Latest Review	Next Review	Status		Rating	Comment
		0.634	0.506	1.337	0.000	0.000	2.607									
		-0.026					-0.026	54			1999	2004	In Progress		Medium	
		0.000					0.000	55			1999	2004	In Progress		Medium	
		-0.001					-0.001	56			1999	2004	In Progress		Medium	
		-0.001					-0.001	57			1999	2004	In Progress		Medium	
		-0.038					-0.038	58			1999	2004	In Progress		Medium	
		-0.005					-0.005	59			1999	2004	In Progress		Medium	
		-0.019					-0.019	60			1999	2004	In Progress		Medium	
		0.000					0.000	61			1999	2004	In Progress		Medium	Little connection to Murrumbidgee
		-0.013					-0.013	62			1999	2004	In Progress		Medium	
		-0.048					-0.048				2010	2015			Low	
		-0.072					-0.072				2010	2015			Low	
			-0.020				-0.020	65			2003	2008			Medium	
			-0.100				-0.100	66			2003	2008			Medium	
			-0.070				-0.070	67			2003	2008			Medium	Remodelled 2006
			-0.029				-0.029	68			2003	2008			Medium	
			0.000				0.000	69			2003	2008			Medium	
			-0.105				-0.105	70			2010	2015			Low	
			-0.245				-0.245	71			2010	2015			Low	
				-0.324			-0.324	72			2011	2016			Medium	
				-4.600			-4.600	73			2011	2016			Low	
				4.669			4.669	74			2011	2016			Low	
				0.004			0.004	75			2011	2016			Low	
								76			2007	2012	In Progress			Low Impact - Long lag times
								77				2011				Modelling required
		0.411	-0.064	1.217	0.000	0.000	1.564									
		5.84687	4.866	4.489	0.000	0.000	24.0529									

APPENDIX III: BASELINE CONDITIONS

The BSMS Baseline conditions are the agreed suite of conditions in place within the catchments and rivers of the Basin on 1 January 2000. They incorporate: land use (level of development); water use (level of diversions); land and water management policies and practices; river operating regimes; salt interception schemes; run-off generation; and salt mobilisation processes, and groundwater status and conditions.

The Baseline conditions given below have been set for all five Basin states including the Baseline conditions for the ACT at Hall's Crossing which was adopted by the Ministerial Council in December 2010 as an End-of-Valley site with a target of 100% of the Baseline conditions.

Table 11: BSMS end-of-valley baseline conditions

Valley	Salinity (EC)		Salt load (t/y) mean	Valley reporting site	AWRC site number
	Median (50%ile)	Peak (80%ile)			
Victoria					
Vic Upper Murray	54	59	150,000	Murray R at Heywoods	409016
Kiewa	47	55	19,000	Kiewa R at Bandiana	402205
Ovens	72	100	54,000	Ovens R at Peechelba-East	403241
Broken	100	130	15,000	Broken Ck at Casey's Weir	404217
Goulburn	100	150	166,000	Goulburn R at Goulburn Weir	405259
Campaspe	530	670	54,000	Campaspe R at Campaspe Weir	406218
Loddon	750	1,090	88,000	Loddon R at Laanecoorie	407203
Avoca	2,060	5,290	37,000	Avoca R at Quambatook	408203
Wimmera	1,380	1,720	31,000	Wimmera R at Horsham Weir	415200
Vic Riverine Plains	270	380	630,000	Murray R at Swan Hill	409204
Vic Mallee Zone	380	470	1,300,000	Flow to SA	426200
Australian Capital Territory					
ACT	224	283	32,700	Murrumbidgee R at Hall's Crossing	410777
New South Wales					
NSW Upper Murray	54	59	150,000	Murray R at Heywoods	409016

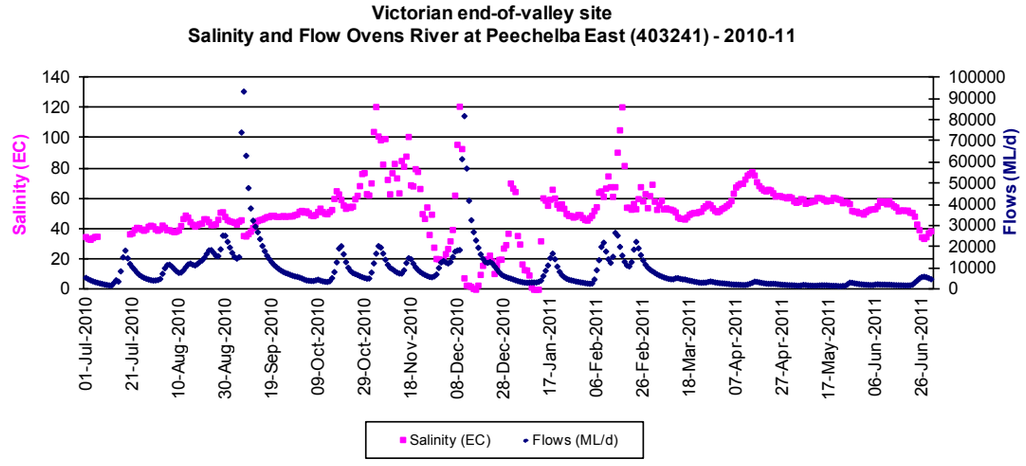
Lachlan	430	660	250,000	Lachlan R at Forbes (Cottons Weir)	412004
Murrumbidgee	150	230	160,000	Murrumbidgee R d/s Balranald Weir	410130
NSW Riverine Plains	310	390	1,100,000	Murray R at Red Cliffs	414204
NSW Border Rivers	250	330	50,000	Macintyre R at Mungindi	416001
Gwydir	400	540	7,000	Mehi R at Bronte	418058
Namoi	440	650	110,000	Namoi R at Goangra	419026
Castlereagh	350	390	9,000	Castlereagh R at Gungalman Bridge	420020
Macquarie	480	610	23,000	Macquarie R at Carinda (Bells Bridge)	421012
Bogan	440	490	27,000	Bogan R at Gongolgon	421023
Barwon-Darling	330	440	440,000	Darling R at Wilcannia Main Channel	425008
NSW Mallee Zone	380	470	1,300,000	Flow to SA	426200
Queensland					
Qld Border Rivers	250	330	50,000	Barwon R at Mungindi	416001#
Moonie	140	150	8,700	Moonie R at Fenton	417204A
Condamine-Balonne	160	210	10,000	Narran R at New Angledool	422030#
	170	210	5,000	Bohkara R at Hebel	422209A
	170	210	4,200	Ballandool R at Hebel-Bollon Rd	422207A
	150	280	6,500	Briaire Ck at Woolerbilla-Hebel Rd	422211A
	170	210	29,000	Culgoa R at Brenda	422015#
Warrego	101	110	4,800	Warrego R at Barringun No.2	423004#
	100	130	5,500	Cuttaburra Ck at Turra	423005#
Paroo	90	100	24,000	Paroo R at Caiwarro	424201A
South Australia					
SA Border	380	470	1,300,000	Flow to SA	426200
Lock 6 to Berri	450	600	1,500,000	Murray R at Lock 4 (Flow)	426514

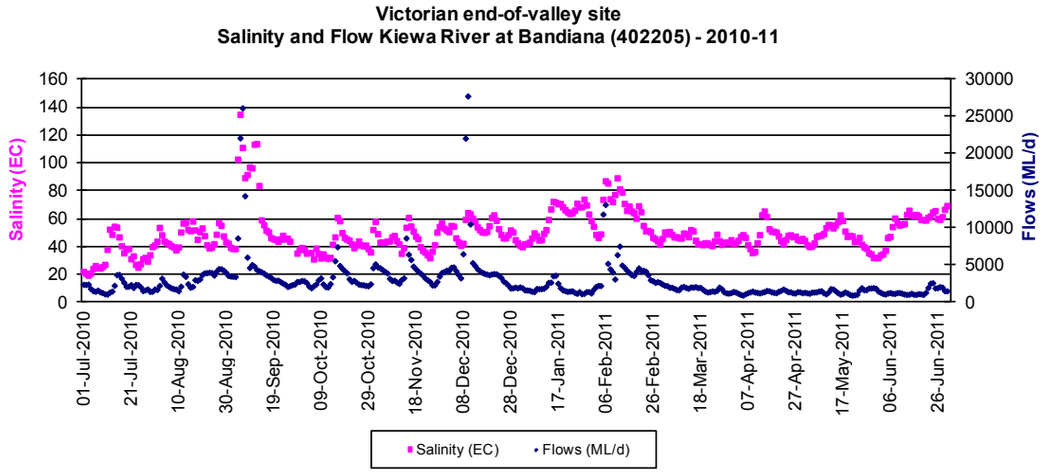
				Berri Pumping Station (Salinity)	426537
Below Morgan	600	820	1,600,000	Murray R at Murray Bridge	426522
All PARTNER GOVERNMENTS					
Murray—Darling Basin	570	920	1,600,000	Murray R at Morgan (Salinity)	426554
		(95ile)		Murray R at Lock 1 (Flow)	426902

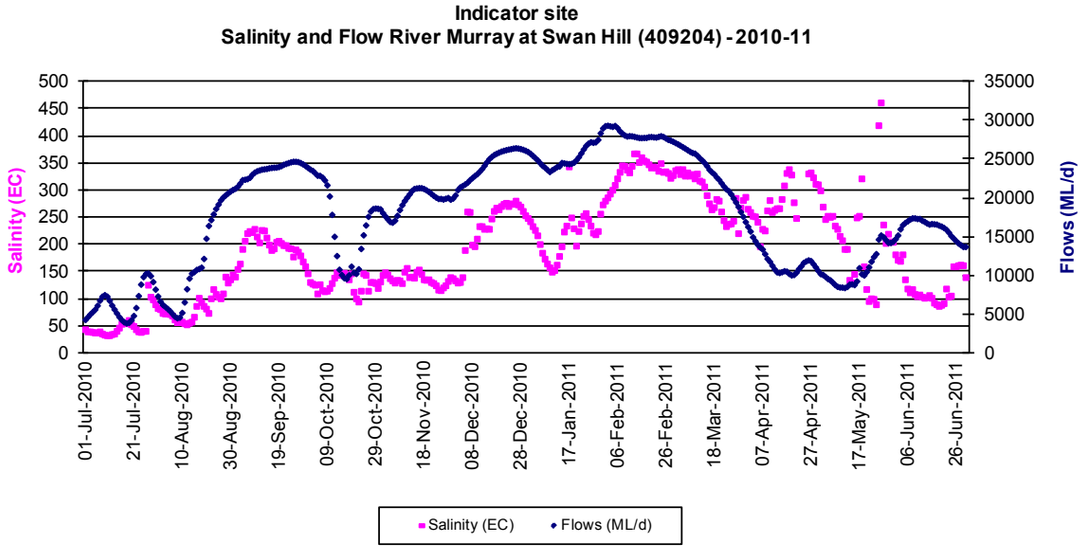
 # These sites are operated by New South Wales for Queensland.

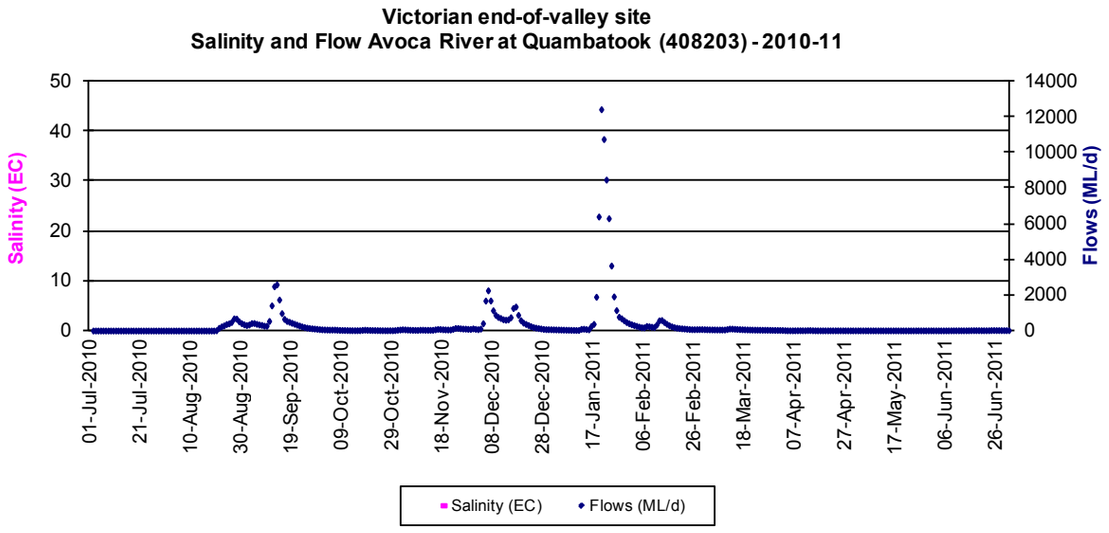
APPENDIX IV: FLOW AND SALINITY DATA FOR END-OF-VALLEY TARGET SITES

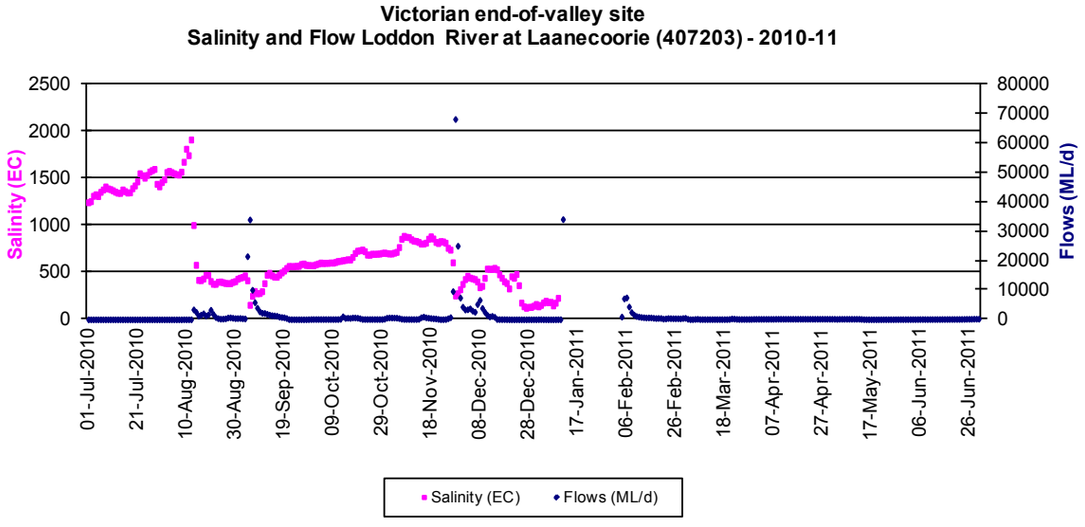
Victoria

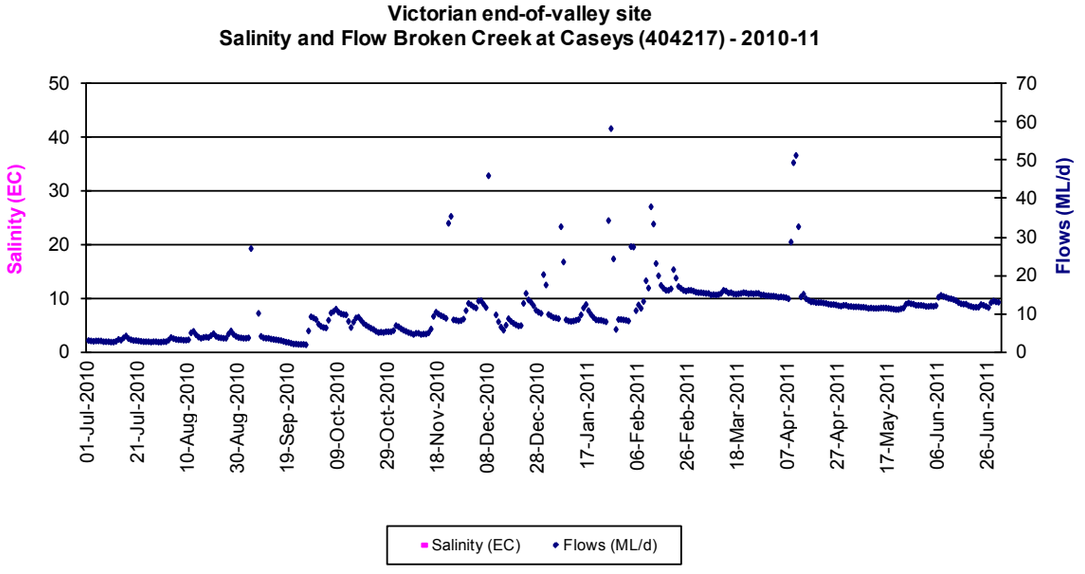




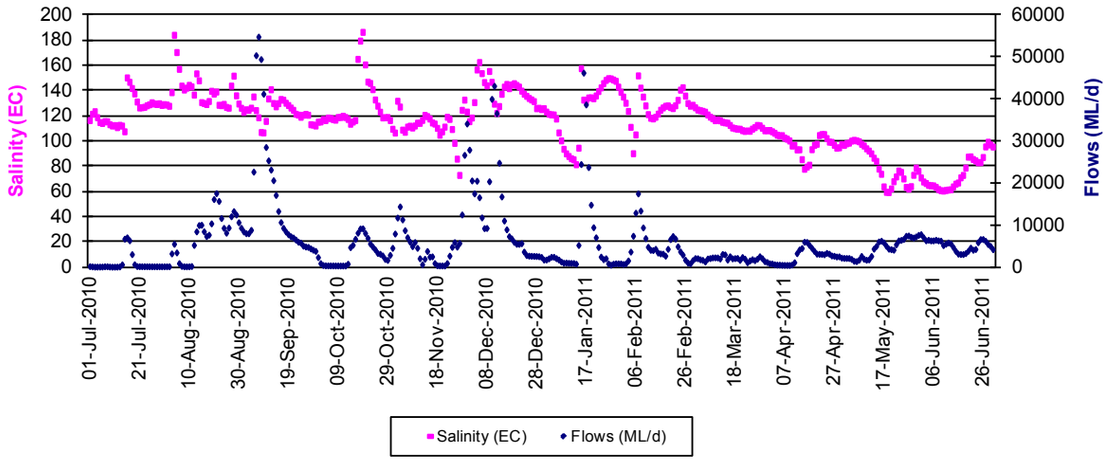



Victorian end-of-valley site
Salinity and Flow Avoca River at Quambatook (408203) - 2010-11
Salinity (EC)
Flows (ML/d)
50
40
30
20
10
0
14000
12000
10000
8000
6000
4000
2000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)

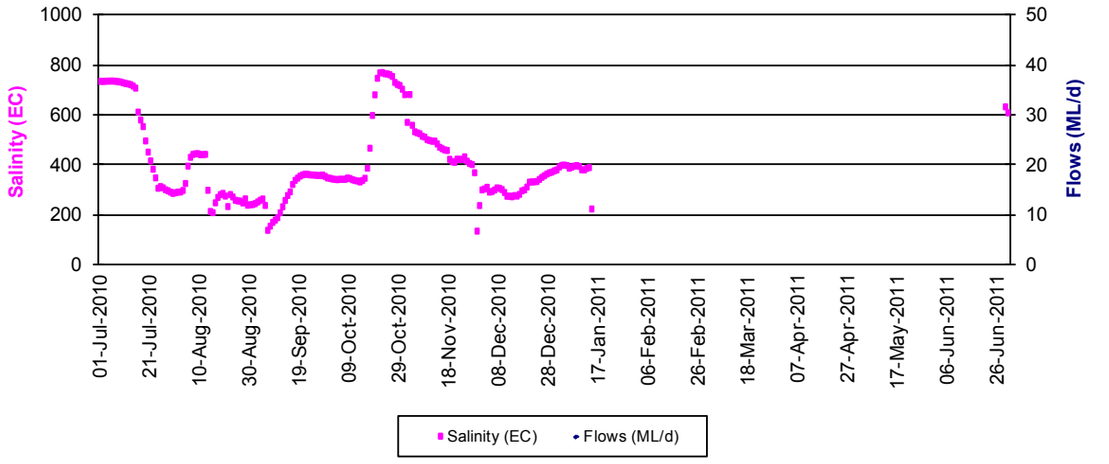

Victorian end-of-valley site
Salinity and Flow Loddon River at Laanecoorie (407203) - 2010-11
Salinity (EC)
Flows (ML/d)
2500
2000
1500
1000
500
0
80000
70000
60000
50000
40000
30000
20000
10000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)


Victorian end-of-valley site
Salinity and Flow Broken Creek at Caseys (404217) - 2010-11
Salinity (EC)
Flows (ML/d)
50
40
30
20
10
0
70
60
50
40
30
20
10
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)

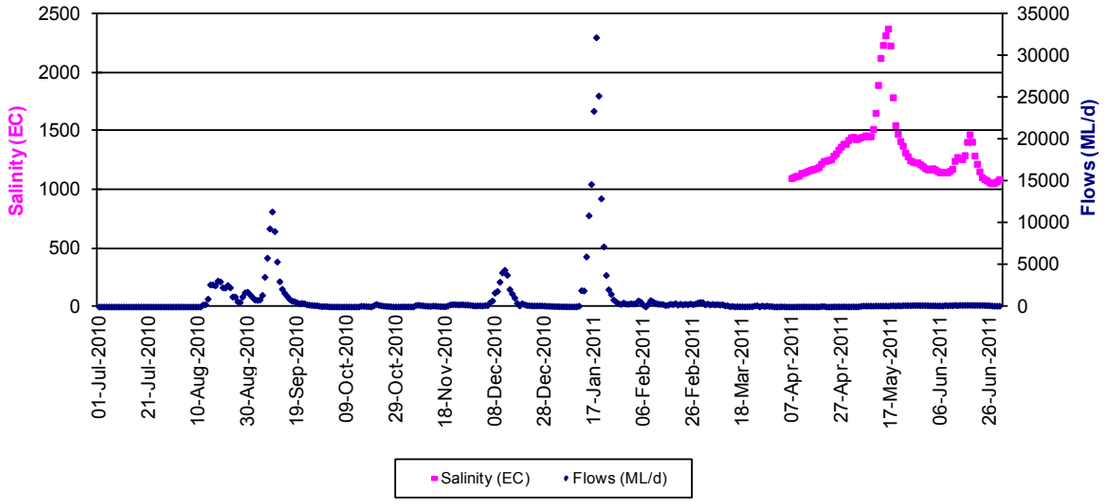
Victorian end-of-valley site
Salinity vs Flow Goulburn River at Goulburn Weir (405259) - 2010-11



Victorian end-of-valley site
Salinity vs Flow Campaspe River at Campaspe Weir (406218) - 2010-11

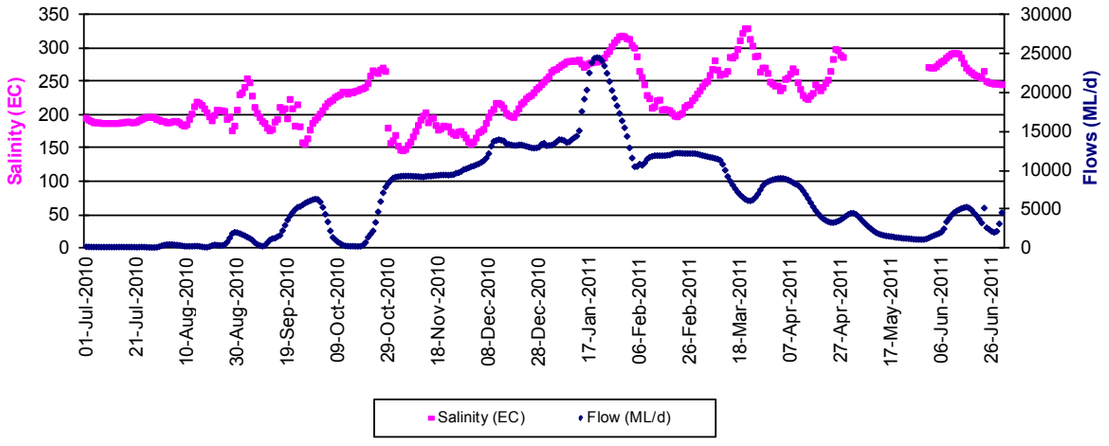


Victorian end-of-valley site
Salinity vs Flow Wimmera River at Horsham Weir (415200) - 2010-11



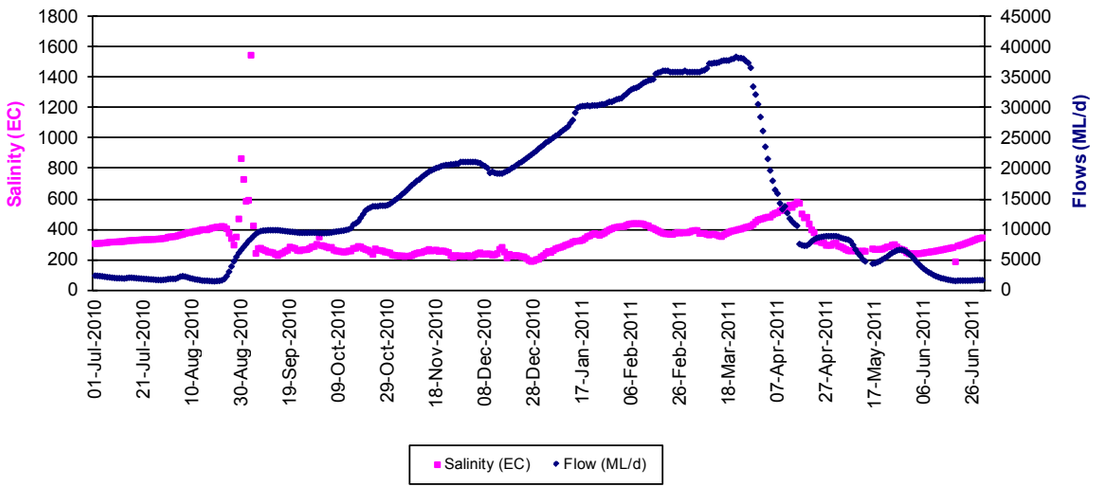
New South Wales

NSW end-of-valley site
Salinity and Flow Murrumbidgee River at Balranald (410130) - 2010-11

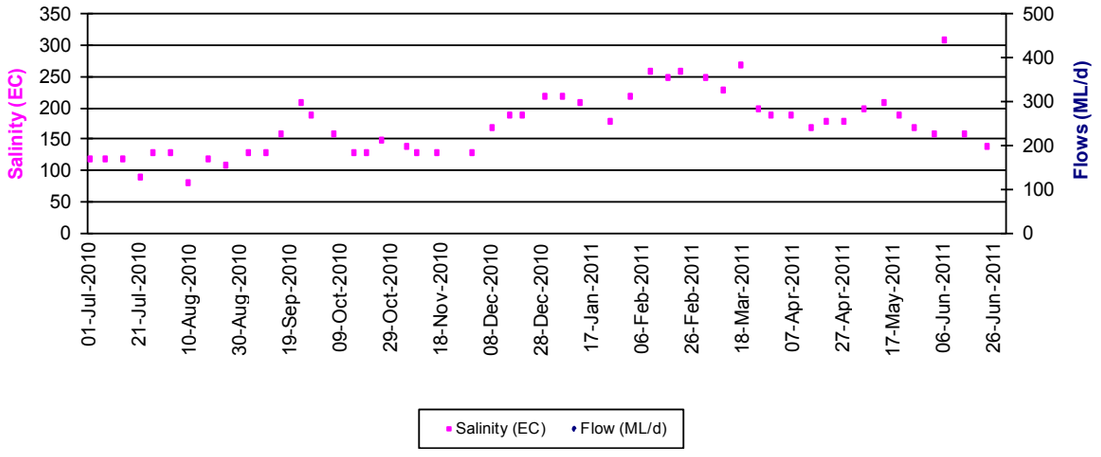


NSW end-of-valley site
Salinity and Flow Barwon River at Mungindi (416001) - 2010-11

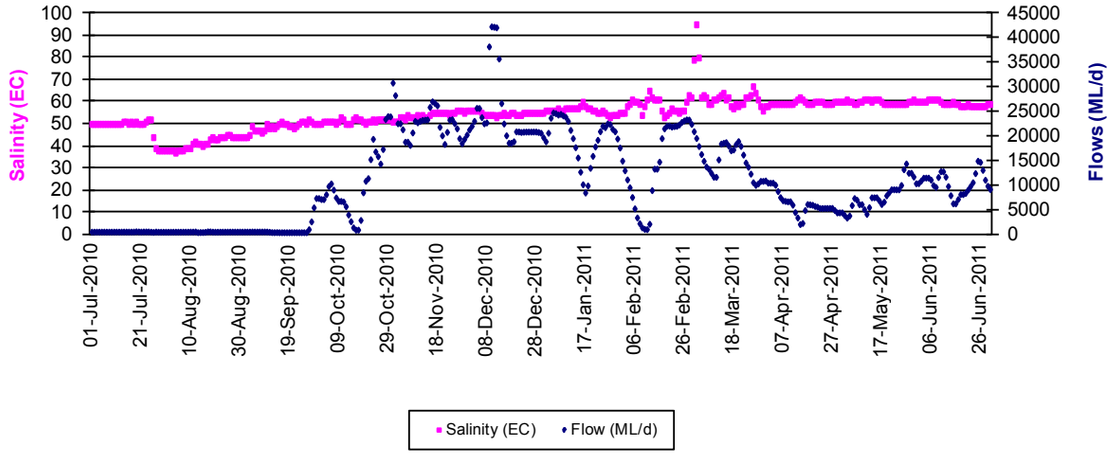
NSW Interpretation site
Salinity and Flow Darling River at Wilcannia Main Channel (425008) - 2010-11



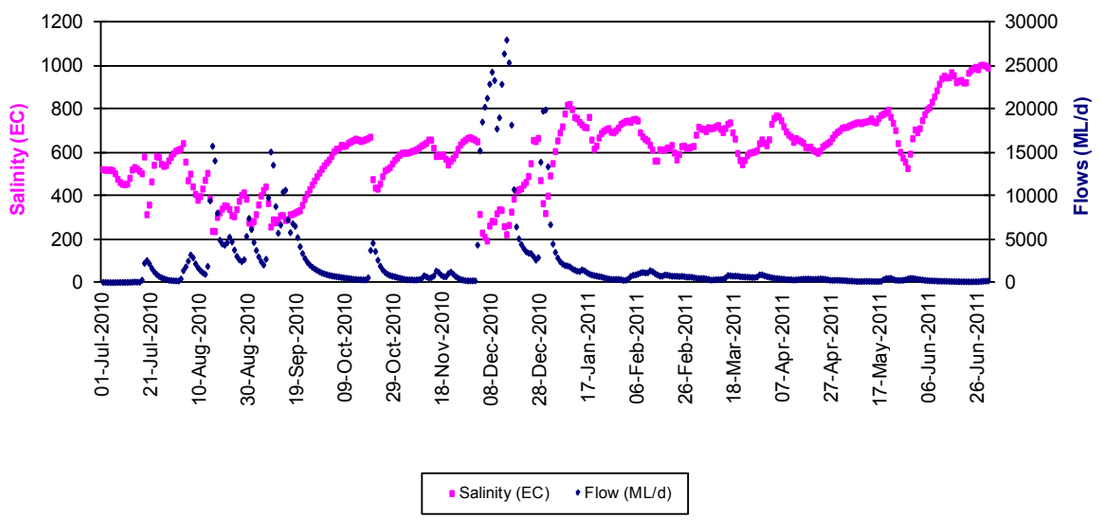
NSW Interpretation site
Salinity and Flow River Murray at Redcliffs (414204) - 2010-11



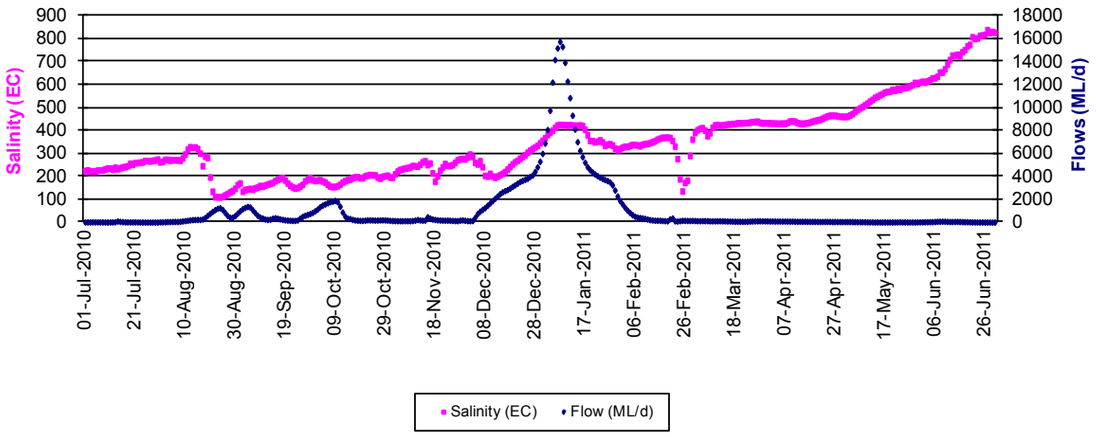
Interpretation site for NSW and Vic
Salinity and Flow River Murray at Heywoods (409016) - 2010-11



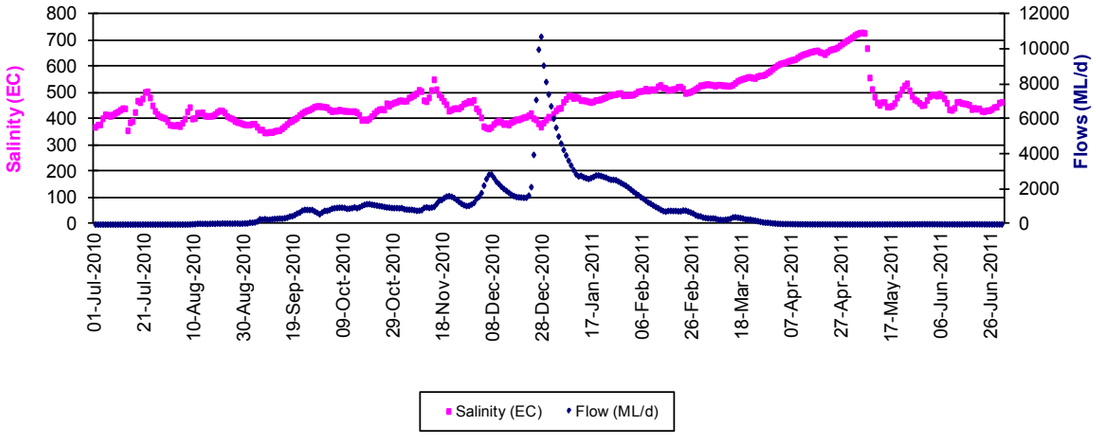
NSW end-of-valley site
Salinity and Flow River Lachlan at Booligal/Forbes (412005) - 2010-11



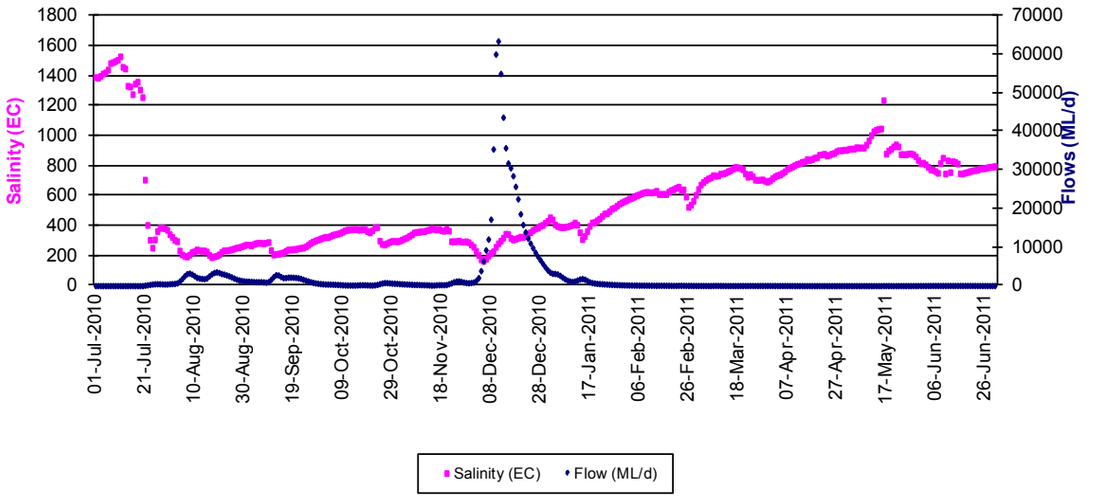
NSW end-of-valley site
Salinity and Flow River Bogan at Gongolgon (421023) - 2010-11



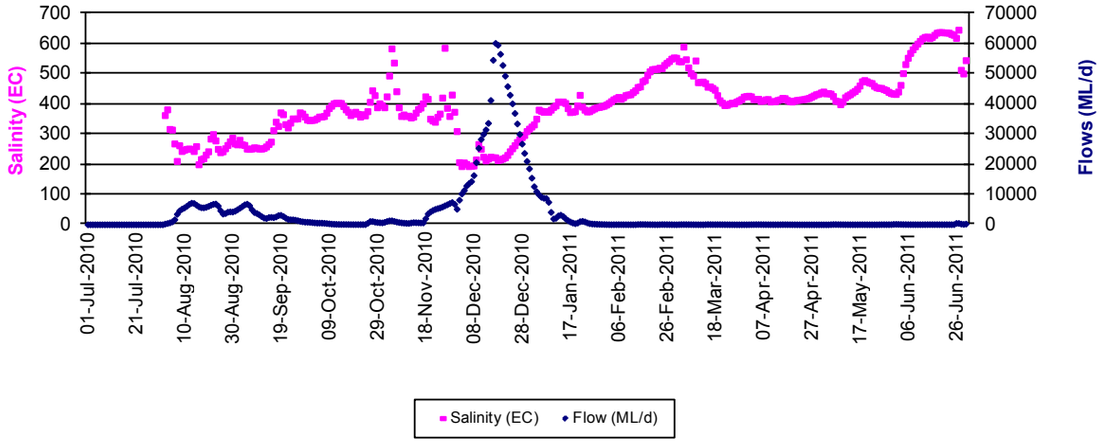
NSW end-of-valley site
Salinity and Flow River Macquarie at Carinda (421012) - 2010-11



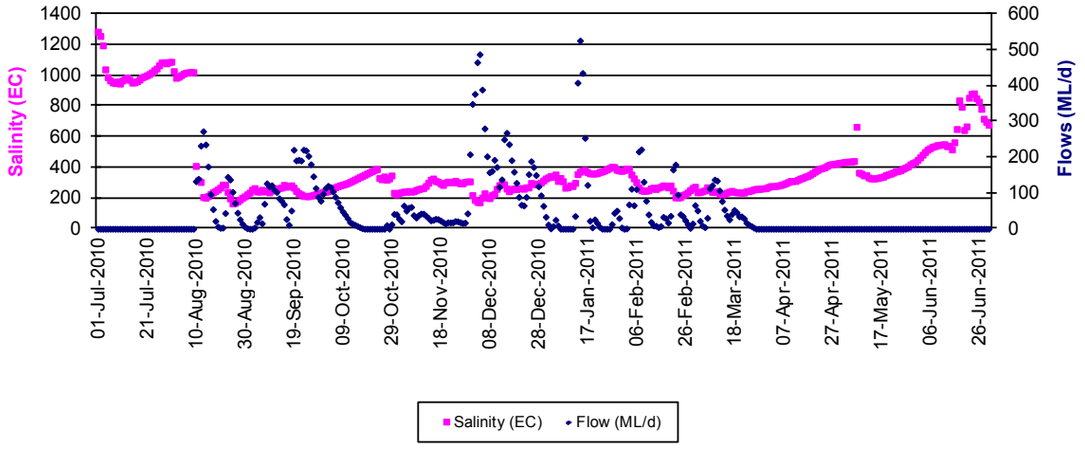
NSW end-of-valley site
Salinity and Flow River Castlereagh at Gungalman Bridge (420020) - 2010-11



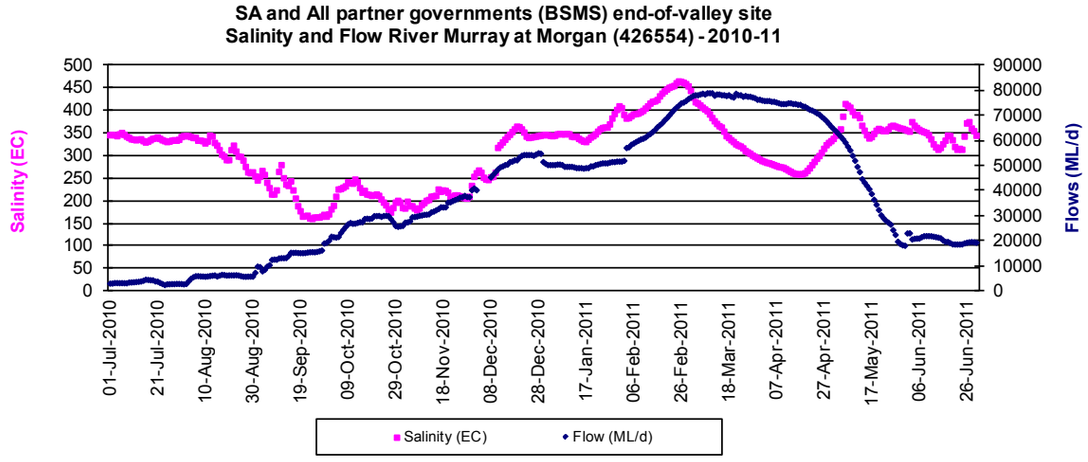
NSW end-of-valley site
Salinity and Flow River Namoi at Goangra (419026) - 2010-11

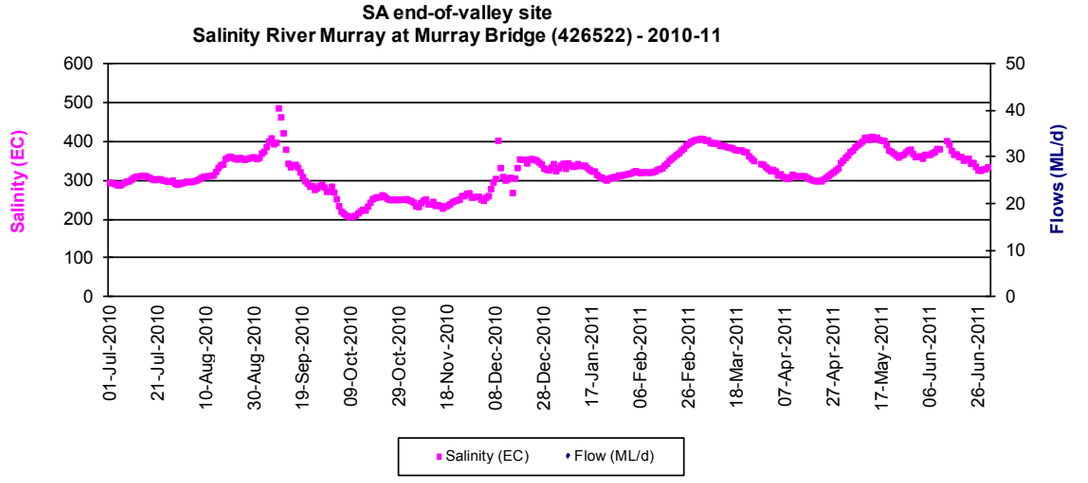


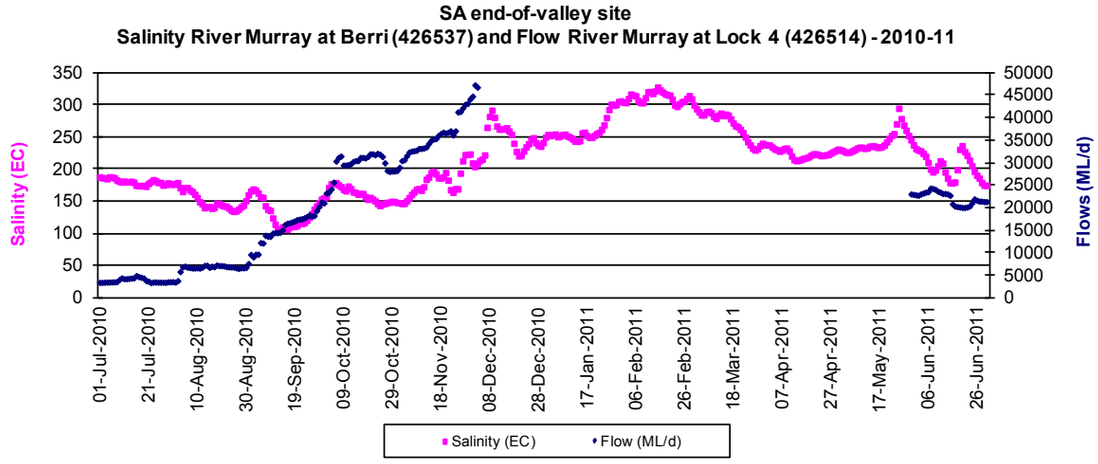
NSW end-of-valley site
Salinity and Flow River Mehi at Bronte (418058) - 2010-11

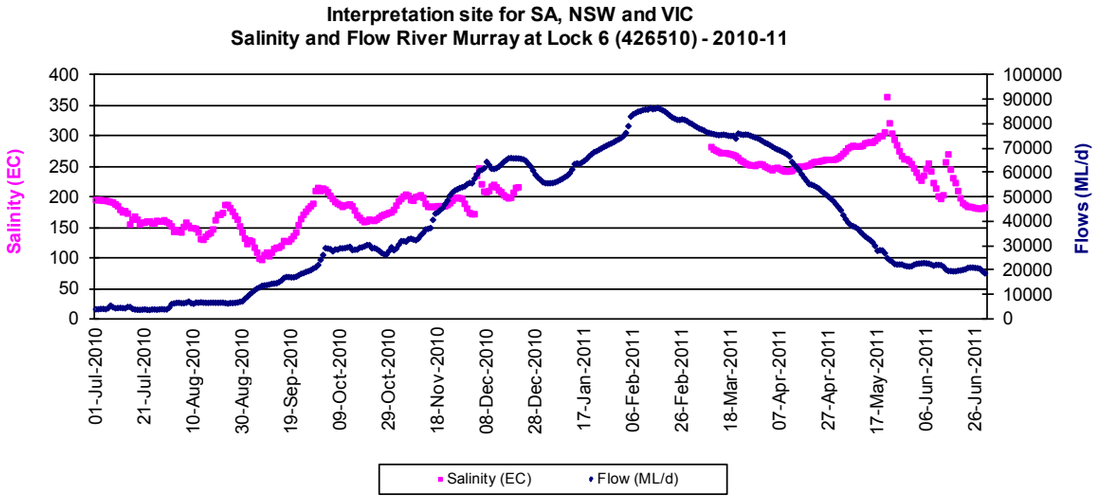


South Australia

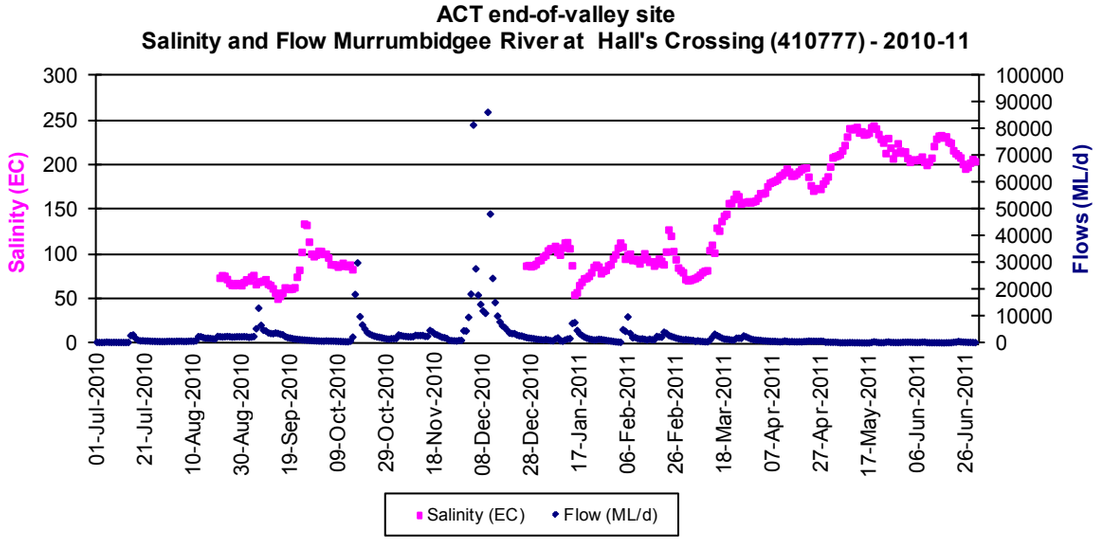




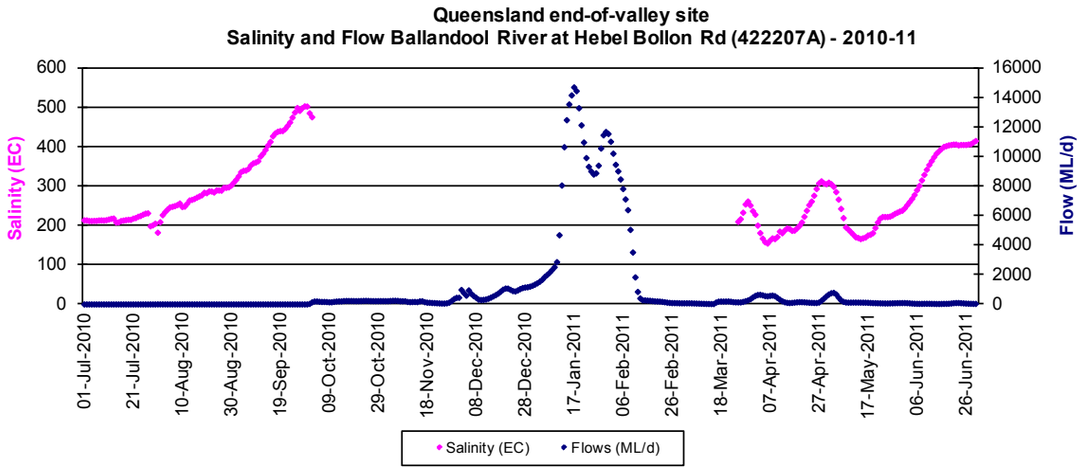


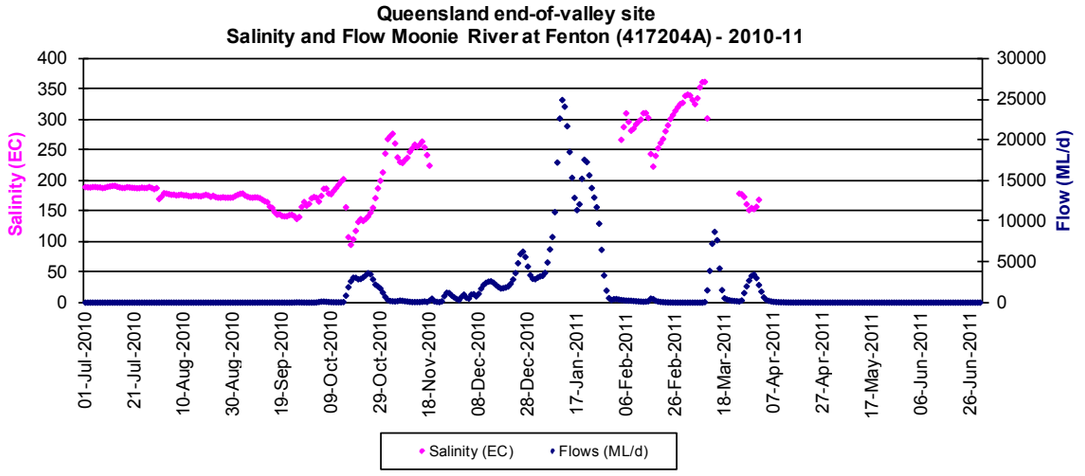


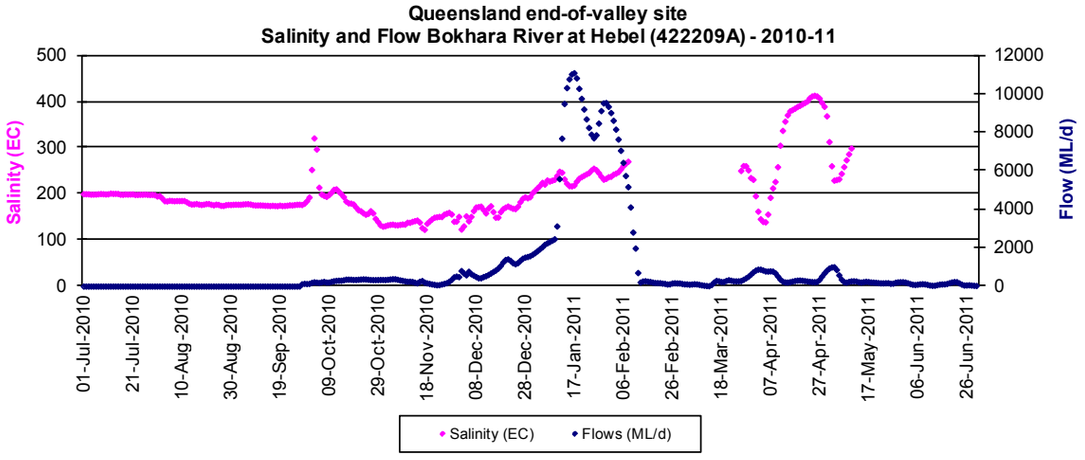
Australian Capital Territory

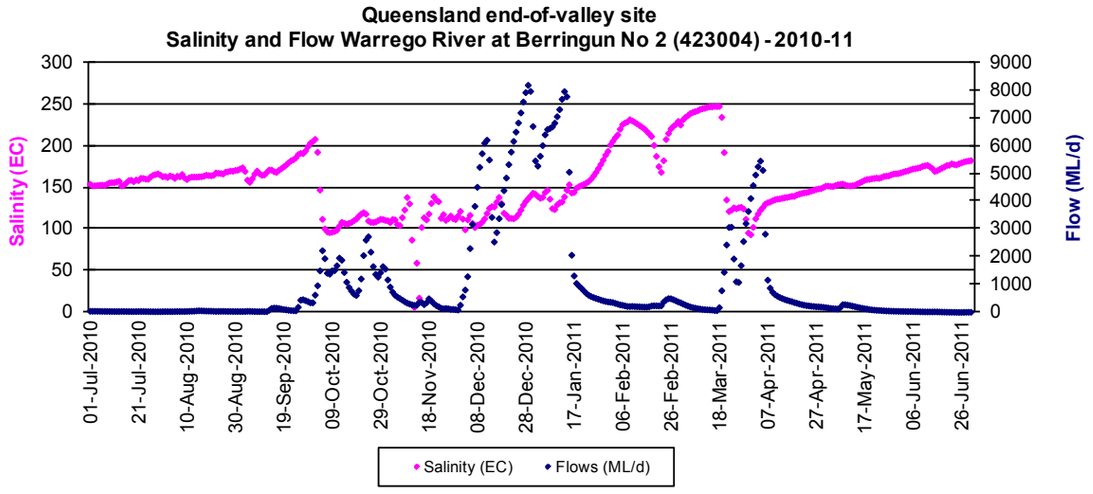


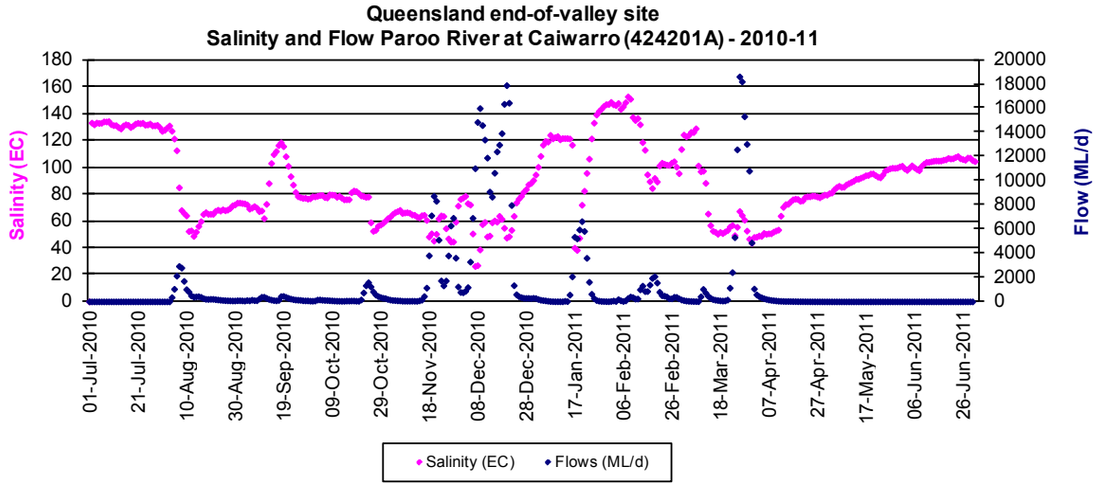
Queensland

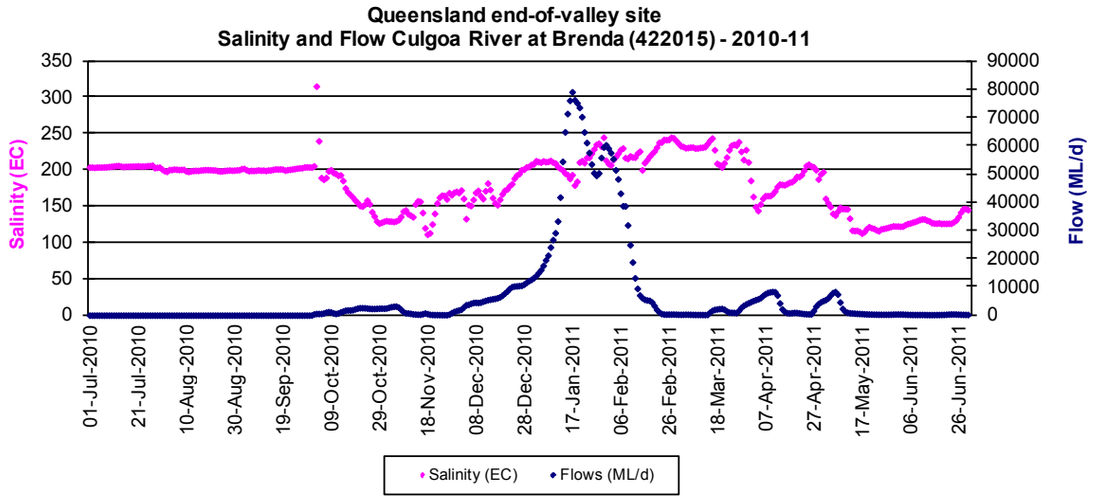

Queensland end-of-valley site
Salinity and Flow Ballandool River at Hebel Bollon Rd (422207A) - 2010-11
Salinity (EC)
Flow (ML/d)
600
500
400
300
200
100
0
16000
14000
12000
10000
8000
6000
4000
2000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)

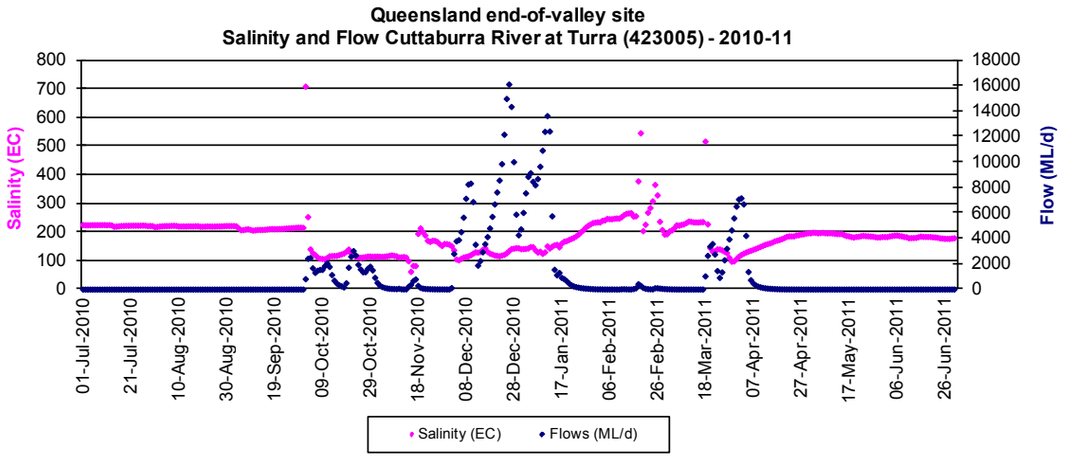

Queensland end-of-valley site
Salinity and Flow Moonie River at Fenton (417204A) - 2010-11
Salinity (EC)
Flow (ML/d)
400
350
300
250
200
150
100
50
0
30000
25000
20000
15000
10000
5000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)

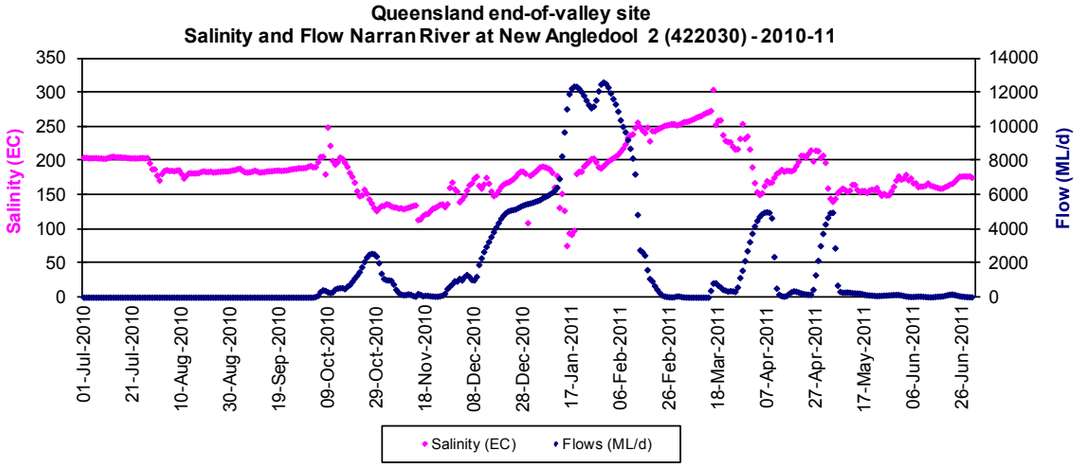

Queensland end-of-valley site
Salinity and Flow Bokhara River at Hebel (422209A) - 2010-11
Salinity (EC)
Flow (ML/d)
500
400
300
200
100
0
12000
10000
8000
6000
4000
2000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)

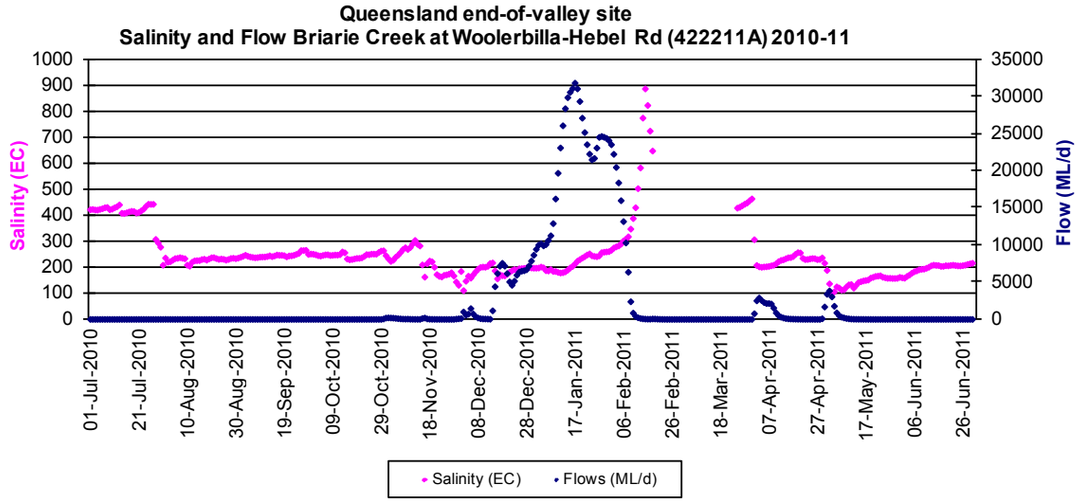

Queensland end-of-valley site
Salinity and Flow Warrego River at Berringun No 2 (423004) - 2010-11
Salinity (EC)
Flow (ML/d)
300
250
200
150
100
50
0
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)


Queensland end-of-valley site
Salinity and Flow Paroo River at Caiwarro (424201A) - 2010-11
Salinity (EC)
Flow (ML/d)
180
160
140
120
100
80
60
40
20
0
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)


Queensland end-of-valley site
Salinity and Flow Culgoa River at Brenda (422015) - 2010-11
Salinity (EC)
Flow (ML/d)
350
300
250
200
150
100
50
0
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)


Queensland end-of-valley site
Salinity and Flow Cuttaburra River at Turra (423005) - 2010-11
Salinity (EC)
Flow (ML/d)
800
700
600
500
400
300
200
100
0
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)


Queensland end-of-valley site
Salinity and Flow Narran River at New Angledool 2 (422030) - 2010-11
Salinity (EC)
Flow (ML/d)
350
300
250
200
150
100
50
0
14000
12000
10000
8000
6000
4000
2000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)


Queensland end-of-valley site
Salinity and Flow Briarie Creek at Woolerbilla-Hebel Rd (422211A) 2010-11
Salinity (EC)
Flow (ML/d)
1000
900
800
700
600
500
400
300
200
100
0
35000
30000
25000
20000
15000
10000
5000
0
01-Jul-2010
21-Jul-2010
10-Aug-2010
30-Aug-2010
19-Sep-2010
09-Oct-2010
29-Oct-2010
18-Nov-2010
08-Dec-2010
28-Dec-2010
17-Jan-2011
06-Feb-2011
26-Feb-2011
18-Mar-2011
07-Apr-2011
27-Apr-2011
17-May-2011
06-Jun-2011
26-Jun-2011
Salinity (EC)
Flows (ML/d)

APPENDIX V: COMPARISON OF 2010-11 WITH LONG-TERM IN-STREAM SALINITY AND SALT LOAD DATA FOR END-OF-VALLEY TARGET SITES

Under the BSMS, the jurisdictions monitor flow and salinity data for the nominated end-of-valley target sites and also, where applicable, for the interpretation sites (monitoring of salinity for shared rivers or valleys that cross state boundaries).

Table 12 summarises the in-stream EC at each monitored site in the Basin. Records indicate the 50th and 80th percentile for 2010-11, as well as the long-term 50th and 80th percentile EC values. The length of the long-term record is also indicated. At a basin scale, the 50th and 80th percentiles salinities for 2010-11 are comparable with longer term statistics in some catchments, and significantly different in others. No clear pattern is apparent. The most significant variations in EC between 2010-11 and the longer-term statistics are likely to be due to dilution role played by exceptionally large flooding regimes that occurred in some catchments that were not apparent in others. For example, the particularly large and extended floods in the Campaspe and Loddon River systems would have provided substantial dilution flows for an extended period of time and influenced downstream River Murray salinities. Elsewhere, short term salinities do in some cases vary somewhat from the longer term statistics, but not to the magnitude of the 50th percentile of the two Victorian systems referred to above.

Salt load estimates were calculated when both EC and flow data were adequately recorded. Table 13 illustrates mean annual salt load for 2010-11 compared to the long-term mean annual loads. Salt load exports for 2010-11 for most tributary valleys were substantially larger due to a flow regime well above average over much of the Basin.

Table 12: Comparison of 2010-11 in-stream salinity data with longer-term records

Site	Length of record (years)	50th percentile		80th percentile	
		2010-11	All data	2010-11	All data
NSW/Victoria shared					
Murray at Heywoods	38	55	52	60	57
Victoria					
Kiewa at Bandiana	38	48	42	60	52
Ovens at Peechelba East	32	52	63	62	92
Broken at Casey's Weir[&&]	0	NA	NA	NA	NA
Goulburn at Goulburn Weir^	22	118	73	133	124
Campaspe at Campaspe Weir[&]	21	363	647	520	836
Loddon at Laanecoorie	3	602	1107	1324	1374
Murray at Swan Hill	44	185	237	274	352
Avoca at Quambatook[$]	25	NA	4150	NA	8140
Wimmera at Horsham Weir	19	1247	1234	1449	1689
Australian Capital Territory					
Murrumbidgee at Hall's Crossing[#]	21	107	232	206	376
New South Wales					
Lachlan at Forbes	12	621	449	722	606
Murrumbidgee at Balranald	45	225	161	271	228
Murray at Redcliffs[~]	44	170	283	212	374
Mehi at Bronte	10	305	426	437	629
Namoi at Goangra	19	401	376	457	532
Castlereagh at Gungalman	10	447	273	817	752
Macquarie at Carinda	19	461	510	525	657
Bogan at Gongolgon	11	321	325	442	510
Darling at Wilcannia	47	306	368	396	512
New South Wales/Queensland shared					
Barwon at Mungindi	19	227	248	360	636
Queensland					
Moonie at Fenton	8	186	131	259	166
Narran at New Angledool	9	184	135	205	191
Bokhara at Hebel	9	185	183	238	219
Ballandool at Hebel-Bollon Road	9	252	180	375	235
Brairie at Woolerbilla-Hebel Road	8	233	237	265	319
Culgoa at Brenda	9	199	163	210	196
Warrego at Barringun	10	157	81	177	154
Cuttaburra at Turra	10	187	111	222	170
Paroo at Caiwarro	7	81	77	119	114

New South Wales/Victoria shared					
Murray at Lock 7 (flow) Lock 6 (EC)	49	215	339	267	456
South Australia					
Berri Pumping Station (EC)	69	219	411	258	575
River Murray at Murray Bridge[&]	77	324	522	367	770
Berri Pumping Station (EC)	69	219	411	258	575
River Murray at Murray Bridge[&]	77	324	522	367	770

*** 95%ile for BSMS Target at Morgan**
^ Used flow data for 405200A (Goulburn River at Murchison)
[#] Missing data relate to lightning strikes and flood damage
[&] Site with no flow
[&&] Site with no salinity
[$] Spot salinity data ends in September 2008
[~] Flow data stops in October 1994
NA - Data not available

Table 13: Comparison of 2010-11 salt load data with longer term records

Site	Length of record (years)	Mean annual salt load (tonnes)	
		2010-11	All data
NSW/Victoria shared			
Murray at Heywoods	38	137300	133700
Victoria			
Kiewa at Bandiana	38	37000	15100
Ovens at Peechelba East	32	103400	41100
Broken at Casey's Weir[&&]	0	NA	NA
Goulburn at Goulburn Weir^	3	161300	57700
Campaspe at Campaspe Weir[&]	0	NA	NA
Loddon at Laanecoorie	3	117900	54700
Murray at Swan Hill	44	841400	598400
Avoca at Quambatook[$]	25	NA	Limited data
Wimmera at Horsham Weir	19	31900	12600
Australian Capital Territory			
Murrumbidgee at Hall's Crossing[#]	21	43900	31400
New South Wales			
Lachlan at Forbes	12	219300	102500
Murrumbidgee at Balranald	45	371600	100600
Murray at Redcliffs[~]	28	NA	1236400
Mehi at Bronte	10	2800	4800
Namoi at Goangra	19	242200	77300
Castlereagh at Gungalman	10	142800	40600
Macquarie at Carinda	19	86200	20200
Bogan at Gongolgon	11	78900	14200
Darling at Wilcannia	47	1159800	377300
New South Wales/Queensland shared			
Barwon at Mungindi	19	169300	48700
Queensland			
Moonie at Fenton	8	13200	7500
Narran at New Angledool	9	74000	18100
Bokhara at Hebel	9	64300	8000
Ballandool at Hebel-Bollon Road	9	5200	600
Brairie at Woolerbilla-Hebel Road	8	141900	68800
Culgoa at Brenda	9	308400	52300
Warrego at Barringun	10	31600	23100
Cuttaburra at Turra	10	35800	21700
Paroo at Caiwarro	7	17200	28900

New South Wales/Victoria shared			
Murray at Lock 7 (flow) Lock 6 (EC)	17	2158500	1240400
South Australia			
Berri Pumping Station	17	732900	485800
River Murray at Murray Bridge[&] Basin Target Site	0	NA	NA
Murray at Morgan*	44	2733200	1499300

*** 95%ile for BSMS Target at Morgan**
^ Used flow data for 405200A (Goulburn River at Murchison)
[#] Missing data relate to lightning strikes and flood damage
[&] Site with no flow
[&&] Site with no salinity
[$] Spot salinity data ends in September 2008
[~] Flow data stops in October 1994
NA - Data not available

APPENDIX VI: BSMS OPERATIONAL PROCESSES DURING 2010-11

The Basin Salinity Management Advisory Panel (BSM AP) terms of reference and membership (with representatives from MDBA, South Australia, Victoria, New South Wales, Australian Capital Territory, Queensland and Australian Government) were approved by the MDBA in June 2010. This advisory panel provides advice to the MDBA through the Natural Resources Management Committee.

Advice of the BSM AP is valuable in implementation of monitoring, evaluation and reporting components, essential to ensure accountability under the Basin Salinity Management Strategy 2001-2015. In 2010-11 the BSM AP established a special taskforce, Environmental Watering Salinity Accountability taskforce (EWSA-TF), to work on salinity accountability issues associated with environmental watering.

The advisory panel provides the necessary co-ordination, quality assurance, functions and policy advice, and liaises closely with the Technical Working Group on Salt Interception. Table 14 provides details of the meetings held during the 2010-11 year.

Table 14: Meeting schedule for the BSMS Implementation during 2010-11

Meeting No.	Meeting date	Location	Representation
BSM AP 5	13 July 2010	Brisbane, QLD	MDBA, NSW, QLD, SA, VIC, AG, ACT
BSM AP 6	30 September 2010	Canberra, ACT	MDBA, SA, VIC, NSW, QLD, AG
BSM AP 7	13 October 2010	Adelaide, SA	MDBA, SA, VIC, NSW, QLD, AG
BSM AP 8	3 March 2011	Melbourne, VIC	MDBA, SA, VIC, NSW, QLD, AG
EWSA taskforce workshop	2 March 2011	Melbourne, Vic	MDBA, SA, VIC, NSW, QLD, AG

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