MURRAY VALLEY PRIVATE DIVERTERS

26th June 2014

REVIEW OF THE COMMONWEALTH WATER ACT 2007

Submission to the Expert Panel

Communication contact:
lbmobile@bigpond.com
PO Box 642
Deniliquin NSW 2710

Murray Valley Private Diverters (MVPD) forwards this submission on behalf of the following organisations in NSW Southern Riverina region. The submission has not made specific references to actual sections of the Act due to time constraints, however the MVPD encourages further discussion with the Panel.

Wakool Landholder Association
Wakool System Advisory Committee
Bullatale Creek Landholders Group
Bullatale Creek Trust
Merran Creek Trust
Wakool River Association
Colligen Creek Landholders
Eagle Creek Pumping Syndicate (Inc)
Bringan Irrigation Trust
Edward River Pumpers

Terms of Reference:

The 2007 Water Act will have major social and economic ramifications on Australia's management of the Murray Darling Basin. The greatest impact will occur in the Southern part of the Murray Darling Basin, both in terms of water recovery and delivery arrangements for environmental flows.

This submission rejects the limitations set under the terms of reference for the review of the Water Act 2007 on the basis that this review, does not encompasses all the provisions, necessary to determine the effectiveness of the legislation.

A key failing is that the review parameters were established by the original wording of the mandatory terms of reference for the 2014 review (Section 253 Water Act 2007)

The Water Act has been subject to a number of legislative amendments since 2007. These amendments were limited but necessary to correct original drafting errors and other matters. In 2008, the Act was amended when during the peak of the drought, it was realised that environmental protection prevailed over **critical human needs**.

To effectively manage water in the Murray Darling Basin to benefit Australia's social, economic and environmental values , further amendments are required.

During the implementation phase of the Water Act 2007, in particular the Murray Darling Basin Plan, further deficiencies in the Act are unfolding.

Recommendation:

- **Enable additional information outside the Terms of Reference to be incorporated in the 2014 Review of the Commonwealth 2007 Water Act**
- **The Review Panel to seek additional time for these matters to be appropriately investigated**

- **Amend the Water Act 2007 to ensure that future reviews parameters are not pre-determined**

Terms of Reference:

1)

Have regard to the extent to which water plans are in transition:

A key failing of the architects of the Water Act 2007 was the failure to incorporate the principles of the National Water Initiative and to give recognition and build upon the previous State/Federal Cooperative arrangements of water management particularly in the Southern Basin.

The Water Act and resulting Murray Darling Basin Plan have yet to be implemented in full. As a result it is too early to answer the set terms of reference questions in this section.

i) The management objectives and outcomes of the Basin Plan are being met
ii) Long-term average sustainable diversion limits are being met and
iii) Targets in the basin plan are being met and
iv) Water trading is occurring effectively and efficiently
v) Other key elements of the basin plan are being implemented.

At this point in time, community responses from those most affected by the Water Act 2007, is that none of these objectives (i-v) have been met.

From its inception, the Water Act 2007 and the Basin Plan have and continues to attract strong community criticism. The Water Act was developed in response to the Millennium Drought and in the absence of sound understanding of how water was previously managed in the Murray Darling Basin.

As the Basin Plan moves from its design to implementation phase, the original concerns expressed through community consultation are now being realised at various levels of Government and even more so by communities most affected.

Recommendations:

The Water Plans should remain in transition for a considerable period into the future until unresolved issues are addressed. This includes the requirement for:

- **robust science to underpin decisions that guide SDL targets and environmental water recovery objectives**
- **a cost benefit analysis of individual environmental flow targets set by the MDBA including an assessment of what environmental flow targets are physically and safely deliverable**
- **an analysis of the independence of the Murray Darling Basin Authority with regard to its role and relationship with South Australia**
- **A review of the MDBA to assess its future capabilities for management planning of the water resources of the Murray Darling Basin.**

An assessment of:

- **i)** Consistency in water charging regimes
- **ii)** Contribution made by those charging regimes to achieving the Basin Water charging objectives
- **iii)** An assessment of the extent to which water is being used in higher value uses
- **iv)** An assessment of the progress in the implementation of improved water information systems, including the National Water Account

Any arrangements on water charging must take into account the differences that occur throughout the basin. These may relate to how water is managed, how water charges are determined, the specific organizational and infrastructure arrangements for water delivery, historical regional differences and the ability of individuals users to pay.

Water charging arrangements must also adequately factor in how to improve Government inefficiencies.

The Water Act 2007 attempts to create uniform water charging regimes, but has resulted in more complex arrangements and further costs to water managers and water users. In particular to smaller water licenses and/or scheme operators.

The Water Act 2007 sought to apply one size fits all rule, which was not achievable. MVPD rejects the concept that uniform rules and charges can apply across the entire Basin.

The Water Act 2007 is creating additional regulatory and compliance costs to water administrators and does not adequately differentiate between a larger water corporation and the capabilities of smaller scheme operators.

The Act has caused additional costs to State Governments which in the case of NSW, is then likely to pass on additional costs to water entitlement holders who may have no capacity to pay or in turn to pass on these additional costs through farm production values.

Water users are not receiving transparent information on Government charges, particularly in relation to the MDBA and other Federal actions arising from the Water Act 2007

<u>The cost of the Water Act 2007 to all Australians has been grossly underestimated and this cost is not matched by transparent environmental gains.</u>

Unless substantive changes are made in the next phase of the Water Act , specifically the Basin Plan implementation phase, it will mean significant additional costs are incurred with no perceivable net gain to the environment. For the Southern Basin in particular, this will be reflected in a major reduction in economic output.

This submission strongly rejects specific language that was used in the Water Act.

The term over allocation should be withdrawn and more adequately reflect actualities of water management in the Murray Darling Basin. To include in the terms of reference an assessment of

how water is being used in higher value uses, is a major reflection on the failings of the architects of the Water Act 2007.

Governments should not attempt to play God by deeming what is a higher value for water use. Government past intervention in commercial industry is littered with failures, specifically it is worth mentioning Managed Investment Schemes and the push by senior bureaucrats and politicians to encourage a non commercial approach for grape and forestry production.

There is no such permanent arrangement in Australian agriculture to reflect a higher value use and therefore should not be part of this assessment/review. A high value crop one day can be a low value crop the next.

Recommendation:

- **Review the appropriateness of the Water Act 2007 objectives in relation to Basin Wide water charging regimes**
- **A cost benefit analysis on new regulatory regimes on smaller water schemes and/or private pumpers**
- **Removal of the Water Act 2007 reference to high value uses**

Commonwealth Water Holder:

CEW trade conditions should be amended to reflect the needs of Government and to maximise opportunity for both the environment and social and economic outcomes. Governments have made a commitment to retain characteristics of the water entitlements they purchased.

The current limitations that restrict trade should be removed to allow to enable the Commonwealth Government to recoup costs associated with management of its environmental water portfolio. This is critical to also avoid any future risks to other water users:

- The CEWH to trade water to maximize resources to reinvest in environmental programs and to pay for environmental water management/water charges and other administrative issues.
- The CEWH has already distorted the water market by the volume of water taken out of production. Distortion of the water market needs to balance in the light of limiting the impacts on other water users whilst seeking opportunity to maximise returns.

Recommendation:

- **CEWH trade conditions be revaluated to enable commercial returns to be achieved**
- **Expand the opportunities for CEWH trade rules to fund additional environmental works**
- **Remove CEWH trade restrictions that specify conditions relating to further water recovery**

2)

The effectiveness of the Act in achieving its objectives

The objects of the Water Act 2007 are not reflected in subsequent wording in the broader body of the Water Act. As a result the application of the Water Act 2007 contradict its own objectives.

A key criticism of the Water Act 2007 is the haste in which it was developed. As a result there has been an insufficient duty of care by the Federal Government in the creation of public water

policy, a factor that will have long term ramifications on the social and economic values of Australia.

The establishment of an 'independent' Murray Darling Basin Authority (MDBA) and timeframes for the Basin Plan, has meant that a major piece of public policy has been developed without the necessary expertise.

The new Authority lacked the necessary water management skills and timeframes were not sufficient to ensure effective planning.

The Water Act 2007 is riddled with contradictions and legal wording ensures that key claims cannot be achieved.

Recommendations:

- **The Water Act 2007 review be expanded and timeframes amended to reflect the scale and complexity of issues**

(a) to enable the Commonwealth, in conjunction with the Basin States, to manage the Basin water resources in the national interest; and

The Water Act 2007 established the Murray Darling Basin Authority (MDBA) with a key role to develop a new Murray Darling Basin Plan. Despite the specific objects of the Act referring to a collaborative approach to manage the Basin Water Resources, this was not effectively done.

This is largely due to the functions, structure and the appointment process of the Board of the Murray Darling Basin Authority.

Without adequate experience, timeframes and skills sets, the MDBA developed the Basin Plan in isolation of the States. As a result since the original Guide to the Proposed Basin Plan (2010), to the final Basin Plan, key failings remain and have not been rectified.

Despite major community and State Government concerns, there has been a systematic failure to address matters that are fundamental to the development of a scientifically robust Murray Darling Basin Plan.

It is disturbing that in the MDBA's documented response to community consultation issues fail to provide an accurate view of community concerns.

Federal and State Government deliberations on the Murray Darling Basin Plan and related water management issues through the Basin Officials Committee (BOC), should not be viewed as meeting the objects of the Water Act 2007. The fact remains that the Murray Darling Basin Plan , a key component of the Water Act 2007 was developed without an appropriate level of consultation or inclusion of the Basin States.

The States are largely now only being consulted on the implementation phase of the Basin Plan. This is not consistent with the objects of the Act which specify a collaborative approach to managing the Basin Water Resources'.

The current structure and format of the Murray Darling Basin Authority has demonstrated a need to resume a more collaborative approach with the States to manage the Murray Darling Basin.

It would be appropriate for the expert panel in this current 2014 review, to also evaluate the Murray Darling Basin in a post drought scenario and review whether the conditions prescribed in the Water Act 2007 are still relevant.

The review will need to look at whether the original concepts set by the Murray Darling Basin Authority (MDBA) are still valid in light of new information. Including the actual capacity of Southern River systems to deliver both irrigation and environmental water flow targets.

Recommendation:

- **The MDBA be restructured to ensure it reflects the skills and expertise necessary to manage water in the Murray Darling Basin**
- **Appointments to the Board are made via recommendations from the States and no individual state should have the power of veto over another State preferred nominee**
- **The BOC have increased capacity in decisions on the Murray Darling Basin and have provisions to seek amendments to the Water Act where appropriate**

(b) to give effect to relevant international agreements (to the extent to which those agreements are relevant to the use and management of the Basin water resources) and, in particular, to provide for special measures, in accordance with those agreements, to address the threats to the Basin water resources;

Australia is a participant to a number of international environmental agreements, many of which involve voluntary participation. These agreements in themselves are not legally binding, however the Water Act 2007 has delivered a regulatory component to which other countries signed to the same voluntary agreements, are not bound by.

The Water Act 2007 was specifically drafted to give effect to 'voluntary' international agreements' as a means for the Commonwealth to assume control over the waters of the Murray Darling Basin. It makes specific reference to Ramsar Convention for international wetland recognition.

A detailed summary of the basis for this approach was outlined by NSW Irrigator's Council briefing note: ***The Water Act 2007 "how did we end up with this?"*** (*9th November 2010*) (**ATTACHMENT A)**

A key failing of the Water Act 2007 is that it prioritises voluntary international wetland agreements (eg Ramsar) over Australia's social and economic values.

This means the Water Act 2007 is not consistent with Australia's other international alignments such as the Australia's National Strategy for Ecological Sustainable Development (ESD) (Dec 1992) endorsed by the Council of Australian Governments (COAG).

Australia's acceptance of these internationally recognised principles, a balance of environmental, social and economic needs, is then contradicted by the Water Act 2007 which prioritises the environment, above social and economic values.

The Water Act 2007 and the resulting Murray Darling Basin Plan, also does not treat Australian' Ramsar recognised sites equally.

The Coorong, Lower Lakes and Murray Mouth (CLLMM) remain the primary driver for additional environmental flow targets under the Basin Plan. As a consequences for achieving the MDBA stated flows to the CLLMM, other upstream Ramsar listed wetlands (eg Barmah Millewa) may suffer significant environmental decline from over watering.

In this region, the largest natural constraint on the Murray River is the Cadell Fault. All environmental flow targets for the Murray River must pass through this region. It is impossible to fulfill environmental flow targets for the CLLMM or Chowilla Floodplain (both in SA) without causing significant overwatering risks to the Barmah Millewa Forest system.

In addition to tree health decline from over watering, a further risk is that environmental flow targets for SA will cause significant changes to the Barmah choke. With continued flow pressure on high risk areas, tree falls will lead to significant erosion and bank collapse.

In this stretch of the Murray, if the thin perched river banks are eroded it will substantially alter the passage of normal regulated Murray River flows through the Barmah choke. This may lead to siltation issues in the Barmah lakes and a redirection of water flows away from the Murray channel to disperse at will in the Barmah and Millewa forests creating 3rd party impacts for other river users, including SA.

Environmental decline as a result of inappropriate timing of forest inundation has been well document since the 1990s. (*refer Page 49-51 Water Planning & the Environment).*

Inundation of associated creeks, roads and creek crossings particularly in late spring will also increase the risks of significant uncontained wildfires. Fire trails or private land access may be compromised making early intervention in fire control impossible.

Local Fire brigades have reported their concerns and evidence of the necessity of early fire intervention in red gum forests, has already been seen in January 2012 in the Millewa Forest (NSW) . When early intervention was prevented by National Park management decisions, it was only good luck and a sustained attack by local farmers that prevented the wider destruction of the Millewa Forest. If fire trails aren't accessible due to intercepting streams cutting access, such early fire control measures would not occur.

None of the adverse risk factors to upstream Ramsar sites have been considered in the quest to establish new flow targets out the Murray Mouth.

Potential adverse environmental impacts are not confined to the Barmah Millewa Forest system. An environmental watering project for the Perricoota Koondrook forest also faces potential adverse impacts from over watering. From an original budget of $57 million, the Perricoota Koondrook Forest Flood Enhancement Work has now confirmed costs of $80 million with estimates putting this figure nearer to $100 million. While the concept initially attracted local community support, this has not continued as significant community concerns in relation to construction works have not been acted upon.

Flood risk fears in regard to the larger flow objectives set by the MDBA remain an outstanding concern. The design capacity for enabling exit flows is not commensurate with the inflow targets. In addition repeated community concerns have been raised in regard to the effects of ponded water on tree health and the effects this will also have on invasive European carp recruitment.

Recommendations:

- **The Panel review ensures that a cost benefit analysis for the protection and enhancement of Ramsar sites are applied equally across the Basin**
- **The Coorong Lower Lakes and Murray Mouth (SA) Ramsar site is reassessed to ensure that other infrastructure options are incorporated into long term plans of management**
- **New transparent arrangements are incorporated for all environmental targets and objectives,**
    - **This should include a rigorous risk assessment framework for environment water users**
    - **Independent scientific data specifically fit for purpose of the Basin Plan (eg in contrast to the MDBAs reliance on the external data or reports used for different purposes eg SRA)**
    - **An evaluation of environmental water flows is assessed in conjunction with adverse environmental impacts, including damage from over watering, river bank slumping and risks of exotic species (eg carp)**
- **A new transparent framework is incorporated for the assessment, measurement and benchmarking of ecological responses**

(c) in giving effect to those agreements, to promote the use and management of the Basin water resources in a way that optimises economic, social and environmental outcomes; and

The Water Act 2007 and subsequent Murray Darling Basin Plan has fundamentally failed to address or optimise economic, social and environmental outcomes. A key reason is that the Water Act 2007 prohibits a balance of these three values.

The environment remains the primary objective as specified under the Act.

There has been widespread public and political belief that as the Commonwealth Government has focused on purchasing water entitlements and/or acquired water through investments in irrigation efficiencies, social and economic values will not be compromised. This is inaccurate as these two strategies do not negate the full social and economic impacts of the Basin Plan on either individuals or the broader communities. Other factors will still have significant impacts, many of these are yet to impact

This was further fuelled by the inability of the MDBA to understand water management in the Murray Darling Basin and limitation of the MDBA commissioned reports on social and economic impacts.

Social and Economic reports cannot in any way be considered comprehensive or to have addressed the full requirements under clause C of the Water Act 2007.

- Social and economic studies were limited in scope by the terms of reference and by short timelines set by political processes. Significant issues were outside the terms of reference set by the MDBA therefore remained un-assessed.

- The MDBA developed the Murray Darling Basin Plan without a parallel understanding of what environmental flow targets could be safely delivered in the Murray River system without 3rd party impacts. There has been no assessment of river capacity constraints in relation to the delivery of productive and environmental water objectives.

- In response to community concerns, the Basin States commissioned a Constraints Management Strategy (CMS) (report due November 2013). The MDBA is now recognizing that constraints issues are more extensive than it first thought but this has not translated into actions to revise environmental flow targets. The November 2013 report could only identify broader areas for further investigation. As at June 2014 the CMS report has not significantly progressed. The MDBA are now preparing a pre feasibility report on constraints issues for the Basin officials Committee. (note: in 2014 the MDBA first version constraints maps were inaccurate, the second series replacements are acknowledged/described by the MDBA as 'back of the envelope' indications of potential bridges or private creek crossings that may be impacted. The pre feasibility report due now in November 2014 also cannot be used as an indication of actual costs)

- Significant water market distortions have already occurred in the temporary water market – this arises from the volume of productive water being taken off the market and converted to environmental use. As the remaining pool of productive water shrinks, water scarcity is driving up the cost of water. This has been not been factored in to social and economic analysis to date. There were early indications for a slight rise in water pricing, but sheer volume of water being taken out of production in the Southern Basin has brought forward water pricing impacts and at cost rises not previously anticipated.

- MDBA has failed to develop any flood risks analysis in the design of their environmental flow targets. The MDBA has publicly stated it will 'learn as we go'. A situation hardly acceptable in duty of care of Governments.

- There has been widespread belief that as the Commonwealth Government has focused on purchasing water entitlements and/or acquired water through investments in irrigation efficiencies, social and economic values will not been compromised. This view ignores all other direct and indirect associated affects of the Water Act 2007

In short, Southern Basin communities have spent significant times and resources identifying major issues with the Water Act 2007 and the Murray Darling Basin Plan. These concerns have been well documented but have not been reflected in subsequent decisions of the MDBA.

Social and economic costs to individuals and organizations has and will continue to be high, but is not recognised.

This submission recommends that the panel tasked with reviewing the Water Act 2007, explore the countless public submissions from the communities most affected. It is these submissions that have attracted the least response and therefore have not been adequately reflected in public documents released by the MDBA. (refer to public submission to the Guide to the Proposed Basin Plan (2010) & subsequent drafts of the Basin Plan reviews, parliamentary inquiries)

Clause C in the Terms of Reference also refers to environmental outcomes. The standard of information relating to the environment is equally deficient as those relating to social and economic values.

The Water Act 2007 parameters have not encouraged robust scientific information or the preparation of adequate scientific planning around environmental objectives and targets.

The Water Act 2007 has fostered a complacent approach to setting environmental targets, without any transparency on what actual objectives can be achieved or the established of benchmarks against which to monitor outcomes against clearly defined targets.

At almost every point, there has been a systematic failure of process and this can be traced back to aspects of the Water Act 2007. This includes the framework for how decisions on the environment could be made and the timeframes in which they were to occur.

As an example, this submission draws attention of the Expert Panel to the inappropriate reliance on the Sustainable Rivers Audit (SRA). Please refer to page 58 *(Water Planning & the Environment*). This report was not designed nor is adequate to underpin a planning process of the magnitude of the Basin Plan.

Of particular concern is that scientific assessments were carried out during the Millennium Drought and the process for evaluating health of Basin Rivers does not meet community expectations for robust science.

The SRA report relied upon by the MDBA was to be the first of three reports and the report itself notes that it was the 1st step toward an analysis of trends'

The SRA report notes:

- *Data was gathered during the Millennium Drought period 2004-2007.*
- *" A severe drought has prevailed over the Basin during the Audit period – it is too soon to say how much this has affected fish & macroinvertebrates communities"*
- *The 'SRA is an audit, concerned with surveillance…….is concerned with signs of change of changes rather than causes'.*
- *'SRA employs a concept of Reference Conditions. This describes the patterns & processes that would be expected to prevail* ***now*** *had there been no significant human ntervention in the landscape. It is open to some uncertainty, because it is estimated rather than measure (note reference condition is not a target for management but is a comparison figure)*

Please refer to attachment B – Page 58 *Southern Riverina Irrigators Submission to the MDBA 'Water Planning and the Environment' (January 2011)*

This submission also draws attention to an MDBA commissioned report – *An Assessment of the ecological and economic benefits of the environmental water in the Murray-Darling Basin, A final report to the Murray Darling Basin Authority from the CSIRO Multiple Benefits of the Basin Plan Project (March 2012)*

This report suggests that the value of the ecological and environmental benefits of the Basin Plan will range from $3 to $8 billion. However in determining these values, the report has relied on feedback from participants involved in a brief survey. At the time it was reported that survey participants may not have been actual stakeholders and assumptions on values for the environment are not transparent or appear to be substantiated.

In respect to private property values in areas immediate adjacent to the Barmah Millewa forest, the report findings are seriously questionable. It is not possible to ascertain how approximate $1 rises and falls in respective NSW/Victorian localities are derived, and any assumptions have completely ignored additional flood risks.

In contrast the report refers to anticipated property value rise for a 1 metre water level rise in Lakes Alexandrina which appear consistent with water front property expectations. (Lake Alexandrina SA property values are anticipated to rise up to $58,000)

Recommendations:

- **The Water Act 2007 is amended to reflect a balance between social, economic and environmental values**
- **A comprehensive review is undertaken to identify specific sections of how the Water Act 2007 has failed to meet its own objectives.**
- **The Panel encourages a review of the social and economic reports commissioned by the MDBA to incorporate new information and identify issues not factored into these reports**
- **The Murray Darling Basin Plan is applied equally across the Basin. The Basin Plan only applies above Lock 1 but the primary beneficiaries are social, economic and environmental values of *South Australia below Lock 1.***
- **A review is conducted to determine why the Basin Plan has focused on the Southern Basin in particular the Murray, Goulburn and Murrumbidgee Rivers. Of the 2750GL to be recovered for the environment, 2289GL is to be sourced and therefore delivered in the Southern Basin.**

- **Full cost benefit analysis are applied to decisions on the environment including an adverse risk analysis for upstream environments in the mid Murray.**

(d) without limiting paragraph (b) or (c):

(i) ***to ensure the return to environmentally sustainable levels of extraction for water resources that are overallocated or overused; and***

This section of the Water Act 2007 sets an incorrect understanding of how Murray Darling Basin Waters are effectively managed. Over allocation is an incorrect term and ignores how water entitlements are managed and yield is allocated.

Recommendation:

The Panel introduce terms that are reflective of actual water management terminology

(ii) to protect, restore and provide for the ecological values and ecosystem services of the Murray-Darling Basin (taking into account, in particular, the impact that the taking of water has on the watercourses, lakes, wetlands, ground water and water-dependent ecosystems that are part of the Basin water resources and on associated biodiversity); and

This section of the Water Act indicates that the Murray Darling Basin should be restored to set conditions and to provide an ecosystem service that remain non prescribed.

The values of such services are interpreted by those making the rules, however definition of ecological value as interpreted by the Murray Darling Basin Authority has some major deficiencies.

For example, the Coorong Lower Lakes and Murray Mouth are categorized into an area to be protected, restored, but to what. The MDBA incorrectly described and set targets on the basis that the Lower Lakes were always fresh and that sea water intrusion (eg estuarine conditions) only occurred since 1900 due to upstream extractions. The MDBA make repeated references to literature that supports this position and such references can be further seen in the 2014 MDBA Environmental Watering Plan for the CLLMM.

In valuing ecosystem services, there remains in Australia no clearly transparent definition of how these services are valued and by whom. Largely ecosystem services are often a value applied by urban communities over rural areas or natural areas, but with little or no understanding of the true impacts on the environment or the communities affected.

Commissioned reports from the MDBA utilise survey findings to help gauge a view about how ecosystem services are valued. These surveys may be by phone answers may given without the participant being required to value a service if he/she had to actually pay. Refer to: MDBA Commissioned report : *An Assessment of the ecological and economic benfits of the environmental water in the Murray-Darling Basin, A final report to the Murray Darling Basin Authority from the CSIRO Multiple Benefits of the Basin Plan Project (March 2012)*

This same report describes the economic benefits of environmental water in the Murray Darling Basin as between $3 and $8 billion. It is not transparent how these values were determined.

This is the most common complaint about the Water Act 2007, communities and State governments who have intimate knowledge of water management, local environments and risks have had the least say.

.

Recommendations:

- **The Water Act 2007 is revised to ensure more appropriate evaluation for benchmarking environmental conditions and to incorporate such actions in to setting environmental flow objectives under the Basin Plan**
- **The Water Act implements together with key affected stakeholders a framework to determine what position environments are to be restored to under Australia's variable climate scenarios**

(iii) subject to subparagraphs (i) and (ii)—to maximise the net economic returns to the Australian community from the use and management of the Basin water resources

To meet this objective the Water Act 2007 requires revision to ensure that economic returns for the use and management of Basin water resources are maximised.

Contrasting this objective, the body of the Water Act 2007 sets parameters that prescribe the opposite outcome. The result is that the Water Act seeks to reverse previous Governments investments in water storage systems and drought preparation strategies for water planning in Southern Australia. With this comes significant hanges to the economic and social prosperity of the Murray Darling Basin.

The Act substantially reduces the economic maximisation of water in the Southern Basin and puts at jeopardy generational government investment in water storages and security.

The Water Act 2007 has generated more uncertainty, increased risks to both irrigators and dependent communities and will drive up the cost of water for no substantial environmental benefit.

The Environment already receives a 58% share of the Murray Darling Basin Waters (MDBA). In addition Significant amounts of environmental water goes un- recorded. *(**Attachment B:** P5 Water Planning & the Environment*) Further the environment continues to derive benefits under regulated conditions and the delivery of irrigation water.

The Act is specifically designed to benefit one section of the Basin (below Lock 1) a fact described as the beneficiary in the original *MDBA Guide to the Proposed Basin Plan (2010)*

When considering how to maximise the net economic returns to the Australian community from the Basin water resources, there is clearly a failing in the design of the Act.

The original concept of an overarching Act was to implement sections of the National Water Initiative that required a Federal perspective. However the Water Act 2007 was developed in the peak of the Millennium drought and it strayed from the original concepts.

The Water Act /Basin Plan became an opportunity for redefining States shares of the Murray River. Consequently South Australia share of the Murray resources will rise by up to 2000GL. Although the MDBA was initially very explicit about 'end of system flow objectives in SA', subsequent community reaction led to a different description. The Basin Plan now largely referred to requiring water to meet the needs of 18 environmental indicator sites

Information on Environmental indicator sites (18) are not transparent, nor are there benchmarks to ascertain what changes are to be actually achieved. The key beneficiary site remains the CLLMM, where actual targets are set, including new flows out the Murray Mouth and new salinity targets for the former estuary. **(Refer Attachment B)**

In addressing this objective of the Act , the Australian public has been misled as to the actual extent environment decline, its recovery after drought and how effective the prior management of the Basin Waters have been in the Southern Basin.

Terms of reference 2 continued)

2) b)

Opportunities to reduce or simplify the regulatory and/or reporting burden while maintaining effective standards

This submission does not have sufficient timeframes to explore broader issues around regulatory and reporting burdens. MVPD seeks further opportunity to discuss these issues in more detail with the Panel.

MVPD does refer to inconsistencies in the application of reporting requirements in regard to irrigation supplies and the use of water for environmental purposes.

Effective environmental reporting standards are a significant omission in the Water Act 2007. As a result it has been possible for the MDBA to set targets in the absence of robust information to support such targets and to ascertain how those targets will be measured, monitored and what benchmarks and goals are set.

Recommendation: The Water Act 2007 is reviewed to ensure that environmental targets set by the MDBA are subject to a rigourous scientific evaluation process. Transparent bench marks should be transparent and enable the public to interpret what are the actual objectives being sought and to monitor outcomes.

3)
The review will also recommend appropriate future review points for the Act and the Basin Plan, noting the 2019 implementation date of the Basin Plan

The communities of the Murray Darling Basin have 'reform fatigue'.

The pace of changes to water policies in Australia have not allowed investment decisions to effectively managed and the current approach is undermining investment confidence.

Examples of the pace of changes can be seen in:

- 1997 Cap on extractions (Murray)
- 2002 Living Murray
- 2004 National Water Initiative and implementation of new Water Sharing Plans
- 2007 Water Act
- 2010 Guide to the Proposed Basin Plan
- 2012 Basin Plan

A review of the Water Act 2007 and the Basin Plan will need to account for continued adjustments and need for improvements in its implementation. However, water property rights cannot be undermined by continued changes that seek to implement additional water for the environment.

Any future review need to minimize commercial investment risks. Water policies in Australia are undermining industry confidence and are leading to substantive rises in the remaining of price of productive water. It is important to bring a level of stability to help regain a level of investment confidence and social stability.

A major failing of the development of the Water Act and Basin Plan is that stakeholders most affected by the decisions had the least impact in community consultation.

The development of the Water Act 2007 and the Basin Plan was removed from the previous cooperative arrangements under the previous Murray Darling Basin Commission. It is important that any review effectively delivers a joint approach that includes a collaborative partnership with the States.

The true costs of the Water Act 2007 remain unknown but are expected to exceed $12 billion particularly with the inclusion of additional implementation risks and decline in economic output as the full affects of the Basin plan become apparent.

Limited provision addressing 3rd party impacts (eg to be outlined in the Constraints Management Strategy (CMS)) are only reflected in the announcement of the additional $1.77 billion to recover

an additional 450GL. In this announcement, an amount of $200 million was set aside to relax constraints.

The concept of 'relaxing constraints' is largely fictional and based on a perception of the MDBA that there would be no 3rd party impacts. Some are natural physical constraints such as the Cadell Tilt (southern NSW) remain a significant natural constraint to water delivery to South Australia, others may require significant purchases of private land, new bridges , roads, compensation to industry and shires for additional costs to be borne.

This submission encourages the Review Panel to investigate all options to incorporate any amendments necessary to Water Act 2014.

This could include:

- Immediate recommendations to improve aspects of the Water Act 2007
- A review process that incorporates the SDL Adjustment mechanism
- A review on the current and accumulative costs to Australia's national interests of the Murray Darling Basin Plan

Recommendation: Future Reviews of the Water Act 2007 and Basin Plan avoid the inclusion of mandatory provisions whereby other aspects are excluded (as has occurred with the original Water Act 2007)
Recommendation: any review is undertaken in joint agreement with the States
Recommendation: A review is conducted with full public consultation that regards communities most impacted as key stakeholders.

This submission contains a number of attachments as supporting documents: These include:

Attachment A – NSW Irrigators Council Briefing Note: 'How did we end up with this?' (9 November 2010)

Attachment B – Southern Riverina Irrigators submission to the Guide to the Proposed Basin Plan (January 2011)

Attachment C – Southern Riverina Irrigators additional correspondence - RRAT Senate Inquiry Murray Darling Basin

Attachment D - Prof John Briscoe Harvard University – Submission to the Standing Committee on Legal and Constitutional Affairs of the Senate (2011)

NOTE: Professor Briscoe was invited by the MDBA to participate in an external review process on the Guide to the Proposed Murray Darling Basin Plan

NSWIC
NEW SOUTH WALES IRRIGATORS' COUNCIL

PO Box RI437
Royal Exchange NSW I225
Tel: 02 925I 8466
Fax: 02 925I 8477
info@nswic.org.au
www.nswic.org.au
ABN: 49 087 28I 746

Briefing Note

The *Water Act*

"How did we end up with this?"

9 November 2010

Andrew Gregson
Chief Executive Officer

Introduction

The *Water Act* (Cth) 2007 ("the Act") is an Act of the Commonwealth Parliament. It deals with a range of issues relevant to the use and management of water across the Murray-Darling Basin (MDB). These matters include;

- The MDB Agreement (or interstate water sharing agreement), which is an Inter-Governmental Agreement (IGA) between the Commonwealth and relevant States;
- The management of Basin water resources (including the Basin Plan);
- State water resource plans;
- Risk allocation in the event of a reduction water availability;
- Critical human water needs;
- Rules for management of the water market and the regulation of operators who deliver water;
- Water information;
- Commonwealth environmental water management; and
- The establishment and operation of the MDB Authority.

From the perspective of NSWIC Members and levy payers, the Basin Plan is the critical component of the Act.

Background

The Act has been before the Commonwealth Parliament twice – once under a Coalition Government and once under a Labor Government. It initially came before the Parliament under Minister Turnbull in 2007 and then had a series of amendments (primarily additions – matters other than the Basin Plan) made to it in late 2008 under Minister Wong.

To adequately understand how the Act became what it is – an environment focused process with social and economic considerations an afterthought – it is necessary to understand the political scenario at the time it was being developed.

Then Prime Minister Howard needed an environmental issue. For a variety of reasons, he chose water and focused on the MDB. The "blueprint" for that reform was the National Water Initiative (NWI) – still called the "blueprint" by Minister Wong and still overseen by the National Water Commission (NWC). The NWI, itself an IGA, set out the triple bottom line approach to resource management (social, economic, environmental). There was a clear goal in the NWI for the Commonwealth to legislate to enforce its provisions. Note that both Mike Taylor (Chairman, MDBA) and Ken Matthews (Chairman and CEO, NWC) publicly state that the Basin Plan is unlikely to be NWI compliant as the triple bottom line is abandoned.

In order to get that legislation right, the Commonwealth needed the cooperation of the States (either simultaneous legislation or, preferably, a referral of powers). Of course,

the period during which this was occurring was becoming increasingly unstable for political reasons. Eventually, the relationship between Canberra (Coalition) and the States (all Labor) broke down to the extent that one State, Victoria, essentially withdrew completely.

By this stage, the Act was at version 63 or thereabouts. That is, it had undergone significant consultation and change in the drafting process. Without the political will of the States, however, the Act's very Constitutional validity was in question. Did the Commonwealth have the power to "go it alone"?

It appears that the Coalition Government instructed Parliamentary Counsel to find sufficient Commonwealth power to implement the Act.

Constitutional Capacity

The Australian Federation is constructed such that all power is reserved to that States except that which they specifically provided to the Commonwealth at Federation. The powers which were granted to the Commonwealth are contained within the Constitution.

To properly implement the NWI, an additional referral of powers from the States would have been necessary. As it was not to be provided at the time of its first passage under Minister Turnbull and the Coalition, a consideration of what capacity the Commonwealth had was necessary.

Evidence of that consideration can be found in Section 9 of the Act which references Section 51 of the Constitution wherein the legislative powers of the Commonwealth Parliament can be found. Section 9 identifies each power that the Commonwealth believes it has in order to implement the Act:

(i)	Trade and commerce;
(v)	Postal, telegraphic, telephonic and like services;
(viii)	Astronomical and meteorological observations;
(xi)	Census and statistics;
(xv)	Weights and measures;
(xx)	Foreign corporations;
(xxix)	External affairs; and
(xxxix)	Matters incidental.

This is, in essence, a "grab bag" of every possible head of power that the Commonwealth might bring to bear.

The key provision is the External Affairs power. The clearest example of the use of this power by the Commonwealth is in respect of the Tasmanian Dams case in 1983, where the power was considered (in the Commonwealth's favour) by the High Court. The Tasmanian Government was preparing to build a dam in a wilderness area. The Commonwealth had executed certain international conventions to protect certain wilderness areas. By virtue of the External Affairs power, the Commonwealth were able to stop the construction of the dam to ensure that Australia complied with its external agreements.

External Affairs and the Water Act

With the External Affairs power in mind, the Commonwealth turned to international agreements that Australia had executed in order to affect this head of power. The primary agreement identified was the Ramsar Convention, although the Act does reference 8 specific *relevant international agreements* in Section 4 together with "any other international convention".

A full Briefing Note on the Ramsar convention (its full title is the Conventional on Wetlands of International Importance especially as Waterfowl Habitat done at Ramsar, Iran, on 2 February 1971) is available on the NSWIC website. For the purposes of this document, all that is necessary is to recognise that Ramsar (and the other agreements) all focus solely on environmental outcomes.

The Water Act as it Now Appears

The Objects of the Act are essentially all that remains of the intent of the NWI to adopt a triple bottom line approach. The balance of the Act – for the simple reason of legislative capacity – focuses wholly and solely on environmental considerations. Social and economic considerations are descriptive only. That is, the economic and social damage that the Basin Plan will bring about must be *described*, but are not taken into account as environmental implications are in setting Sustainable Diversion Limits (SDLs).

So what of the amendments during the second passage of the Act? Did they not contain a referral of powers?

Yes – to an extent and only on certain matters. There was a limited referral (varies across States) to achieve a number of matters (primarily related to water markets), but none of the amendments was (substantively) in respect of the Basin Plan.

Implementation Compounds the Problem

Once struck as a legislative instrument by the Commonwealth, the Act contemplates implementation by the States through compliant water resource plans. This is scheduled to occur in 2014 in NSW and not before 2019 in Victoria. Notwithstanding the election timetables of those two states (post Basin Plan Guide release), the States are currently not expressing significant determination to implement the Plan. Speculation that Victoria will refer the matter back to the Commonwealth for implementation, likely triggering a High Court challenge to the validity of the Act, is rife.

NSWIC does not wish to see this matter resolved in this fashion.

How Does This Get Fixed?

The Basin Plan to be delivered by the MDBA will bring about social and economic implications that are clearly untenable as the triple bottom line approach was abandoned for political expediency. To that end, the Basin Plan needs to change – considerably.

There are three ways in which change might be occasioned;

1. *Change the Act (Parliamentary Process)*

   The simplest logical solution is to change the Act. Whilst it has been twice passed by the Parliament, considerable new knowledge now suggests that change is warranted;

   1. The ramifications of the Act are now far better understood – and are likely far worse than contemplated; and

   2. The window for "good policy" has reopened. The NWI can only be met by a sensible and practical referral of powers. A negotiated outcome is the only way for Governments (State and Federal) to avoid social and economic Armageddon under the Plan.

   NSWIC believes that this course of action is preferable as it is the only method by which to bring about long term, supportable and implementable change.

2. *Change the Legislative Instrument (Ministerial Discretion)*

   Section 44 of the Act describes the process by which the Minister must operate once the full legislative instrument is delivered by the MDBA. Section 44(3)(b)(ii) gives the Minister the capacity to *direct* the Authority to change the Basin Plan in all material respects. The Authority must comply with that direction.

   That is, the Minister has *absolute discretion* as to the content of the Plan.

   Any changes directed by the Minister must be accompanied by a statement of reasons to be laid before the Parliament with the Plan (44(7)(b)).

   NSWIC does not believe that this course is preferable as it brings about only temporary change to the initial version of the Basin Plan, leaving in place the structural and foundational problems of the *Water Act*. In short, it is a temporary fix to a long term problem.

3. *Disallowance Motion (Parliamentary Process)*

   The Basin Plan must be laid before a House of Parliament pursuant to the Legislative Instruments Act (2003). In the current Parliament, it is probable that a disallowance motion pursuant to Section 42 of that Act would be moved.

   NSWIC does not wish to see the matter resolved in this manner given the uncertainty that it would create.

MURRAY DARLING BASIN

SUBMISSION

GUIDE TO THE PROPOSED BASIN PLAN

Water Planning and the Environment

Murray Mouth 1949 (photo:SA Mapland)

Murray Mouth 2001 (photo: SA Mapland)

17th JANUARY 2011

Louise Burge
Submission prepared for Southern Riverina Irrigators

CONTENTS

Overview

(Extract: Murray Darling Basin Authority Guide to the Proposed Basin Plan: Volume 1)[1]

> **"The Water Act 2007 and the proposed Murray Darling Basin Plan build on a long history of water reform in Australia. For more than a decade, the Australian Government and Basin States have been working together to restore the environmental health of the Basin and redress past decisions"**
>
> **"the Authority is acutely aware of the urgency and importance of restoring the ecological health of the Basin".**
>
> **"Twenty out of twenty three catchments in the Basin are in 'poor' to 'very poor' ecosystem health."**
>
> **"the combination of drought and historic diversions mean that there have been no significant flows through the Murray Mouth since 2002."**

The Murray Darling Basin Plan will reshape Australia's food bowl, permanently reversing Australia's long term economic investment and resource planning, developed by previous generations.

At the heart of the proposed changes, are social and political responses, to a number of perceived issues.

1. the Murray River is dead and dying and there are imperatives to restore the ecological health of the Basin
2. Flows of an additional 'minimum 2000 GL' out the Murray Mouth will result in a 'healthy' river
3. the Murray Mouth, Lower Lakes and Coorong ecological problems have resulted in over extraction of waters from the Murray River
4. the Murray Darling Basin waters are over allocated
5. re-plumbing the Basin can drought proof the nation
6. returning water to the environment will give irrigation communities more certainty

In assessing the merits of these statements and developing a sustainable approach to managing the waters of the Murray Darling Basin, we need to carefully explore the issues. This document may encourage a broader understanding of the issues surrounding development of the Basin Plan.

[1] MDBA – Guide

(map MDBC archive website)

The Murray Darling Basin covers 14 % of Australia's land area with the total basin river catchments extending to 10.06 million km2 [2]

"Agricultural economic output from the Basin is around AUD $23 billion. AUD $10 billion of this is from agriculture, equivalent to almost one third of the value of Australia's total annual agricultural output." [2]

"The Basin contains 72% of Australia's total area of irrigated crops and pastures. The important irrigation industries are dairy, cotton, rice and horticulture. The value of irrigated production from the Basin has been estimated to be worth $3-$4 billion at the farm gate, with an estimated four fold multiplier in value through processing beyond the farm gate.[3]

"The Murray Darling Basin is home to 40% of all Australia's farms, producing wool, cotton, wheat, sheep, cattle, dairy produce, rice, oil-seed, wine, fruit and vegetables for both the domestic and overseas market. As Australia's most important agricultural region, the Basin produces one third of Australia's food supply and supports over a third of Australia's total gross value of agricultural production." [4]

Three quarters of Australia's irrigated crops and pastures are grown in the Basin.
The Basin's most valuable resource is water. The water in the Murray-Darling Basin system comes from a very small percentage of the Basin area; mainly along the southern and eastern rim. Almost 68% of the vast 'catchment' area contributes very little or no regular run-off to the river.[4]

The three longest rivers in Australia all run through the Murray Darling Basin.
These are: the Darling River (2740km approx) the River Murray (2530km approx) and the Murrumbidgee (1574km approx)

Food production in the Murray, Murrumbidgee, Lachlan and Lower Murray Darling Basins directly employ 30,000 people – six times greater than the national average for agriculture".[5]

2 Water for the Future
3 MDBC
4 Discover Murray River
5 RAMROC

EXECUTIVE SUMMARY

The waters of the Murray Darling Basin (MDB) have been subject to significant planning and investments by Governments and the community, in addressing the social, economic and environmental needs of Basin.

In **determining the needs of the environment**, it is important to recognize, that environmental benefits, are **not limited to a defined 'environmental entitlement'**. The environment has and will, continue to receive benefits from the provision of **regulated or consumptive** water supplies and other prescribed water entitlements.

Benefits to the environments of the Murray Darling Basin are achieved in the delivery of water for human and stock needs, dilution and loss provisions that accompanying a volume of water supplied as 'consumptive' water for agriculture, as well as the specified volume of 'consumptive' water.

The National Water Commission, in its Australian Environmental Water Management Report (2010) states:

> "Water can be used for multiple benefits temporally and spatially, and is normally 'used' more than once. Therefore, the complexity in defining and accounting for environmental water, is that **environmental, economic and social benefits are derived from the same volume of water.** For example, a particular flow in a river may:
>
> - sustain key environmental assets (environmental)
> - ensure that consumptive (extraction) volumes can be conveyed downriver by surcharging the system (economic)
> - provide sufficient water levels for navigation by houseboats and other commercial and creational craft
>
> "Despite the concept of the 'consumptive pool' articulated in water plans, attempts to demarcate volumes into 'consumptive' or 'environmental' often fail because of this complexity. Therefore, the **multiple benefits of a single volume of water** create challenges for jurisdictions when they attempt to comply with the reporting requirements of the National Water Initiative"

The report further notes:

> Environmental water commitment – "jurisdictions commonly make their **environmental water commitments through the establishment of annual allocation** limits **and access rules**, in both surface water and groundwater systems. **These are significant forms of environmental water commitment**, constraining the use of the resource, so as to '**leave behind' enough water to meet the environmental water objectives adopted in water plans."**
>
> "Aside from rule-based management, in some jurisdictions where a high level of competition for water exists within systems, entitlements have been purchased (or created through water savings) to be held and used for environmental purposes."

Given the scale of Government and community investments in achieving objectives for the environment to date, through water sharing plans, the **Murray Darling Basin Authority** proposes to **increase environmental flows without the Australian community** being aware of **what has been achieved to date**.

If previous Government **investment in securing water supplies** for communities and industries through the building of **major storage dams had not occurred**, the **Murray River would have gone dry** during this **current extended drought.**

For the **Southern Basin,** since the initial **River Murray Agreement in 1915**, water planning has undergone substantial change which has placed new levels of importance, on the needs of the environment.

Up until 1979, under the River Murray Agreement, the largest Basin States of New South Wales and Victoria had 5/13th each of Murray River Water sharing arrangements. South Australia, was entitled to 3/13th, being the smallest basin state (6.7% of the basin) with minimal contribution to river inflows. During proposals to build a new storage dam at Chowilla and Dartmouth prior to 1979, South Australia held its right of veto and negotiated an increased share of the Basin Water to equal NSW and Victoria. (At the time it was identified that Chowilla site was unsuitable due to regional salinity issues).

The Murray Darling **Basin Plan should not be the catalyst of re writing** the tri state **water sharing arrangements.**

In determining additional needs for the environment under the new MDB Plan, it is important to understand what has been achieved in the past, before appropriate decisions can be made about the validity of further adjustments.

A range of environmental concerns have evolved through the 1990's to the current date, under the auspices of the Murray Darling Basin Commission and its replacement, the Murray Darling Basin Authority.

Planning for the environment has been achieved under the Murray Cap on extractions (1997), the National Water Initiative (NWI) (2004) (which developed stronger environmental provisions delivered through the Basin's Water Sharing Plans), the Living Murray Initiative and a range of other environmental programs. The Living Murray Initiative saw an investment of $700 million to recover 500 GL of water, for 6 icon sites on the Murray River. The Living Murray is a small component, of the total expenditure on the environment of the Murray Darling Basin. (Note: environmental benefits derived under the Living Murray or National Water Initiative water plans have not been assessed due to drought)

A key driver of change was to address the need to enhance environmental flows to wetlands, provide additional flows to meet environmental concerns in the Lower Lakes, Coorong and Murray Mouth and to address concerns of dryland salinity and its modeled risk to the Murray River.

The Murray Darling Basin Commission's Salinity Audit (1999) provided salinity predictions for 'all major river valleys in the Basin for the next 20, 50 and 100 years'. [6]

This Audit was 'complimented by a CSIRO publication that assesses the ability of our agricultural land and grazing industries to reduce the predicted impact – Effectiveness of Current Farming systems in the Control of Dryland Salinity' (John Williams, Glen Walker & Mat Gilfedder – CSIRO). [7]

[6] MDBC Website: Salinity

[7] MDBC Salinity Audit

This report's executive summary, on farming systems and the control of dryland salinity, identifies that the 'problem', (ie dryland salinity) 'is not under control and therefore the risks of land impacted by dryland salinity, would rise from 1.8 million hectares to 15 million hectares'.

> 'projections for the town of Morgan (SA) a key location used to monitor the effect of salinity in the lower parts of the Basin in South Australia, illustrate the problem. Here the salinity of the River Murray is expected to increased by a further 240 EC units (micro/Siemens/cm) over the next 50 years'. This will bring salinity in this part of the river close to the World Health Organisation's limit of 800 EC for desirable drinking water..' [8]

The World Wildlife Fund convened the Wentworth Group of Concerned Scientists. Their Blueprint for a National Water Plan (July 2003) sought 'at least' 100 GL each year for five years – a total of 500 GL. (*aspects from the Wentworth Group's Blueprint for a National Water Plan, are also consistent with policy development under the National Water Initiative).*

Key documents that have **underpinned environmental planning** for the **Murray River,** specifically the **Living Murray Initiative**, include:

- Report of the River Murray Scientific Panel on Environmental Flows. River Murray – Dartmouth to Wellington and the Lower Darling River (June 2000)("***SRP Report)***
- Snapshot of the Murray Darling Basin River Condition. (September 2001) *("**Snapshot**")*
- Independent report of the Expert Reference Panel on Environmental Flows and Water Quality Requirements for the River Murray System. ("**ERP Report**)

Following differing views on the health and condition of the Murray River, a report was commissioned by Murray Irrigation Limited, to **review the science behind the Living Murray Initiative.**

In the report, 'a Review of the Science behind the Living Murray Initiative' – Ecology Management Pty Ltd (October 2003), the executive summary includes the following observations on the reports underpinning the Living Murray Initiative. These include:

- **("SRP report")** – Ecology Management Pty Ltd stated:
  - "expert panels do not supersede the need for basic data collection" & "outputs from the panels can vary significantly depending on their membership, their Terms of Reference' and the timing of their conduct"
  - "The River Murray Scientific Panel identified 22 activities which threaten river floodplain health. 7 of those relate to flow and only 2 related to reduced volumes of water"
  -
- **("Snapshot")** – Ecology Management Pty Ltd stated:
  - "the Snapshot represents a concise summary of Basin specific data drawn from The Assessment of River Condition ("ARC", Norris et al 2001) plus some use of specific river data drawn from several sources". Ecology Management acknowledges the "scale of information, the readable nature and that the report acknowledges it own limitations", but goes on to say……
  - "The limitations are substantial and relate mainly to lack of data, either with respect to particular aspects of the environment or in terms of spatial or temporal distributions of data points, the methods by which data has been

[8] MDBC/CSIRO

modeled or condensed and the inability to place a relative weight on the various causes of impact"

- **("ERP Report)** – Ecology Management Pty Ltd stated:
  - "the ERP report (Jones et al 2002) is probably the most influential but least scientific report with respect to environmental flows in the River Murray. It is influential because it was submitted to the highest decision making body – the Ministerial Council, prior to being reviewed by either public or peers. It is the one which relies most on expert opinion and hydrological models, models which do not cover floodplain *per se*."

The Federal Government House of Representatives Standing Committee on Agriculture, Fisheries and Forestry, investigated the Murray River in an **Interim** Report titled - Future Water Supplies for Australia's Rural Industries and Communities. (2004) The committee's conclusions include:

- '*given the magnitude of what is at stake, the potential economic and social dislocation that could emerge from any decision to allocate water to increased river flows, the* ***Committee is of the view that there is insufficient certainty in the science underpinning the Living Murray Initiative'.***
- '*The level of disagreement between the scientists is itself cause for concern.' 'The Committee asks 'would scientists promoting new treatments or pharmaceuticals to address the health problems of human beings be so cavalier in terms of paucity of data and testings as appears to the be the case with the health of the Murray Darling Basin'*
- *'The Committee is aware of the historical evidence for extreme variability with the flow regimes of the River Murray and has sought, and is still seeking, comprehensive historical data on river flow to guide its understanding of the River's needs.'*
- *'the Committee is also of the view that greater emphasis should be placed on environmental management regimes which require non-flow actions.'*
- *Finally, the Committee believes that the science behind the Living Murray must be undertaken free of agendas – that in order to protect the integrity of the process, all scientific research be undertaken by independent scientists untainted by advocacy or rent seeking".*

During this period, the health of the Murray River had reached a new political status and the river's health, was increasingly sensationalized. In the House of Representatives Standing committee's **final report,** the statements made in the interim report, appear to be 'toned down'. This is perhaps reflective of the political positions at the time and the importance of the Murray River in political terms.

During this and subsequent periods, it is important to recognize, that the claims for more water for the environment, have constantly been amended upwards.

The Federal Government invested in the Living Murray $700 million , which proposed 500 GL of water recovery for six icon sites along the Murray River. (Note: Water recovered under the Living Murray has not been utilized, monitored or assessed, due continued drought conditions commencing in the North from 1997 and more generally across the Basin during the period 2001-2010).

At this period, some environmental advocates had sought a broader target of 1500 GL, to **restore the 'dead and dying' Murray River.**

In June 2010, the Wentworth Group of Concerned Scientists in Association with Prof R. Quentin Grafton, Ian Kowalick, Prof Chris Miller, Tim Stubbs, A/Prof Fiona Verity, A/Prof Keith Walker, identified in a paper *Sustainable Diversions in the MDB* that:

> 'the best-available science suggest there is a substantial risk that a working river will not be in a healthy state when key system level attributes of the flow regime are reduced below two-thirds of their natural level. To achieve a level of two-thirds natural flow in all the catchments of the Basin the environment's share of existing Cap on diversions would need to be increased by approximately 4,400 GL (ie. 4,400 GL long-term Cap equivalent).
>
> This represents a reduction of approximately 40% of the current Cap on diversions. This implies that the Sustainable Diversion Limit for the Basin should be defined in a manner that is equivalent to a Cap of approximately 7,100 GL.'[9]

The Murray Darling Basin Authority (MDBA) released the Guide to the Proposed Basin Plan on 8th October 2010. **The Guide identified the amount of water needed for the environment as between 3,000 GL and 7,600 GL**

In order to minimize social and economic impacts, the MDBA has identified the following targets as the preferred range for restoring the health of the Murray Darling Basin.

1. 3000 GL - recovery of water for the environment
2. 3500 GL – recovery of water for the environment
3. 4000 GL – recovery of water for the environment

The figures identified in this range are to optimize economic, social, and environmental outcomes and to recognize the physical constraints of the Basin, ie where water could be sourced.

The MDBA's proposals set to 'move the goal posts' again, when significant water planning for the environment, achieved under the National Water Initiative, have not even been determined or monitored, due to the severity of the 'Millennium drought' (2001-2010).

Underpinning the planning decisions of the MDBA, are a range of scientific documents.

Key documents include:

- 1999 Murray Darling Basin Commission's *Salinity Audit* and the complimentary report – *Effectiveness of Current Farming systems in the Control of Dryland Salinity*
- CSIRO - *Sustainable Yield Report*
- Murray Darling Basin Ministerial Council – *Sustainable Rivers Audit*

Following the release of the MDBA Guide to the proposed basin plan, basin communities have expressed strong concerns in relation to the MDBA's reliance on existing source data that may need revision and specific reports, generated during a major drought event.

Existing source documents for example, the MDB Salinity Audit and in the broader National Salinity Audit 2000, are based on modeled predictions risks, related to rising groundwater. The **audits at the time, led to the $1.4 billion investment** in the National Action Plan for **Salinity** and Water Quality funded under the Natural Heritage Trust.

[9] Wentworth Group in Association – Sustainable Diversions in the Murray Darling Basin

Salinity issues during the 1990's to early 2000s period, were at a 'political high' and the National Action Plan website refers to the "the area of salt affected land in Western Australia increasing at a rate of **one football field per hour" and "if salinity is not effectively managed with 20 years, the salt content in Adelaide's drinking water may exceed World Health Organisation (WHO)** standards for desirable drinking water in two out of every five days".[10]

The modeled predictions for dryland salinity, specifically the '17 million hectares at risk', are now considered to be worthy of a review.

The **modeled extent and scale of dryland salinity** since initial predictions, **has not** been consistent, **with practical observations**.

Using data sourced from the Murray Darling Basin Commission (MDBC) own website, a graph shows that the Murray River salinity levels since 1982 have steadily fallen and remain well within the WHO standard for raw drinking water of 800 EC.

The CSIRO's Sustainable Yield Report is not specifically commented on at this time due to shortage of the submission closing date. Suffice to say that with any model, an error factor generally exists. Communities concerns in relation to this report exist, but no specific comment can be made at this point.

The Murray Darling Basin Ministerial Council – Sustainable Rivers Audit (SRA) involved the collection of data during a period of extreme drought (2004-2007). This period was part of the more extensive drought (2001-2010). The SRA report was released in 2008.

The reference benchmark for comparison, describes the patterns and processes, that would be expected to prevail now, had there been NO significant human intervention in the landscape. The reports refers to:

> "*It is open to some uncertainty, because it is estimated that than measured'. 'the health of an ecosystem cannot be readily judged by comparison with a database indicating 'normal' ranges for different variables, as ecologists do not have access to the kinds of reference data that a medical practitioner* does'.

The SRA reports were to be scheduled at 3 year intervals to the MDB Ministerial Council. The report, which has underpinned the opinions of the MDBA on the health of the Basin Rivers , was **only an 'analysis of trends' (*note; determined in a drought period*)** and was to be the 1st in a series, of 3 reports.

The SRA report, assessed 23 River Valley catchments. Only 1 was considered in good health, 2 in moderate health, 7 in poor health, 13 in very poor health. Assessed on hydrology, macrointertebrates and fish, a river could score well on hydrology, but the presence of alien fish eg carp, together with poor scores on macroinvertebrates, could produce an overall score of poor.

On the basis of this and other supporting documents, the MDBA has identified that a minimum of 3000 GL is now required to restore the health of the Basin. Of this approximately 2000 GL is to flow out the Murray Mouth into the Southern Ocean. The MDBA argue that if this scenario was achieved, it would improve the health of the basin and in particular the whole Murray River ecosystem. The MDBA's reliance on

[10] NAP: Salinity and Water quality

increased 'end of system' flows **does not** acknowledge the range of **other influencing factors,** that have had **impact on the environmental conditions of the Lower Lakes**, **Coorong and Murray Mouth.**

Historical records show that during major periods of drought, the Murray and Darling Rivers would have dried completely or to a series of pools. Under these scenarios, end of river system flows could be zero or negligible, if assessed as flows from the Murray River itself.

Sedimentation of the Murray Mouth was **evident in 1839, 1857, 1876, 1914 and 1938.** [50]

The Murray River originally moved through a series of wetlands and swamps in its lower reaches before entering the estuarine waters of the Lower Lakes.

In high flow or flood events, there would be significantly increased fresh water flows into the Lower Lakes. During periods of droughts or low flows, it was not uncommon for sea water intrusions to occur 250 km upstream in the Murray River.

Salinity readings observed in 1914 show 804 p.p.m (*1436 EC) at Morgan and 6,929 p.p.m (*12,373 EC) at Murray Bridge.[14] Salinity levels at the time, were attributed to marine influences.[14]

During the same historical period, original estimates in 1914, identify that the **tidal prism influencing the Murray Mouth was 16,900 ML**. (Johnston 1917).[11] Historically, flows out the Murray Mouth would be a mix of fresh and marine tidal waters, with the weighting of fresh to sea water, dependent on climatic events.

New South Wales, Victoria and South Australia (SA) agreements on river regulation, included major investments in water storages, locks, weirs and the building of the barrages in SA.

In 1940, five concrete barrages (7.6km) were constructed across the Lower Lakes in South Australia (SA), to convert the estuarine waters of the Lower Lakes into permanent freshwater lakes. At this time, SA's share of River Murray Water, was 1500 GL. This was later increased to 1850 GL, as part of negotiations to building Dartmouth Dam (1979).

The construction of the barrages removed 90% of the tidal prism and only 11% of the natural estuarine area remains. The current tidal prism has been reduced to a range between 643 and 2,200 ML. [12]

The original tidal prism estimated in 1914 (Johnston 1917) was subsequently revised in 1990, to 20,000 ML. This figure of 20,000 ML is often assumed today, to reflect actual Murray River flows out the Mouth, instead of the original estimate of the tidal prim that reflected both marine and fresh water flows.[11] This figure also is quoted, (20,000 ML barrage flow for 4 weeks), as the volume required to clear the Murray Mouth under regulated conditions.

*Waterwatch SA – ppm conversion to salinity
11 Bourman, Murray-Wallace, Belperio, Harvey
12 Murray Mouth Advisory Committee
50 Bourman R; Harvey N – the Murray Mouth Flood Tidal Delta

[14] de L'Association Internationale des Sciences

Changed flow variations have also occurred since 1940, as a result of the operation procedures of the barrages that release water from the Lakes, into the remaining estuary leading out to the Southern Ocean.

The lake levels are artificially raised higher in early summer by limiting or **closing the barrages to raise water heights** to 0.85m AHD. By surcharging the lake heights through closing the barrages, **after evaporation losses of approximately 750,000 ML – 950,000 ML per annum, a relatively static lake level of approximately** 0.75m ADH can be maintained.

Such a static level also enables gravity fed river irrigation outlets, to be opened (no pumps) to water farm land on the reclaimed swamp and wetland areas on the Lower Reaches of the Murray River, between Lock 1 and Wellington. In this area, l**evees banks were used to reclaim historical low lying swamp and wetland areas of the Murray. This created a raised (perched) river, higher than the surrounding land**.

The **operations of the river and lakes system in this manner**, mean that at certain periods **limited fresh water, is released to the remaining estuary** to flow through the Murray Mouth.

Under low flow years, the operations of the barrages mean even less water is released into the estuary, as plans still aim to maintain static lake levels. Under these scenarios and with the loss of 90% of the historical tidal prism, tidal deltas can form, which is a common function of even a pristine, tidal inlet system.

Up until January 2010, **81.8% of NSW was in severe drought**.[60] The severe drought in Northern NSW (Darling system) began post 1997, while in the Southern part of the basin, the full impacts of the drought occurred from 2002. In the Southern Regulated system, annual water allocation announcements in Victoria and NSW, ensured that South Australia's guaranteed entitlements of 1850 GL, was met up until the 2006/2007 water year.

The continued severity of the drought, meant that critical water supply decisions were enacted. The NSW Murray-Lower Darling Water sharing plan was suspended in November 2006. At this period the full impact of shortage of water in the major dams was felt in SA. The Lower Lakes suffered severe water shortages, as did most other creek and rivers in the Basin.

Since construction of the barrages in 1940, South Australia's (SA) water planning aims to ensure that the Lower Lakes are kept at flood height of 0.75 AHD. In years when SA does not receive above its entitlement flows of 1850 GLs , then maintaining the Lower Lakes at desired levels, is difficult.

Under these circumstances, the true influence of the barrages, which removed 90% of the natural tidal prism becomes evident.

As far back as 1903 it was predicted in the initial plans to build a barrage near the Murray Mouth, that '**shoaling'** on the upside and downside of such structures would occur. (Moncrief 1903)[52] At this period however, it was expected that, flows coming from South

[60] NSW LHPA – drought maps

[52] James K; *The bio-geomorphological evolution of a former flood tidal delta (Bird Island) in the Murray Mouth estuary of South Australia,*

East of South Australia into the Coorong, passing on through to the Southern Ocean, would remove any sand build up ('shoaling') occurring within the vicinity of the Murray Mouth. (Moncrief 1903) [52]

It is evident that river regulation, **which includes the construction and operation procedures of the barrages** (7.6 kms in length) **and the South Australian South East drainage and land reclamation schemes** (constructed 1876-1975), have all changed the natural environments of the lower reaches of the Murray and the Coorong.

It is important to understand that a wide range of policy decisions made within South Australia itself, have impacted on the Lower Lakes, Murray Mouth and Coorong.

The ability to **maintain** the Lower Lakes as a modified freshwater environment and using freshwater flows the Murray Mouth to assist the scouring action, to remove the build up of sand at certain periods, **is feasible in higher flow or non drought periods**.

What is not feasible, is to maintain current operations and the **expectation that**, even during major drought, the Lower Lakes can be maintained at **historical high levels** and that an objective to **use freshwater**, as the key mechanism to **scour out the Murray Mouth** channel to the Southern Ocean.

The Murray River system and its relationship with the Southern Ocean, is not dissimilar to many **other Australian tidal inlet systems.**

A narrow opening to the sea, the continual sand deposits that occur with incoming tides and the site's interaction with natural coastal climatic events, such as storm surges, are a major feature of tidal inlet systems.

The Lower Lakes and Murray Mouth tidal inlet system, has been substantially modified by river regulation and the construction and operations of the barrages. Therefore a presumption that increasing end-of-system flows is the **solution to sand sedimentation is inaccurate.**

Changes to operating policies and investments to improve aspects of the barrages, should be a major part of **future planning**.

A number of reports exist that document and propose solutions, to the environmental impacts of the barrages.

In a report for the Murray Darling Basin Commission (June 2000) – River Murray Barrages Environmental flows – An evaluation of environmental flow needs in the Lower Lakes and Coorong, recommendations included:

- Articulate detailed barrage operating guidelines to meet ecological needs
- Automate barrage gates for more flexible operation and sensitivity to ecological needs
- **Modify the Mundoo Barrage** to increase flow capacity and operate **preferentially to limit sedimentation, at the Murray Mouth**
- Evaluate options for relocation and revised management of the barrages to enlarge estuarine area to increase the range of habitats
- Integrate flow management actions with other regional planning and management activities for maximum effectiveness

The expansion of Bird Island in the Murray Mouth estuary as a result of the location and lack of effective operations of the Mundoo Barrage, remains a risk to future channel capacity in the remaining estuary. This is not addressed by the MDBA. Instead the comprehensive recommendations made in a number of reports on the issue, have been ignored, in favor of a 'freshwater solution'. This cannot address the stabilization and continued growth of Bird Island.

The Coorong has become an 'icon' in terms of saving the Murray River. As with the issues of the Lower Lakes, there are broader considerations that the Australian public needs to be aware of.

The MDBA has received a comprehensive report on the Coorong and Lower Lakes in April 2010 submitted by Southern Riverina Irrigators, but appears to have disregarded it. In addition to this advice, there is a range of literature and detailed information that should have enabled the MDBA to be objective in its deliberations on the Coorong.

The MDBA, in determining future end-of-system flows have ignored the major cause of environmental decline in the Coorong - the impact of South Australia's South East and Upper South East, Drainage Schemes.

The **MDBA verbally acknowledged** during consultation, the **main South Australian South East drainage and land reclamation scheme,** (1863-1975) **has redirected flows away from the Coorong,** directly out to the Southern Ocean. Yet the Guide continues to reinforce the myth, that environmental problems of the Coorong, are caused by irrigation extractions from the Murray River.

The MDBA Guide to the Proposed Basin Plan and supporting literature, fails to identify **what is now, common knowledge**.

The claims relating to the Coorong, long held up as the 'icon' issue of environmental decline and a powerful argument to claim more water from the Murray River, **can only be described as 'misleading'.**

The MDBA in developing the Guide to the Proposed Basin Plan, appears to have endorsed the Federal Department of Environment, Water, Heritage and the Arts (DEWHA) and the South Australian Government's 'Securing the Future – A long-term plan for the Coorong, Lower Lakes and Murray Mouth' (CLLMM). This long term plan of management released in June 2010, was funded by DEWHA as part of a $200 million investment to manage the environmental problems of the Lower Lakes and Coorong.

The South Australian Plan for the CLLMM site states

> "the plan recognized that **large flows down the River Murray will maintain an open mouth** and transport salt and other pollutants to the ocean via natural processes."
>
> "when flows are adequate **to maintain the Lower Lakes at or near optimal operating range, minimal intervention is required** and adaptation actions that aim to build and maintain a resilient ecology at the site are possible".
>
> "the **return of adequate freshwater end-of-system flows (flows through the Murray Mouth)** is essential for any improvement in the health of the site, **as any solution other than freshwater would not preserve the current values** of the site **to the same extent**" [13]

The Plan claims that if -**"4,700 GL** flowed over the barrages every year the CLLMM **ecosystem** would probably be in **good condition**, average flows do not occur every year, and it is the below-average flows that cause concern". The MDBA Guide **objectives** are to raise the **current <u>average</u> flows of <u>5100</u>** up to **7100 - 7,700** GL.(note: *low flows are normal in droughts*)

South Australia is guaranteed its entitlement share of 1850 GL in most years. In average to wetter periods, flows to South Australia will exceed, their minimum entitlement share of 1850GLs and can be closer to the MDBA's average flow figure, of 5100 GLs.

The SA Government's **long term plan** for the CLLMM site is predominantly based on a freshwater solution to resolve a range of environmental issues that are heightened in drier years. This is despite the plan itself noting that sea level rises under climate change predictions, may "**lead to a transition of the Lower Lakes to an estuarine environment by the end of the century**".

Based on current projections for the Intergovernmental Panel for Climate Change, there will be a minimum sea level rise of 0.3 metres by 2050 and 1.0 metres by 2100.

> "Furthermore, 'localised temporary events such as extreme tides (plus surges) as well as storm and wave effects, could raise **water levels locally** and temporarily but nevertheless quite **significantly"**. "**Sea level rises** could also **threaten the barrages** in the medium to long-term, especially during storm events". "Increasingly salty water in Lake Alexandrina could be forced upstream and compromise potable water at South Australian pumping locations in the River Murray below Lock 1". [13]

There are grave concerns about the lack of genuine comprehensive planning for the CLLMM site. This long term plan supported by DEWHA, clearly has a **reliance** on **increased end-of-system flows** –('<u>fresh water solution'</u>), <u>achieved via new sustainable diversions limits under the Basin Plan.</u>

<u>This appears to be the key policy solution, to resolve all environmental issues,</u> that have resulted from the construction and operation procedures of the barrages, the impacts on the Coorong of the South East and Upper South East Drainage schemes, river regulation and the South Australia management policy, to maintain below the Murray River below lock 1 and the Lower Lakes height levels, at approximate 0.75 AHD.

This reliance seems even more incredulous when climate change predictions for the CLLMM site are included. Under this scenario, the Australian public can rightly assume that the **<u>$10 billion dollar taxpayer's investment</u>** to reconfigure the current water dependent economies of the Basin to increase **<u>freshwater flows out the Murray Mouth is a complete waste of money.</u>**

<u>It is essential that the MDBA broaden its views to acknowledge the full range of factors affecting environmental issues of the Murray River, Lower Lakes, Coorong and Murray Mouth.</u>

[13] Securing the Future CLLMM

Key Findings:

- The MDBA have failed to adequately consult with Basin Communities in developing strong foundations for the plan.

- The communities of the Murray Darling Basin question the 'independence' of the MDBA. Specific concerns include:
    a. the strong alignment of the Basin plan with the long term plan for the Coorong, Lower Lakes, Murray Mouth (CLLMM) developed by the South Australian Government and funded by the Federal Department of Environment, Water, Heritage and the Arts.
    b. This CLLMM plan relies on securing increased end-of-system flows, to be the predominant action to keep the Murray Mouth open - the 'freshwater' solution.
    c. the CLLMM plan aims for a 'dynamic estuary' but takes no remedial infrastructure or operating action, to address the ecological issues created by barrages in 1940 which reduced the estuary area to the current 11%, of its pre barrage size
    d. the CLLMM plan identifies that the Southern Ocean will naturally enter the Lower Lakes over the barrages, due to climate change sea level rise predictions (1.0 metre by 2100). Despite this, the MDBA endorses reconfiguring of Australia's food bowl to increase flows to maintain the Lower Lakes as a freshwater system and to use freshwater to scour the Murray Mouth.
    e. The MDBA's Guide to the Basin plan appears consistent with the visions, of the Wentworth Group

- <u>The end of system Lower Lakes low water levels 2005-2009, was a reflection of the severity of the broader drought across the Basin, **not poor water planning**. I</u>n Australia's naturally variable climate, this was an extreme, but natural event.

- The MDBA plan seeks to reconfigure Australia's food bowl in order to plan for, a one in one hundred year, drought scenario. (eg the scenarios of the Federation Drought 1895- 1903 and the Millennium drought 2001-2010)

- There is insufficient understanding by the MDBA of the experience and complexities in water delivery systems, managed by the States, which prove to be relatively effective in most years.

    1. The Darling River system has experienced low flows similar to previous historic drought events.

    2. The Murray River system under river regulation continued to flow and supply a level of resource to towns, industry and entitlements holders, despite the severity of the drought.

- The MDBA believe that a new Basin Plan can assure flows to the environment and 'increase certainty' of entitlements, even during prolonged periods, of major droughts. (*note: <u>there will be **no increased 'certainty' for irrigation entitlements**</u> – entitlement volumes will simply transfer from productive use to environmental use)*

- Australia's major dams storages cannot physically store enough water to meet human needs, stock and domestic, irrigation supplies, dilution and losses flows, additional two years guaranteed reserves – plus store enough water to ensure reliable supplies for a ten year 'drought' (of the magnitude of the Federation drought or Millennium).

- The MDBA has failed to factor in existing benefits to the environment, achieved in existing water planning arrangements in the Basin, prior to establishing new rules for more environmental water. This includes comprehensive actions for the environment, achieved under the National Water Initiative, Living Murray and the full range of other environmental water recovery programs – **most of which have not been monitored or assessed, due to the prolonged drought** event.

- There are significant concerns regarding the foundation science used by the MDBA in developing the Basin Plan. The MDBA has relied on existing data which may/may not be adequate for the purposes of the Basin plan

- The MDBA uses hydrology and a set of 'indicator sites' as a measure of Basin Health. This is contrary to all previous Government and community investment and planning for Total Catchment management. There is a presumption that 'flow volumes = river health'

- The MDBA in the Guide to the Proposed Basin Plan, has **failed to developed** a comprehensive **plan,** for the **delivery** of proposed **environmental flows** to the environment. Consequently, there are **significant** increased **flood risks** to basin communities on both private and public land, including the 'built' infrastructure of towns and regions.

    1. **Flood risk** are **not specific** just **to** the **volume** of the **environmental water** to be released. The relationship to other factors such as the **timing** of releases, **seasonal rainfall**, **dam capacity** and **water levels of creeks**, rivers and billabongs, are critical decision points.

    2. Natural capacity constraints of Murray River (eg Barmah choke) limit the flow volumes required to meet all demands. The MDBA have stated that there will be an impact on the 'reliability' of entitlements, but given the lack of information how environmental volumes will be managed, it is difficult to determine the full impacts for existing water license holders and their future ability to access their entitlements in peak periods.

- **Social and economic studies** have been **minimal at best, totally inadequate at worst** with the impacts assessments being confined to entitlement loss. This does not reflect the full range of issues. The MDBA in determining the Sustainable Diversion Limits (SDLs), has acknowledge that they wish to limit impacts below 40%. Without the full range of factors being included in the basin plan, it is impossible for the MDBA to draw any conclusions about impact.

    1. There has been no socio economic impact assessment on the consequences to changes to the 'reliability factor' of entitlements, particularly when the full Basin Plan's implementation is delivered through new State Water Sharing Plans post 2014. (or 2019 Vic)

    2. There has been no socio economic on risks of the delivery of environmental flows. In particular, third party flood risks to either individuals or relevant Shire Council Assets including road or asset management programs. It is not clear who or how compensation will be paid for 3rd party flood damage. This is despite a confidential note reflecting the MDBA is aware of potential flood risks, obtained under the Freedom of Information laws

3. It is widely acknowledged that the MDBA stated '800 job losses' reflects a very poor analysis of impacts, that is beyond the standards expected of a Government appointed authority

- The MDBA has not provided information or encouraged the use of engineering solutions, as a key mechanism, to restate mid level floods to water specific wetlands that cannot be watered without achieving over bank flows. This is critical to prevent third party flood risks. Although engineering solutions are considered, they are not the preferred option by the MDBA, as identified during rounds of public consultation. **The MDBA has publicly stated in consultation on the release of the Guide, that they would not recommend or include 'modifications' to the Lower Lakes in South Australia.**

- River regulation has modified the natural flows and impacted on the natural flood regimes of the Murray and Darling River system. Strong differences prevail between the Northern Darling System and the more regulated and highly populated areas of the Southern regulated system of Murray and Murrumbidgee. In order to re-state small to moderate flood events to water ecological assets outside the main stem of the Murray River, it is imperative to investigate engineering and environmental water efficiencies programs to minimize risks of flood events

- The MDBA Guide appears to have endorsed a pre-determined position to use 'end of system flow' volumes, to address the ecological problems of the Lower Lakes, Coorong and Murray Mouth, that should be attributed to a range of factors, not primarily related to river flows

- The plan fails to identify the range of factors affecting the Murray Mouth. Indeed the plan helps cement widespread misunderstanding of the reason for **Mouth Closure in 1981.** There has been no comprehensive information provided, in particular;
  1. the increased sedimentation or 'shoaling' that has occurred since the construction of the initial barrage (1914) and subsequent (1940) barrage over the Mundoo channel.
  2. The **unusually calm seas that prevailed at the time (autumn 1981**) [52]
  3. The operations and locations of the five barrages which have significantly increased sedimentation in the tidal inlet of the Murray Mouth Zone.
  4. The growth of Bird Island in the last 60 years, which has resulted from the construction and operation of the barrages (Mundoo) together with the influence of the continued mouth migration. [52]

- The largest flood in Australia's historical records – the flood of 1956 – was unable to remove the sediments in the Murray Mouth (Bourman et el 2000) [52]

- The MDBA have failed to adequately explain the relationship (if any), for increasing volumes to the Lower Lakes and the benefits derived to the continued expansion of housing development and associated waterfront canal system at Hindmarsh Island. There is no 'interception' information by the MDBA in relation, to this development.

- The MDBA support for increased 'end of system flows' and a 'fresh water solution' for the CLLMM site, fails to factor in:

[52] James K; *The bio-geomorphological evolution of a former flood tidal delta (Bird Island) in the Murray Mouth estuary of South Australia, School of Natural and Built Environments*

1. reduced inflows predicted as a result of significant Wildfire events in the Snowy Mountains and the headwaters of the Murray River (2003)
2. future inflow risks resulting from carbon forest plantings on localised and headwater catchments

- The MDBA note that the SDLs will be determined after factoring in Plantation Forestry and other interceptions activties eg farm dams. This implies that there is an allowance of 'growth' for forestry and that large scale forestry interceptions, will be subsidized by reductions to existing water entitlement assets, when setting the SDLs.

- The MDBA has prided itself on 'community consultation'. Despite limited consultation, there is no evidence in the Guide that responses from the community have been built into the plans. Statements or information made during consultation or through submissions, letters to the Board or other literature, appear to have been ignored. When issues have been identified, there appears to be a reluctance to 'change'.

Executive summary conclusion:

The MDBA should be congratulated for releasing the Guide to the Proposed Basin Plan, giving the opportunity for all Australians to understand the ramifications of the Basin plan, prior to the release of the formal Draft and its sixteen week consultation period.

Key concerns have been identified through the release of the Guide, including the independence of the authority and the science that has underpinned the decisions of the MDBA.

It is acknowledged that the Water Act 2007 is fundamentally flawed and in its current form, cannot address the balance of social, economic and environmental factors required. The MDBA is bound to meet the Act and this is understood by the community.

During consultations, it was repeatedly requested that the MDBA report to the Federal Government about the deficiencies of the Water Act 2007. It is disappointing that the MDBA, could not make a public statements to this effect.

There is also significant risk that a lack of understanding about environmental sites listed under International Environmental Agreements, will result in poor decision making in the basin plan. International agreements have been prioritised as a result of the design of the Water Act 2007 and this will takes environmental water planning to a new level.

It is important to acknowledge, that the determination of site management and ecological thresholds are not cemented under International Law. The Australian plans of management and ecological character descriptions, have continued to evolve over time. As such, Australia retains control over the management and environmental character descriptions, in relation to Australian Ramsar sites.

Australia is to invest a further $10 billion dollars in enhancing the environment of the Murray Darling Basin. **The scale of this investment should ensure a more rigorous basin plan,** that is supported by strong scientific principles and actions, that can protect the environment and the economic worth of the basin, in our unique Australian environment.

It is vital that the robust decisions for the efficient use of environmental water are in place to **minimise the impacts on the taxpayer** and to balance the requirements of Australia's future food production. **This has not been done**, nor appears supported by the MDBA.

To avoid permanently damaging Australia's food bowl, it is essential that the process of major investments in the environment, are built on strong foundations.

Australians have been educated to believe that the 'mighty Murray' is significantly 'unhealthy' and that major public expenditure is required to restore its ecosystem function. This is despite the fact, that significant environmental and economic benefits have been derived from the regulated water supplies of the Murray and it continued to flow, during one of the worst droughts in history.

The Murray River is still classed as well within, World Health Organisation's raw drinking water standards of 800 EC and under a regulated system since 1940, it has continued to provide benefits to the environment, social and economic well being of this nation.

The extent and severity of the drought (2001- 2010) across the Basin has caused significant environmental, social and economic stress. This drought was beyond the capacity or ability of the Basin planners to prevent and should be considered in the historical context, of the Federation Drought (1895-1903).

The Guide to the Basin Plan will **not provide more certainty** to irrigators as **existing water entitlements,** now used to produce food and fibre, will be **transferred to the environment.** As a result, there will be no increase in certainty for existing license entitlement holders (eg irrigators).

The perception that 'the Basin is over allocated' is incorrect. For the regulated systems of the South, water planning ensures that 'allocation' or 'available water determinations' are based progressively in the water year, dependent on inflows to the major storage dams.

Murray Valley – Water Distributions

Year Total	Total NSW Diversions GLs	Total Vic Diversions GLs	Total Flows to SA GLs	SA Evaporation Lower Lakes GLs	barrage flow
2002/03	877	1775	1836.8		
2003/04	1329	1498	2068.9	1180	280
2004/05	1259	1502	1879.2	n/a	n/a
2005/06	1670	1637	2311.5	n/a	n/a
2006/07	Est <600	Est1500 95%	1440		
5 year total	**5734**	**7912**	**9536.4**		

Source: MDBC – River Murray Operational Monthly account
Source: NSW State Water Annual Report 2003/04 (Ref evaporation Figs)
Note: NSW and Victorian annual allocation system vary within their individual Cap provisions. Both States water sharing arrangements, ensure that SA entitlement of 1850GL, is met. (an exception was the critical drought conditions in the Basin, after 2005.)

During the drought the largest irrigation district in NSW – Murray Irrigation Limited (Southern Riverina) announced the following allocations to its General Security entitlement holders:

Year	Water Allocation Announcement
2002/03	8%
2003/04	45%
2004/05	42%
2005/06	56%
2006/07	0%
2007/08	0%
2008/09	9%
2009/10	34%

This document provides an over view of substantial planning that currently exists in the Murray Darling Basin, for managing water extractions and addressing the needs of the environment. The submission specifically identifies planning for the environment, in the Murray River southern connected systems.

In developing the Basin Plan, it is important to acknowledge the 'reforms' that have already occurred and the limitations, of Australia's key water storages, on the Murray Southern connected River systems.

To suggest that the Murray Darling Basin requires further 'reform' implies something is 'broken' or 'not working'**.**

The Murray Darling Basin Authority prior to imposing a **new planning regime**, should **recognize the effects of the drought and evaluate existing environmental planning provisions, achieved under the National Water Initiative.**

The plans should be monitored in 'non-drought periods, prior to the 'Goal Posts' for the environment, being re-set again.

The Authority argues increasing flows to a new set of key indicator sites in the basin, will achieve improved environmental outcomes for the whole basin. This ignores existing water sharing plans, environmental programs and purchases that, have already met a range of environmental objectives.

The **Social and Economic considerations** of the MDBA Guide to the Proposed Basin Plan is **not confined** to those holding license entitlements to water, nor to the water dependent communities. This is an issue for all Australians.

The issue is also beyond the proposed $10 billion investment under the Water for Futures Program which includes delivering the objectives identified under the MDBA Plan.

Greater scrutiny is required on policy development and the continued public expenditure on previous and current politicized issues, relating to the Murray Darling Basin. **Currently, sound science can be overlooked, in favor of environmental advocacy.**

It is time for all Australians to analyse whether new claims for the environment are justified and will deliver the benefits claimed. At stake, is the heartland of Australia's food production.

SECTION 1

AUSTRALIA – A DRY CONTINENT

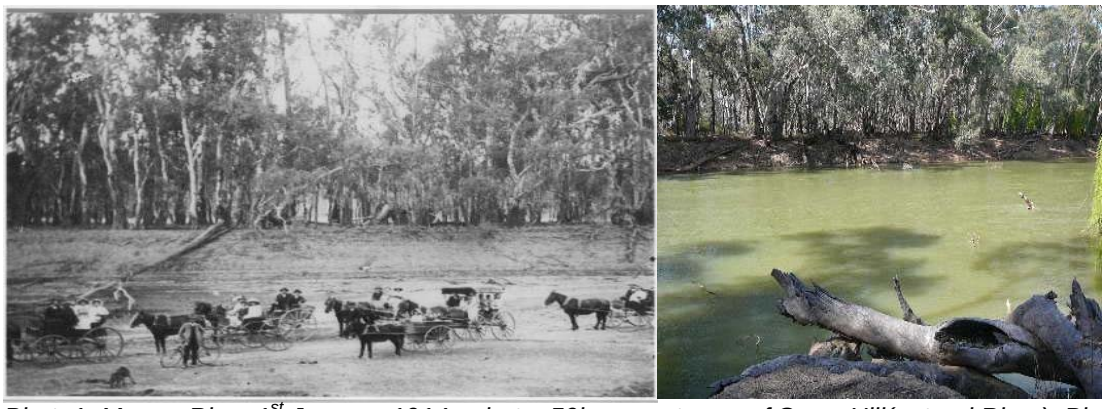


Photo1: Murray River 1st January 1914 –photo, 50kms upstream of Swan Hill(natural River) Photo 2: Murray River 2002 – the 'Millennium' drought (regulated river)

Extract from the Murray Darling Basin Commission website:

"In its natural state the River Murray was quite different from the regulated river we have today. During severe droughts it was sometimes reduced to a chain of saline waterholes. In South Australia, sea water infiltrated upstream for a considerable distance from the mouth.

In most years, Adelaide draws more than 40% of its water from the Murray. During droughts such as that experienced in recent years, this dependence increases to more than 90%. Without our present system of river regulation, the population of Adelaide and many other cities and towns in the Murray Valley would be considerably smaller than they are today.

Since the completion of Hume Dam in 1936, a continuous flow has been maintained throughout the length of the Murray. Without storages and regulation, the Murray would almost certainly have ceased to run during the droughts of 1938-39, 1944-45, 1967-68, 1982-83 and 1997-98. The drought conditions experienced in the last few years have shown that even with storages and regulation, extended dry climatic conditions could stop the Murray from flowing" [15]

"Australia's climate, compounded by the variability of its rainfall, mean that virtually all of Australia's river systems are subject to considerable variability of flows from one year to another. Australia experiences (together with South Africa) experiences higher runoff variability than any other continental area. The Muray Darling Basin is no exception to this, in spite of the fact that much of the river system is highly regulated…"

[15] MDBC

"The upper Murray, Murrumbidgee and Goulburn river catchments account for 45.5 % of the Basin's total runoff from 11% of its area. The upper Murray catchment alone, accounts for 17.3%. "The Darling River system, contribute 31.7% of the Basin's mean annual runoff from 60.4% of its area".

"86% of the Basin contributes virtually no runoff to the river systems, except during floods". [15]

"In times of drought, the storages, provided they contain water, add to river flows, as illustrated by the contributions of the Snowy Mountains reservoirs to flows in the Murray during periods of drought". "For the Murray and Murrumbidgee, the high and relatively reliable precipitation in their source areas, mean that stream flows are much more reliable than in other parts of the basin."

"The Darling River and its tributaries have much less reliable flows as the 'rivers not experiencing massive floods…. can cease flowing for extended periods. The Darling… at Menindee between 1885 and 1960, ceased to flow on 48 occasions. The longest period of no-flow was 364 days in 1902-1903". [15]

Photo 1: Darling River, Bourke 1941 – Bourke Shire Library,
Photo2: Murrumbidgee River- Balranald Power & pump station 1938 (R Bodinnar collection)

Visionary water planning by previous generations of Australians together with Federal and State Governments, have enabled current generations of Australians to enjoy and prosper from the regulated water supplies, of the Murray Darling Basin.

The construction of the Hume Dam (16km east of Albury) commenced in 1919 and the original capacity of the dam was enlarged in 1961 as part of increased flows derived from the Snowy Mountains Scheme. Storage capacity of the Hume is 3038 GL with a catchment capacity of 15,300km2. In 1957, a 50 megawatt hydro-electric station was incorporated into the Hume Dam to generate power as water is released.

[15]

The construction of the Hume Dam was for secure water supplies, irrigation, flood mitigation and drought control. In its earliest planning stages (ie 1919), navigation was also a consideration. [3]

> "The principle purpose of Hume Dam is to conserve water in periods of high flow for later release during periods of low flow. The principle use of the water is for irrigation, but significant quantities of water are diverted from the River Murray for domestic use, industrial uses and to help supply entitlement flows to South Australia' [3]

Dartmouth Dam has a capacity of 3906 GL and was constructed by the Victorian Rural Water Commission for the River Murray Commission (MDBC now MDBA). The Dam construction was finished in 1979 and is located near the Mitta Mitta and Dart rivers. [3]

The Hume Dam is the Murray Darling Basin Commission (now MDBA) 'primary regulating storage. [3] Inflows from the Hume catchment, excluding Dartmouth and the Snowy Mountain Scheme, are variable, but equal, on average, to the storage capacity. Inflows in a drought year are only about 10% of those in a flood year. Releases from Dartmouth Reservoir are controlled by the Murray Darling Basin Commission [16]

Hume and Dartmouth are operated so that releases can ensure the available 'airspace' with the two storages. Such planning enables appropriate flood mitigation strategies to be in place to minimize flood risks between the two storages.

In the peak water supply periods, South Australia and the Murray River irrigation areas requirements can exceed 30,000 ML/d.[3] The Murray River channel capacity cannot physically deliver this water without causing flooding. The use of mid river storages such as Lake Victoria can assist with storing water to enable the effective delivery of entitlements in most peak demand periods.

The Murray River between Hume and Yarrawonga can only physically pass 25,000 ML/d before causing flood events. Further downstream, a natural physical constriction of the Barmah Choke, limits flows to 8,600 ML/d. In order to overcome these restrictions, the Mulwala Canal and the Edward River are used to pass up to 2000ML/d, thus bypassing to some extent the natural limitations of the river's water delivery capacity. As it takes up to a month for water flows to reach the South Australian border, releases "must be made up to a month in advance" [3]

It is important for the MDBA to factor in the natural or operational constraints of the major storage dams and Murray River channel capacities when determining the scale of water to be recovered for the environment.

The MDBA has not developed an 'environmental water delivery plan' and given the natural constraints of the river system, it is unclear how the scale of water recovered for the environment will be delivered.

The social and economic analysis commissioned by the MDBA has focused on the economic and job impact on entitlements resulting from the proposed Murray Darling Basin Plan Sustainable Diversion Limits (SDLs). There has been no analysis of risk in terms of ability to access entitlements, (thus reliability impacts) or potential adverse flood

[3] MDBC
[16] MDBA

risks to individuals, the State of NSW or individual Shire Councils in the delivery of environmental flows.

The Snowy Mountains Scheme was the world largest hydro-electric scheme situated in the Southern Alps of Australia. The water catchment is approximately 5124 km2 with a large proportion of this area in the Kosciuszko National Park. The scheme was built over 25 years and completed in 1961. The scheme had a workforce of over 100,000 people whose origins included many countries of the world. There are approximately 145km of tunnels and 80km of aqueducts, that collect and move water within the scheme.[17]

The scheme's design was to provide hydro electric power and to provide irrigation water to the Murray and Murrumbidgee Rivers. The Scheme in total has the storage capacity of 7000 GL and of this approximately 5300 GL could be used for electricity generation and then diverted into the Murray and Murrumbidgee Rivers [17]

Of the 16 major dams, Lake Eucumbene, has the largest storage capacity of 4798 GL. Water entitlements are shared between Victoria (24%) and NSW (75%) [17]

Under the Snowy Mountains Hydro-electric Power Act, as the water passes beyond the Snowy Hydro system, control of water is then passed to Murray Darling Basin Authority (previously MDBC) and in the case of the Murrumbidgee River system – to the NSW Office of Water.

The Snowy- Murray System delivers annually 1062 GL to the Murray River and 1062 to the Murrumbidgee as part of its license. On average 1210 GL are released into the Murray system.[18]

According to the MDBA, the long term average surface water inflows for the basin are approximately 32,800 GL. Of this approximately 19,100 remains with the environment including losses such as evaporation with about 13,700 GL (42%) extracted for consumption (irrigation, urban water supplies, industry)[16]

In the Murray Darling Basin Guide to the Proposed basin plan, the guide identifies that **58% of current inflows remain in the environment** [16]

Over the period 1894-1993, the annual discharge at the mouth of the Murray-Darling system has ranged from **1626 GL to 54,168 GL,** with a mean of 10,090 GL and a median of 8,489 GL (maheshwari et.al.1995).3 Even with this particular assessment, it is worth noting that flows would have varied in particular seasons of the year and as the mean and median terminology influence the high flows and low flow periods, it is clear that significant flow variation have occurred.

[17] NSW Government; Dept of Education website
[18] NSW Department of Natural Resources 2006
[16] MDBA

Creation of the Murray River

Australian Geographic - 'The Murray River' states:

> "the key to the Murray's existence lies in the formation of the Murray Darling Basin. This had its beginnings in a large shallow rock depression dating from 350 million years. About 100 million years ago (mya), as the mountains of the Great Dividing Range began rising through the Earth's surface, a large depression west of the divide began to subside and deepen".[22]
>
> "for most of the past 65 million years, the western portion of the Murray Darling Basin was almost continuously covered by warm, shallow seas and marine lakes intruding from the Southern Ocean. These contributed sediments to the basin's floor, including limestone deposits that survive today as crumbling cliffs along the river in South Australia.[22]
>
> "After Australia finally separated from the supercontinent Gondwana 50-45 mya, sea levels around the world rose. A finger of salt water, name the Murravian Gulf, extended from the Southern Ocean into the Western half of the Murray Basin about 32 mya. At its peak, about 20 mya, it stretched beyond the site of present-day Swan Hill, before retreating about 12 mya." [22]
>
> "Vast climate change characterized the next chapter in the basin's history, with the sea repeatedly encroaching and retiring." "From 6-4 mya, the westward flowing rivers chased the retreating sea deep into South Australia and started forging routes to the Southern Ocean. But just over 3.5 mya their paths were obstructed south of present-day Swan Reach, when a massive earth uplift called the Padthaway Block, dammed the rivers and created the giant freshwater Lake Bungunnia. Filling over several thousand years, the lake eventually covered some 33,000 sq. km and extended north almost to today's Menindee Lakes. It survived until about 700,000 years ago, when it breached the "dam" and drained."[22]
>
> "As Lake Bungunnia emptied, a dominant river – the Murray – began cutting a new channel across the old lake bed, incising deeply into the accumulated limestone deposits."[22]
>
> "For the past 500,000 years, the Murray Basin's climate has remained mostly dry. Lower temperatures reduced evaporation from soil and water and transpiration of moisture from plants. With more moisture being retained in the soil, water tables rose, wetlands formed and rivers swelled"[22]

The soils and geological characteristics, are a reflection of the Murray Darling Basin's origins, with salts being a natural part of its marine history.

In its birthplace in the Great Dividing range, the Murray River today commences its journey as a relatively small stream, building momentum on its journey to the Southern Ocean in South Australia.

While small in its upper reaches the Murray River, expands in size as it moves to a more identifiable river form in the region now covered by the Hume Dam. From there, the Murray travels within higher bank formations, to a region of natural physical constraint,

[22] Australian Geographic

known as the Barmah Choke. **Here the Murray River is reduced to a <u>mere 27-30 metres wide.</u>**

At this point, historical seismic events in last 60,000 to 100,000 years caused the Murray basin floor to rise up and the Cadell Tilt blocked the westerly flows of the Murray and Goulburn Rivers. The old bed of the Murray River is still evident in an area referred to as Green Gully.[23]

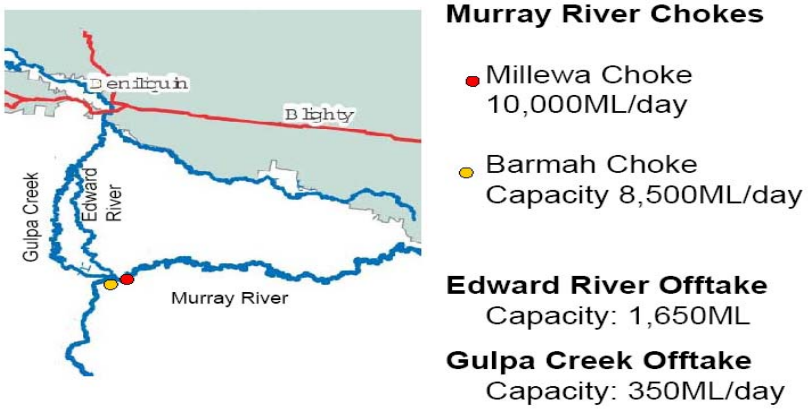
The Murray River began to flow in a northerly direction on a river bed now referred to as the Edward River. Lake Kanyapella formed extending over an area from south of Moira to beyond Echuca. The Goulburn flowed South of Cadell Fault near what is now know as the town of Echuca. At this time, the river area was open woodlands and grassy plains. Pollen from soil tests identify that red gums only colonized the area about 6000 years ago.[23]

In relatively recent times, possibly either just before or after the arrival of aboriginal people, the Murray setting a new course south where its water merged with the Goulburn. By then Lake Kanyapella had dried up although part of the depression today still fills in large flood events.[23]

According to the Mathoura historical information sheets, "scientific testing by Dr Tim Stone of the section of river bank between Picnic Point near Mathoura and the Victorian town of Barmah (known as the narrows or the Barmah choke) have shown that the channel is only about 550 years old. The river here has straight-side banks whereas older sections of the river show the normal sloping sides of a mature stream" [23]

Murray River (photo L Burge -Barmah choke 2008)
(water flow capacity – 8500 ML/D: width 27-30m)

Barmah Choke 'the narrows' (photo T Goodwin 2010)
(water flow capacity – 8,500 ML/d: any additional flow over top the river bank causes unseasonal flooding)



(figure: Murray Irrigation Limited)

[23] Mathoura Historical information sheet

As the Murray River, moves beyond its headwaters and the natural narrowing of the Barmah choke, the river formation broadens as it joins the waters of the Darling River system at Wentworth. In its final journey in South Australia, the Murray River became a wide river expanse before emptying its waters in the historical estuarine system of the lower wetlands and lakes system adjacent to the Southern Ocean.

The natural physical capacity of the main stem of the Murray River, (Millewa choke) and the Barmah (choke) has significant ramifications for the Federal and State Governments in relation to the delivery of large scales of environmental water proposed by the Murray Darling Basin Plan.

OVERVIEW OF WATER PLANNING (summary)

Australian river systems of the Murray Darling Basin are historically variable depending on the climatic conditions in the Southern Hemisphere.

The fluctuating nature of Australia's inland river and creeks is acknowledged by many, however there is a need to pause and reflect on how past investments and water planning have enabled a more secure and stable water supply for the nation.

The Cooperative Research Centre for Catchment Hydrology states:

> "in concert with a high degree of spatial variation, Australian rainfall is highly episodic and stochastic when compared to other continents from the same latitude or with similar climatic zones (McMahon et al. 1992). Australia is characterized by high seasonal variability across the continent and a high frequency of drought/flood oscillations (SOEAC 1996).[24]

Early Australian explorer journals refer to the river and creek conditions varying from dry ephemeral streams, through to raging rivers and floodplains, that were difficult to navigate.

Fluctuations in river heights, are evident from the characteristics of the river banks, which could indicate flow patterns over many centuries.

European settlement in 1750 precipitated the start of a journey for a number of Australian rivers, where natural variations were modified to meet the needs of future generations.

Early settlers took the opportunity to create small scale water storage systems in creek formations to capture water. These small stream interceptions perhaps were the forerunner to large planning works that would service Australia's growing population.

The advent of Government planning and investments in water, saw a shift in attitude where the potential of secure and stable river heights opened opportunities for navigation, irrigation and secure urban water supplies.

[24] Cooperative Research Centre for Catchment Hydrology

Such plans for water included the Water and Conservation Act of 1880, the Victorian Irrigation Act 1886 and the River Murray Waters Agreement in 1915, ratified by the Commonwealth in 1917.

Despite planning for water security, Australia's climatic events would continue to dominate water availability.

Notable droughts include the periods of 1864-66, 1880-86, 1895-1903 (Federation drought), 1911-16, 1918-20, a dry period extending from1933- 1945 - with severe drought within this period from 1939-45, 1958-68, 2001-10.[25]

The sustained Federation drought of 1895-1903 and critical year of 1902, led to large scale planning and investment in securing water supplies for Australia's future.

Following the Federation drought, an agreement was reached between four State Governments to secure reliable water supplies and expand irrigation.

In the Southern Basin, the River Murray Waters Agreement was agreed by the States in 1915 and ratified by the Commonwealth Government in 1917. The Agreement was overseen by the River Murray Commission. This Agreement was amended in 1987 with a new Agreement being signed in 1992.

The Basic principles of the original and subsequent amendments, remain in place today.

The River Murray Waters Agreement also provided:

1. Flow at Albury is shared equally between New South Wales and Victoria
2. Victoria and New South Wales retain control of their tributaries below Albury
3. Victoria and New South Wales supply South Australia with a guaranteed minimum quantity of water or 'entitlement'

The River Murray Waters Agreement also provided:

1. A storage on the upper Murray (Hume Dam)
2. A storage on Lake Victoria
3. 26 locks and weirs extended up to Echuca (14 were constructed)
4. 9 locks and weirs on either the Murrumbidgee or Darling River (Murrumbidgee resulted)

Original State sharing arrangements were further amended with the completion of the Dartmouth Dam in 1979, when during negotiations, South Australia's entitlement was raised from 1500 GL to 1850 GL as a condition for the abandonment of the proposed Chowilla Storage dam due to salinity issues at the proposed site. Prior to these negotiations, South Australia had approximately 3/13th share of the Basin resources, with New South Wales and Victoria sharing 5/13th each. Despite South Australia being only 6.7% of the Basin, modifications to State sharing agreements, gave South Australia a new equal entitlement share of the Basin water resources, with a higher degree of reliability than other States.

The River Murray Commission was superseded by the Murray Darling Basin Commission in the 1980's and integrated catchment management began to dominate natural resource planning in the Basin.

[25] Australian Newspaper

The Murray-Darling Basin Cap (CAP ON DIVERSIONS)

The Murray Darling Basin Ministerial Council

> 'amid growing concerns about the changes to the flow regimes in rivers within the Basin and their consequences, the Ministerial Council (Murray Darling Basin Commission) in June 1993 initiated an audit of water use in the Murray-Darling Basin. The Audit, which was completed in 1995, showed that if volumes of water diversions continued to increase, this would exacerbate river health problems, reduce the security of water supply for existing irrigators in the Basin, and reduce the reliability of water supply during long droughts.'[3]
>
> "In response to the findings of the Audit, a limit was imposed on the volume of water which could be diverted from the rivers for consumptive uses. This limit is called the Cap. An interim Cap was imposed in June 1995. Following an independent review of equity issues, a permanent Cap for New South Wales (NSW), Victoria and South Australia was implemented from 1st July 1997.3

For NSW and Victoria, the Cap is defined as "*the volume of water that would have been diverted under 1993/94 levels of development*". For Queensland (a moratorium on further development in place since September 2000) and the Australian Capital Territory which together divert less than 7% of total water being diverted in the Basin, the Cap arrangements are still being worked out."3

The Murray Darling Ministerial Council meeting 29, 25th August 2000, included Schedule F to the Murray Darling Basin Agreement to further defined the Cap in terms of operation, monitoring and reporting. This schedule defined:

- Long term diversion Cap for each state
- Power of Ministerial council to alter long-term diversion caps
- Develop analytical models
- Calculation of annual diversion targets
- Monitoring and reporting
- Appointment of an Independent Audit Group
- Annual audit by the Independent Audit Group
- Power to require a special audit of a designated valley
- Special audit by Independent Audit Group
- Declaration that diversion cap has been exceeded
- Advice to Ministerial Council on remedial actions 3

National Water Initiative

Australia water reform process was further developed on February 25, 1994, when the Council of Australian Governments (COAG) agreed to the establishment of the Water Reform Framework

The Intergovernmental Agreement on a National Water Initiative (NWI) was signed at the 25 June 2004 at the COAG meeting. The Tasmanian Government joined the Agreement in June 2005 and the West Australian Government joined in April 2006. The oversight body to the NWI was the National Water Commission [26].

[3] MDBC

[26] National Water Commission

The NWI represents a shared commitment by governments to increase the efficiency of Australia's water use, lead to greater certainty for investment and productivity for rural and urban communities, and for the environment. A founding principle of the NWI was a balance between social, economic and environmental considerations.

Under the NWI, governments have made commitments to:

- prepare water plans with provision for the environment
- deal with over-allocated or stressed water systems
- introduce registers of water rights and standards for water accounting
- expand the trade in water
- improve pricing for water storage and delivery
- meet and manage urban water demands

The Murray Darling Basin over the period of 2001-2010 has experienced severe drought. The continued extent and severity of the drought has meant that many of environmental benefits achieved through these Water Resource Plans have not had the opportunity to be tested, as to the effectiveness of planning to meet ecological objectives.

Water Act 2007

Specific aspects of the reforms principles of the NWI agreed to in 2004, were to be implemented across all Basin States and implemented under a new Federal Water Act.

The Federal Coalition Government sought Commonwealth powers on water by introducing the Water Act 2007. However, Federal powers on water were limited as determined by the Australian constitution. During this period, significant political differences occurred between the Federal and State Governments. In the broader public sense, water issues had also, become highly political.

The drafting of the Water Act 2007 was subject to considerable variations but 'without the political will of the States, the Act's very constitutional validity was in question. [27]

The Australian constitution (section 51) identifies the legislative powers of the Commonwealth. Under the arrangements of the Australian Federation, 'power is reserved to the States except that which are specifically provided to the Commonwealth at Federation [27]

The Water Act 2007 enabled the Commonwealth Government to over ride water powers, held by the States of Australia, through the provision of 'external affairs' powers under the Australian constitution (section 51). The Water Act 2007 refers to this in Section 9 (NSWIC). To trigger the use of such powers, the Federal Coalition Government used international environmental agreements and conventions. (eg Ramsar)

The final wording of the Water Act 2007, designed by Commonwealth as a mechanism to obtain a level of power of water over the States, places the environment as the key priority over all other considerations.

The Water Act 2007 therefore, is inconsistent with all principles of ecological sustainable development (social, economic, environment); is against the agreed principles of the

[27] NSW Irrigators Council

National Water Initiative; and is against the agreed Australia's own National Standard for Ecological Sustainable Development (1992).

In 2007 the Federal Parliament passed The Water Act 2007. The Act was amended in 2008. This included an amendment provision to protect the interests of human supplies of water that were critical for towns and cities.

This Act:

- **Establishes the Murray-Darling Basin Authority** (MDBA)
- The Act requires the MDBA to prepare the **Basin Plan**
- Establishes a **Commonwealth Environmental Water Holder**
- Australian Competition and Consumer Commission **(ACCC)** - key role in developing and enforcing **water charge and water market rules** (in line with NWI principles)
- Gives the Bureau of Meteorology **water information** functions that are in addition to its existing functions under the *Meteorology Act 1955*.

Key elements of the Basin Plan include:

Sustainable Diversion Limits (SDLs)
The MDBA will set Sustainable Diversion Limits (SDLs) as part of the new Basin Plan. The State Governments will establish new water sharing plans (WSPs) to meet the new extraction limits – SDLs. This will occur from 2012, (NSW 2014) (Victoria 2019)

The SDLs, will "take into account the best available science, and the 'precautionary principle'. According to this principle, if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation"

Water Trade Rules
The Basin Plan will include water trade rules to enable a Basin wide approach under the new Plan. The development of Water Trade Rules are being managed by the ACCC

- The removal of barriers to trading water rights
- The terms and process for trading water rights
- The manner in which trades of water are conducted
- The provision of information to enable trading to take place

Social and economic analysis and implications
The Basin Plan is required to describe the social and economic circumstances of the Basin communities that depend on Basin water resources. The MDBA will assess the socio economic implications of any reductions in the long term average SDLs. Governments will use this information to consider appropriate responses to social and economic impacts of the Basin Plan.

The Basin Plan will also include:
Environmental Water Plans
Water quality and salinity management Plans
Monitoring and evaluation
Audit of the Basin Plan's implementation

INTERNATIONAL ENVIRONMENT AGREEMENTS

Australia's water resources are also subject to a range of voluntary international agreements on the environment.

International agreements affecting Australia's water resources include "the Convention on Biological Diversity, the Convention on Wetlands (RAMSAR, Iran 1971), the Japan/Australia and China/Australia migratory bird agreements (JAMBA and CAMBA), the Convention on Migratory Species, the Convention to Combat Desertification, the Commission for Sustainable Development and the United Nations Environment Program.

South East Asian Migratory Bird Flyway zone – Ricegrowing region of the Southern Riverina

(photo L Burge, Deniliquin)

Australia also participates in non treaty bodies such as the Valdivia group of Southern Hemisphere countries".[28]

The International Union of Conservation of Nature 'World Conservation Strategy' is identified by the Cooperative Research Centre for Catchment Hydrology as the 'first global statement on sustainable development, although it is less well recognised than the World Commission of Environment and Development meeting of 1987" [24]

In 1987 the World Commission of Environment and Development (WCED 1987) released the Brundtland Report which argues for 'mutual reinforcement of economic and environmental policy.[24]

Australia's participation in the 1992 United Nations Conference on the Environment and Development in Rio de Janeiro established policies for the Environment, Climate Change, Forests and Biodiversity.

Australia's National Strategy for Ecological Sustainable Development (Dec 1992) endorsed by the Council of Australian Governments (COAG), accepts there is no universally accepted definition of ESD, but is largely based on internationally recognised principles of ecological sustainable development that seek to achieve a balance of environmental, social and economic needs.

Australia was one of the first countries to sign up to RAMSAR in 1974. This inter-governmental treaty establishes a national approach and international cooperation for the conservation and sustainable use of wetlands.

[28] Australian Government, Dept Sustainability, Environment, Water, Population & Communities (web)

[24] Cooperative Research Centre for Catchment Hydrology

Australia, has a range of sites nominated for listing and incorporates both public and private lands. The Ramsar Convention is a global treaty and the principle for management of sites is "the Wise Use Concept" – "the conservation and sustainable use of wetlands and their resources, for the benefit of humankind." [29]

Once a site has been listed under Ramsar, a plan of management is developed by the nominating country. As part of, or at a subsequent date, the site's ecological character descriptions are developed to assess future monitoring.

Importantly, countries such as Australia signing up to international treaties or agreements on the environment, do so in a voluntary capacity. Non adherence to the agreed principles for signatory countries, are generally addressed through negotiations, or a range of other non legal avenues.

The nominating country (eg Australia) designs the management plan for a Ramsar listed site and the method of management to retain the site's identified characteristics. As part of agreed principles, the nominating country would provide reports to the Ramsar secretariat, on progress of management and any significant changes, natural or otherwise.

In Australia, if a site is listed under Ramsar, objectives of future management aim, to preserve the ecological character that was evident, at the time of listing. However, the relevant timeframes raise potential concerns about political or human decisions about desired objectives for the site, which can influence the date of listing, the type of environmental characteristics described or noted as having historically prevailed.

The Coorong Lower Lakes and Murray Mouth site was included under Ramsar in 1985. The actual plan of management was not developed until 2000. The detailed 'ecological character descriptions' were not completed until 2005.

Hypersaline conditions of the Coorong were included in 1985 as part of the broader ecological character description of the site. This identifies that significantly modified sites can still attract Ramsar listing in line with the Ramsar principle of 'wise use'.

Further this particular site was noted in a letter to Ramsar in 2006, to have undergone significant changes as far back as 20 – 30 years prior to the time of listing in 1985 (approx 1955).

The **Millewa Forest of NSW** was officially recognised as a **Ramsar wetland site in 2002** when proposed by the NSW State Forests. A Forest Management Plan was developed by NSW State Forests which included an ecological character description on which to assess future management. The ecological character description now appears to be under review given the change of tenure to National Park 1st July 2010.

The detailed ecological character descriptions have not been released, indicating perhaps new policy changes aligned with the change of management tenure from NSW State Forest control, to NSW National Parks. **The MDBA has utilised the Barmah Forest** (Victoria) **ecological character description** which was listed in 1982.

As the timeframes between listing a site, determining a plan of management and identifying its ecological characters may evolve over decades, it is clear that the nominating country retains control over the site and may amend aspects of the site as required/desired.

[29] Australian Government, website – Ramsar Convention

In terms of water planning in the Murray Darling Basin, international agreements have now reached a new level of prominence due to the construction of the Water Act 2007.

Australians should acknowledge specific conditions and continued management rights for sites listed under the Ramsar agreement.

It is important to recognise the parameters in relation to listing of individual sites under an international treaty or agreement (eg Ramsar), the timelines of the listing, plans of management and determination of ecological characteristics.

These decision points, may be relevant for how the Australian Government determines the future management of waters and economic basis of Australia's food production, in the Murray Darling Basin.

WATER PLANNING AND THE ENVIRONMENT

NEW SOUTH WALES

This submission provides an over view of NSW actions on water reform. The report specifically focuses on the Southern connected Murray River systems. In assessing plans for the environment – *note: a volume of water can have multiple benefits*: *National Water Commission report (2010): "environmental, economic and social benefits are derived from the same volume of water".

Overview: Darling River system (Northern NSW)

The Northern Floodplain and Darling River system operates on a different water management regime to the Southern Murray connected systems in NSW.

The Darling River irrigation systems and water sharing arrangements operate on the basis of floodplain extractions and releases from smaller storage systems, than in the Southern Murray connected systems.

The Darling system water sharing plans, in general operate on flow based rules for extractions on the floodplains. Water sharing arrangements between the environment, community and agricultural systems reliant on irrigation, has been developed around a highly variable floodplain.

Water Sharing Plans will determine when entitlement water can be accessed. The rules and issues of floodplain management and water access, operate in vastly different spheres than those of the regulated storage systems in the South. (eg Murrumbidgee and Murray Rivers)

Overview: Southern connected systems (Southern NSW)

In the Riverina region of NSW, population densities are more developed and water management is largely controlled by major dam storages. The rules around water entitlements for irrigation, are based on the system of seasonal annual 'announced allocations'.

In political and media terms, the perception of 'over allocated' is incorrect. The Southern connected systems have licensed entitlements and at the start of each, water planning year, announced allocations to those entitlements occur. The announcements in general progress in the spring and mid summer period and reflect 'available water determinations' as announced by the NSW Office of Water.

In developing the basin plan, it is important to recognize the different levels of planning across States and the level of community and government investment and development in Watering Sharing plans, both surface and groundwater. It is not possible to apply a 'one size fits all' scenario or set of presumptions in regard to the complexities of the Murray Darling Basin.

The Murray-Darling Basin Cap

The Murray Darling Basin Agreement (Schedule F) defines the Cap for New South Wales (NSW) as:

> 'The volume of water that would have been diverted under 1993/94 levels of development plus an allowance in the Border Rivers for Pindari Dam.'
>
> The Cap in NSW and Victoria is not the volume of water that was used in 1993/94. Rather, the Cap in any year is the water that would have been used with the infrastructure (pumps, dams, channels, areas developed for irrigation, management rules etc) that existed in 1993/94, taking into account the climatic and hydrologic conditions that were experienced during the year under consideration. A primary task in monitoring the cap in these States is determining the size of the Cap target for each year. This calculation is done at the end of each year and uses the observed climatic and hydrologic data.
>
> In the south of the Basin, this will tend to result in lower Cap targets in years when there is significant rainfall in the irrigation areas and larger Cap targets in years with less rainfall when the demand is higher. However, the annual Cap target will also be affected by the availability of water. In very dry years in the south of the Basin, the annual Cap target will reflect the resource constraints. In the North of the Basin, the Cap target will be very much affected by the opportunities to harvest water into on-farm storages.
>
> Because of the these complexities, the calculation of the Cap targets is made by use of computer models with relationships for water use that include a range of climatic factors and detailed modeling of flows and storage behaviour.' (Note: the Murray Darling Basin Commission – Water Audit Monitoring Report (2006/07) published June 2008,

The Murray Darling Basin Commission – Water Audit Monitoring Report (2006/07) published June 2008, reference is made to all states under the Basin Cap (NSW, Victoria, SA, Queensland, ACT):

> 'Murray Darling Basin Auditing and approving these models is a major task. Interim Cap models have been developed for most Cap valleys, for which Caps have been agreed. Out of twenty four Cap valleys, Caps have not defined in five valleys and three other valleys do not require a Cap model. Of the remaining sixteen Cap valleys, Cap models have been approved for five; two more Cap models are ready for approval and eight Cap models are currently being audited. There is only one valley (wimmera-mallee Victoria) where a Cap model has not been built. But that valley has significant credit based on long-term Cap.
>
> The annual Cap targets, calculated with the help of Cap models are adjusted for water trades and environmental use of water if applicable'

The most current Cap review is the June 2008 Water Audit Monitoring Report 2006/07 – Report of the Murray-Darling Basin Commission on the Cap on Diversions.
3.5.1 New South Wales states:

> ‘The interim Cap models for most of NSW valleys are available now. The Lachlan and Namoi models, after an audit, have been approved by the Commission under Schedule F. Following an audit, the NSW Murray Cap model (contained I the MSM suite of Cap models) has been recommended by the auditor for approval by the Commission. The Macquarie, Peel Gwydir, and Murrumbidgee models are being audited and are expected to be accredited by the Commission during 2007/08.
>
> Diversions in Gwydir, Namoi/Peel, Macquaire/Castlereagh/Bogan, and Murray exceeded their annual Cap targets and diversions in Barwon-Darling/Lower Darling, Lachlan, and Murrumbidgee valleys were within the annual Cap target for 2006/07. All NSW valleys, except Barwon-Darling/Lower Darling, are in cumulative credit. The cumulative debit of 57GL in the Barwon-Darling/Lower Darling, combined Cap valley was less than 62GL (20% of the long term cap) required for special audit. As a consequence on the recommendation of the IAG, Commission meeting 95-22 April 2008 revoked the declaration of Cap breach. [30]

National Water Initiative (NWI) – NSW Water Sharing Plans

The State of New South Wales has implemented, a range of principles established under the National Water Initiative. Water sharing Plans have been implemented for the major regulated water sources within the Murray Darling Basin Plan. Macro Water Sharing Plans for unregulated surface and some groundwater water systems across NSW, are still to be completed.

By the June 2010, 54 water sharing plans have been implemented or have planning in place covering “approximately 80% of the water extracted in the State”. Macro plans are being implemented to cover the remaining unregulated river and ground water areas.[61]

What is a water sharing plan?

NSW Department of Water & Energy identify:

> “for our rivers and groundwater systems to be healthy and productive in the long term, it is critical to balance the competing needs of the environment and water users. A water sharing plan is a legal document prepared under the Water Management Act 2000 (NSW). It establishes rules for sharing water between the environmental needs of the river or aquifer and water users, and also between different types of water users such as town supply, rural domestic supply, stock watering, industry and irrigation.”[31]
>
> “The purpose of a water sharing plan is:
> 1. to protect the fundamental environmental health of the water source
> 2. to ensure that the water source is sustainable in the long-term
> 3. to provide water users with a clear picture of when and how water will be available for extraction
>
> “Plans can be prepared as either an individual plan covering a specific river or groundwater system or a macro plan covering a number of rivers or groundwater systems.”

[30] MDBC Water Audit & Monitoring Report (2006/07)
[61] NWC Environmental Water Management Report (2010)
[31] NSW Dept Water &Energy – Water Sharing Progress Report

Major elements of a water sharing plan include the following points in relation to the environment:

- provides water for the environment by protecting a proportion of the water available for fundamental ecosystem health and/or including specific environmental rules – this is called planned environmental water
- allows licensed water to be committed for environmental purposes – this is called adaptive environmental water which can arise from water recovery projects or by buying water licenses
- protects the water required to meet basic landholder rights
- set annual limits on water extractions to ensure that water extractions do not increase and therefore erode the water for the environment and also the security of supply to water users – this includes the limit on extractions imposed under the Murray Darling Basin Cap
- specifies rules in groundwater plans to minimize impacts on other groundwater users, dependent ecosystems, water quality and the stability of the aquifer"[31]

How do these plans provide water for the environment?

NSW Department of Water & Energy identify: "Environmental rules in the water sharing plans are designed to:

1. limit extractions so that the major share of water is protected – between 56 per cent and 80 per cent of the average annual water in the regulated systems will be retained in the river – amounting to over five million megalites (1 megalite=1 million litres) in the inland systems
2. replicated natural flow patterns so as to provide water when and where it will best meet environmental needs – on average the rules for the regulated rivers will return an additional 220,000 megalitres of water to the environment over and above that required under the Murray Darling Basin Cap.

The environmental flow rules are based on the following river flow objectives that set out 12 aspects of flow considered to be critical for the protection or restoration of river health, ecology and biodiversity. These objectives were subject to extensive public consultation and endorsed by the NSW Government in 1999.

1. Protect natural water levels in pools of creeks and rivers and wetlands during periods of no flow
2. Protect natural low flows
3. Protect or restore a proportion of moderate flows, 'freshes' and high flows
4. Maintain or restore the natural inundation patterns and distribution of floodwaters supporting natural wetland and floodplain ecosystems
5. Mimic the natural frequency, duration and seasonal nature of drying periods in naturally temporary waterways
6. Maintain or mimic natural flow variability in all rivers
7. Maintain rates of rise and fall over river heights within natural bounds
8. Maintain groundwater within natural levels, and variability, critical to surface flows or ecosystems
9. Minimize the impact of in-stream structures
10. Minimize downstream water quality impacts of storage releases
11. Ensure river flow management provides for contingencies
12. maintain or rehabilitate estuarine processes and habitats[31]

NSW Water Quality and River Flow Objectives are the agreed environmental values and long-term goals for NSW's surface waters. Water Quality objectives have been agreed for Fresh and Estaurine surface waters and Marine Water Quality Objectives. The Objectives

[31] NSW Dept Water & Energy

are consistent with the agreed national framework for assessing water quality set out in the ANZECC 2000 Guidelines.[32]

The purpose of river flow objectives are to produce specific environmental benefits such as:

- Improved survival of ecosystems and aquatic biodiversity
- Improved water quality
- Healthier wetlands
- Improved habit quality and increased variability of habitat for native fish, frogs, waterbirds and other native fauna, including invertebrates
- More successful breed of native birds, fish and other native fauna, which only breed in response to specific environmental triggers, for example, rising or falling water levels in the natural season
- More natural inundation of flood plains and wetlands, leading to better health and productivity (such as grazing), protection of endangered species, biodiversity and water quality
- Discouragement of alien pest species, such as carp, which favour regulated conditions
- Improved health of in-stream and riparian vegetation, leading to greater bank stability, improved efficiency of buffer strips in protecting water quality, and reduced erosion and turbidity
- Reduced frequency of algal blooms

The actual environmental flow rules in the water sharing plans for the regulated rivers vary from valley to valley, depending on which of the above objectives were considered most important for that valley. The range of rules which apply are set out in the table below:

Environmental flow rules in the regulated rivers	**Purpose**	**Valleys where rule applies**
Extraction limit	Sets a limit on the long term annual volume of water that can be extracted, thus protecting the major share of water for the environment	All regulated rivers
End-of-system flow	Requires a flow to be retained at the end of river system. This ensures that flow is maintained below the areas of major extraction	Namoi Murrumbidgee Hunter
Transparent dam release	Requires all dam inflows occurring at certain times to be passed immediately downstream, as though no dam was present. This maintains natural flow variability for that part of the year (usually winter months) when dam releases would otherwise be	Murrumbidgee

[32] NSW Dept of Environment:

	minimal	
Translucent dam release	Requires a proportion of dam inflows occurring at certain times to be passed immediately downstream. This restores the natural flow variability associated with specific flow ranges usually freshes and minor floods	Lachlan Macquarie
Limits on taking high flows	Limits pumping when the dam spills or high flows enter the regulated river from unregulated tributaries. This protects either some or all of these naturally occurring high flows which are important for flooding of wetland areas.	Lachlan Namoi Gwydir Hunter
Limits on taking low flows	Limits pumping from lower flows that enter the regulated river from unregulated tributaries. This ensures that sufficient water is retained in the river for the environment	Gwydir
Environmental water allowances or releases	Creates a 'bank' or volume of water stored in the dam which can be released for specific environmental purposes, such as flushing blue-green algal blooms, reducing salinity or supporting bird-breeding or fish spawning events.	Gwydir Macquarie Lachlan Murray Murrumbidgee Hunter

Note: there have been concerns about the application for rules of translucent flows and the risks of early translucent releases – which could accentuate the risks of storage not filling in the event of season inflows not meeting expectations.

Water Sharing plans progress – Murray Darling Basin Drainage Division (NSW)

Plan	**Area**	**Status of plan (as at 30.6.10) (year)**
Barwon Darling	7128 km2	In progress
Border River Regulated	3796 km2	2009
Border River unregulated & alluvial GW	20,148km2	Under development
Gwydir River - regulated	6556 km2	July 2004
Gwydir River - unregulated	19,498 km2	July 2004
Gwydir – Groundwater		2006

Plan	**Area**	**Status of plan (as at 30.6.10) (year)**
Castlereagh River	17,401km2	2004
Macquarie & Cudgegong Regulated Rivers		2004
Castlereagh River above Binnaway Gazetted Plan		2004
Macquarie & Castlereagh Unregulated & Alluvium		Under development
Lower Macquarie Groundwater		2006
Darling River regulated	3081 km2	2004
Darling River upper unregulated	58,795??	In progress
Far West	95,562	Not planned * identified requiring plan
Lachlan River - regulated	(59,891km2)	Commenced 1st July 2004 Suspended 1 July 2004 (drought -critical planning)
Lachlan River - unregulated Mandagery Creek		2004
Lower Lachlan – groundwater		2008
Lachlan – Belubula regulated & alluvial		Under development
Lachlan – Unregulated & alluvial		Under development
Lake George	941 km2	In progress
Lower Murray Darling	76,766 km2	In progress
Macquarie River regulated	12,284 km2	2004 Suspended July 07 (drought)
Macquarie River unregulated	61,673 km2	In progress
NSW Murray – Lower Darling Regulated Rivers	18,593 km2	2004 Suspended 10 November 06 (drought- critical planning)
Upper Billabong		2004
Lower Murray Groundwater		2006
Lower Murray shallow Alluvium		Under development
Murray Unregulated & Alluvial		Under devleopment
Murrumbidgee River regulated	29,271 km2	2004 Suspended 10 November 06 (drought – critical planning)
Adelong Creek – unregulated		2004
Tarcutta Creek - unregulated		2004
Lower Murrumbidgee Groundwater		2006
Lowbidgee Floodplain - unregulated		Under development
Murrumbidgee Unregulated & Alluvial		Under devleopment
Upper Namoi & Lower Namoi – regulated	7444 km2	2004
Peel Valley regulated, unregulated, alluvium & fractured rock source		2010
Phillips Creek, Mooki River, Quirindi & Warrah Creek		2004
Upper & lower Namoi Groundwater		2006
Namoi unregulated & alluvial		Under development
Upper Murray	5207 km2	Not planned *requiring plan

(source National Water Commission & NSW Office of Water)

NOTE: NSW has approximately 23 other identified regions outside the Murray Darling Basin drainage division currently developing/developed water sharing plans

The National Water Commission – Water Environmental Water Management Report 2010 states:

> "The Commission recognizes that the establishment of the water requirements of the environment and the subsequent provision of water through water plans – following the trade-off process with other public benefit outcomes and consumptive uses – does not lend itself easily to volumes and 'water balances'. Environmental water requirements necessarily involve issues of timing, water quality and dynamic flows – an overall regime that is difficult to represent numerically that poses a significant challenge in water resource accounting".

The report concludes:

> "the determination of environmental water requirements has improved from focusing on base flows, to more sophisticated methods that consider components of the entire water regime"

The NWC report (2010) Section 6.2 – determination of environmental water states for NSW:

"**Environmental outcomes are specified in the water sharing plans. Water requirements to achieve those objectives are not stated, however they are to an extent implicit, in the water management rules set out in the plans.**

Environmental flow rules in initial surface water plans were developed based on 12 broad 'river flow objectives' and the environmental flow rules were tailored to reflect the ecological, hydrologic and water quality conditions in each water source.

The report Section 6.5 – Review of environmental water states:

"for the regulated river plans, NSW has adopted an approach called 'Integrated Monitoring of Environmental Flows'. The program assesses the environmental water provisions of the water sharing plans for the major regulated rivers to:

- Investigate relationships between water regimes, biodiversity and ecosystem processes…; to assess responses in hydrology, habitats, biota and ecological processes associated with specific flow events targeted by environmental flow rules; to use the resulting knowledge to estimate likely long-term effects of environmental flow rules (planned environmental water) and provide information to assist in future adjustment of rules.
- The program is largely aimed at assessing the environmental water provisions of the water sharing plans to determine their effectiveness in meeting the ecological objectives of the plan
- Environmental water provisions in the unregulated river water sharing plans are different to those for regulated rivers. Generally, in unregulated rivers the environmental flow rules consist mainly of annual extraction limits and 'cease to pump' levels which prevent pumping when river flow drops below a specified level.
- For unregulated river plans, monitoring is undertaken over a number of stands which largely focus on low flow issues. These strands examine issues such as fish passage, predictive modeling of fish and macroinvertebrates, low flow vertification, pool refugia, and inflows to estuaries.
- Some groundwater sharing plans include provision for recharge calculations and the proportion of recharge identified as planned environmental water to change

throughout the life of the plan. Monitoring and modeling of groundwater condition is used to inform such changes. This information will also be used to assess outcomes of these plans at the end of their term.

Water Sharing Plans – How water is allocated

The NSW Government allocates water on the following basis in regulated Southern connected systems.

- High security - (includes town water supply, industrial, stock & domestic, and high security license conditions for agriculture)
- General Security – water availability varies annually or seasonally
- Basic Water Rights – eg Stock & domestic
- Conveyance Losses – water held by license to ensure delivery of consumptive water
- Adaptive Environment water – water held under license specifically for the environmental
- Supplementary access – announced when water flows are in excess of rules specified in a water sharing plan

Water Sharing Plans – Priority for water allocation announcements

In NSW, allocation announcements for the Murray and Lower Darling Rivers are based on the following priorities in order:

1. flow required to meet environmental health requirements
2. provide for basic water rights
3. provide for water carried over from previous year
4. provide for high security entitlements
5. provide for initial conveyance losses
6. provide for general security entitlements
7. announced supplementary water

Water Sharing Plans – specific environmental considerations.

Water Sharing Plans (WSPs) vary across regions. Operational rules are determined by a range of factors including, the water source, environmental considerations, end of system requirements and licensed entitlements. Some WSPs may have specific rules in addition to the NSW River Flow and Water Quality Objectives.

An example of this occurs in the NSW Water Sharing Plan for the Murray and Lower Darling Regulated Rivers 2003 where planned environmental water rules exist for the Barmah-Millewa Allowance.

Murray Irrigation Limited (MIL) – formerly a NSW Government water distribution entity and now a private irrigation company, is a private irrigation distribution company whose area of operations is from Mulwala (east) to Moulamein (west). The area of operation covers 748,000 hectares of farmland on the northern side of the Murray River in the Southern Riverina region of New South Wales.

Investments and partnerships arrangements with the Government, have seen the accrual of benefits to the environment, achieved through investments in infrastructure.

Through investments for water saving infrastructure in the areas of MIL operations, environmental benefits were delivered through the NSW Lower Murray Darling Water

Sharing Plan. This included the creation of a permanent water entitlement of **100,000 ML** for the Barmah Millewa Forest (Murray River Icon site) (50,000ML NSW/50,000ML VIC)

A further 50,000 megalitres (25,000ML NSW/25,000ML VIC) can be accessed under certain conditions. This forests entitlement is delivered as a result of Government/community plans developed to deliver ecological benefits for the forest and its environs.[33], [34]

A further investment in channel upgrades, saw an additional 30,000 ML form part of the adaptive environmental water – in the NSW Murray Lower Darling Water Sharing Plan.

Regional cross border water sharing plans (in Victoria and NSW (NSW Lower Murray Darling)) enable the water accounts to built up in the plan. This can mean, the environmental entitlement for the Barmah Millewa totalling up to 700 GL, can be stored over successive years. This specified environmental water for the Barmah Millewa identified in the WSP can be released in a larger volume to maximize the environmental benefits but significant issues related to the storage and release of this scale of environmental water (ie account @ 700 GL).[34]

In 2005/06, the Barmah Millewa environmental water account released 512,000 ML into the Barmah Millewa Forest in the middle of the 'Millenium drought'.

Water Sharing Plans – environmental benefits achieved through the delivery of consumptive water

Environmental benefits are derived through the delivery of entitlements prescribed under a water sharing plan. As an amount of water allocated for specific purpose in a Water Sharing Plan, is released from a water storage system (eg Hume Dam), benefits accrue to fish species, macro invertebrates, bird, mammals and vegetation, as 'entitlements' move through the river, creek or channel systems. Such benefits are in addition to specifically identified environmental benefits achieved through rules of a water sharing plan (planned environmental water); benefits achieved through specific 'environmental entitlements' (adaptive environmental water); or other specific environmental purchases or conditions.

Water Sharing plans establish the bulk access regime for extractable water under access licenses. For example the Water Sharing Plan for the Murray and Lower Darling Regulated Rivers 2003, include the share component:

- stock and domestic access licenses
- local water utility access licenses
- regulated river (high security) access licenses
- regulated river (conveyance) access licenses
- regulated river (general security) access licenses
- supplementary water access licenses

Note: Supplementary license conditions can be determined by the relevant NSW Minister. In wetter periods, water in excess of planned requirements or of storage capacities, may be activated as supplementary licenses (all/or part). Supplementary licenses not accessed, are retained in the river system for the environment as is experienced in 2010. Flows pass through the river system but are not categorized as 'environmental flows'

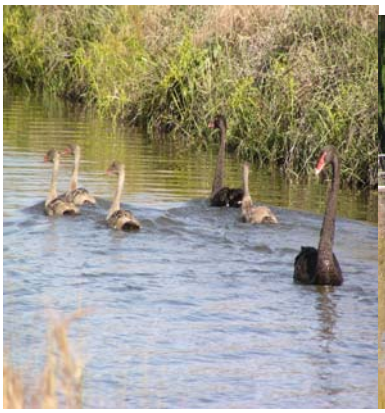
[33] Murray Irrigation Limited

[34] NSW Office of Water – NSW Murray & Lower Darling Water Sharing Plan

Originally water planning enabled general Security entitlements to access up to 455 GL of Supplementary Water, which was approximately 20% of water use. In 1996/97, NSW **imposed a ceiling of 250 GL**.

The rules around the delivery of 'consumptive or licensed water', developed under a Water Sharing Plan, have a range of inbuilt rules for the protection of the environment as noted in the previous section.

However, what is not noted or evaluated, in considering the needs of the environment, are the benefits derived for the environment, through the delivery of 'consumptive or licensed water'. Accrual of benefits can be assessed through in river, stream or tributaries flow, channel distribution networks or, ultimately as water is distributed for agricultural, for the production of food or fibre.



(photos: Black Swans & cygnets - L Burge Breeding in MIL irrigation channel width of channel 4 m)

(Photo: Brolgas in the Riverina L Burge)

The Southern Riverina region of NSW is a diverse agricultural region producing wheat, sheep, beef, dairy, rice and vegetables. While the region hosts the largest rice mill in the Southern Hemisphere, farms producing rice, do so on a rotational basis with other cereal and livestock enterprises. Farming areas, such as the Southern Riverina, that have seasonal water sources, attract a significant level of biodiversity than is increasingly recognized for its contribution to the environment.

The rice growing region of Australia have become part of The East Asian-Australian Flyway Zone – an international flyway corridor for migratory journeys of many bird species, including water birds that would otherwise not be seen in this part of the world.[35]

Research has shown that around 40 billion frogs are found on rice farms throughout the Riverina. The Endangered Southern Bell Frog relies on the rice industry for its survival[36] [37]

On going research by the University of Canberra at the Rice Research Field Station at 'Old Coree' (Jerilderie), have determined that approximately 4000 frogs live in 0.3 of a hectare. It is estimated that frogs comprise the highest biomass of any vertebrate in the rice based systems of the Southern Riverina.

[35] Ricegrower's Association of Australia
[36] Pyke G,
37 Doody JS



(Photo: J Burge tadpole in rice) *(photo J Burge - rice* *(photo: RGA tortoise monitoring)*

In assessing additional water for environment purposes, environmental benefits achieved through the delivery and use of consumptive or licensed water, should be recognized as providing significant benefit to a range of environmental factors.

Major Storage Dam – spills (flood)

The Hume Dam water levels vary in relation to climatic conditions affecting inflows and demand. In the months of November through to April, a drawdown of the Hume Dam water supplies at the end of the irrigation season mean that typically the Hume storage capacity is between 10% and 50% of capacity. The efficiency of the catchment of the Hume Dam, means that despite relatively low volumes at the end of a season (ie 10%), in normal conditions the Hume Dam can reach capacity within a relatively short timeframe (often < 5 months).

Seasonal inflows are stored during the winter and spring to provide reliable water security for urban, irrigation, industrial and tourism needs during warmer months. Depending on seasonal conditions and inflows, the Hume Dam may spill naturally as inflows exceed storage capacity. This can occur on average, one year in two, or at the other extreme, no spills - in dryer periods.

There are four main phases of operation of Hume storage:

- Filling phase
- Release phase
- Pre-release phase
- Spilling (flood) phase

When seasonal inflows exceed demand and storage capacities, the spillway gates at the dam are used, together with the power station and irrigation valves, to pass inflows downstream.

The aims of the operation are:

- To pass the flood without endangering the safety of the dam
- To mitigate, or at least not worsen, the effects of downstream flooding
- To ensure as far as possible that the storage is near full after the flood so there is no loss of resource[34]

Overall, the Hume Reservoir provides very significant flood protection downstream. It can fully absorb many floods during the filling stage, typically during autumn and early winter,

[34] NSW Office of Water

and significantly mitigate later floods. However, once the storage has filled, its flood mitigation potential is very limited until it is again drawn down[34]

Water that is released in the spill (flood) phase is likely to occur when the catchments are significantly wet and the demand on water supplies for consumptive purposes is limited as has occurred in 2010.

Spill (flood) events passing through the Hume Dam can contribute major inflows to the river system. These significant flows will pass through the environment, but may not officially recognized or classified as environmental flows.

Murray River – South Australia Conveyance rules

South Australia's has a share of the Murray Darling Basin Water resource that is determined as a base entitlement flow of 1850 GL/year.

This includes 696 GL to account for the delivery and loss factor of the minimum entitlement flows to South Australia. NSW and Victorian plans ensure that sufficient water is retained over and above the 1850 GL to run the river systems to meet all the States needs.

Additional Dilution flows – South Australia

In the NSW Murray and Lower Darling Regulated Rivers Water Source Plan 2003, specific operational rules apply. An example is additional conditions as they relate to the Murray Darling Basin Agreement and interstate water sharing arrangements for environmental management of the Murray-Lower Darling Rivers

South Australia (SA) has an entitlement share of 1850 GL. This entitlement includes a flow value of 696 GL as a dilution and loss factor..[13]

Following the 1987 MDBC Salinity and Drainage Strategy, in 1992 an amended agreement on the waters of the Murray Darling Basin, provided further flows to South Australia as additional dilution flows, to keep salinity levels below 800 EC. Modelled predictions for salinity lead to this further dilution flow.

This particular rule did not undergo consultation with the irrigation community as would normally occur and therefore is relatively misunderstood.

The additional South Australian 'dilution flow' of 3000 ML/d, is an automatically triggered release rule. When "the storage volumes in the Menindee Lakes exceed nominated trigger points, at the same time as the combined storage volumes of Hume and Dartmouth Reservoirs, also exceed nominated triggers.

The trigger volumes are determined when the Menindee Lakes has a volume of 1300 GL and the combined Hume and Dartmouth storage dams have reached a 1000 GL each. Once the 'dilution flow' is triggered, then flows will be released from Menindee and continue until the NSW reserve is reduced to 480 GL. It is difficult to determine, but there appears to be no mechanism in place to stop these additional salinity 'dilution' flows from commencing or ceasing until the NSW 480 GL is reached, even if salinity levels are not an issue. *(note: Menindee triggers increase in June/July/August*)

[34] NSW Office of Water

[13] SA Government – Long Term Plan CLLMM

At the time of determining this rule, Australia was in the grip of the political 'salinity crisis' where modeled predictions for salinity projected increased risks to the Murray River and supplies to South Australia.

Note: Salinity levels at Morgan, (official salinity reading site) have remained within or well below the World Health Authorities (WHO) raw drinking water standards of 800 EC.

The Menindee Lakes play a significant role in storing waters from the Darling system to augment South Australian entitlement flows. If Menindee falls below set volumes, then South Australian entitlements must be sourced from the Murray River storages.

In August 2010, when salinity at Morgan was approximately 240 EC, Menindee, Hume and Dartmouth volumes had reached the 'dilution' trigger points. Approximately 3000 Ml/d was released from Menindee.

In 2010, this rule did not cause adverse impacts on River Murray storages as continued inflows into Menindee from the Darling kept the storages full. However, if the Darling River inflows to Menindee has ceased, the 'dilution' rule still would have been in place, releasing up to 3000 ML/d, with no mechanism to switch it off until the NSW storage reserve had been reached (480 GL).

In determining the amount of water that is available for the environment, it is not clear if the additional 'salinity dilution' flows to South Australia, are captured in reports, as water for the environment. The original target objective of ensuring EC levels at Morgan are kept within 800 EC, is now not the primary causes for triggering the 'dilution' releases from Mendindee, rather its, when storage volumes are met.

Snowy Hydro rules – compulsory release

Snowy Hydro Limited is required as per the Snowy Water License to release a minimum of 1,062 GL from May to April into the Murray River system. On average though, approximately 1210 GL is released into the system. It is also required to release 1062 GL in the same period to the Murrumbidgee River system through releases into Blowering Dam.

These releases contribute to flow contributions and underpin river operations and entitlements.

The requirement to release as part of the license rules, is for the most part, required in the normal river operations. However, as in 2010, when substantial inflows have occurred and demand for 'irrigation water' is low, the license conditions may require the mandatory releases of set volumes within the defined periods.

In 2010, it is likely that such releases will not be utilized by for consumptive purposes, or required as part of the overall river operations. Therefore these additional flows, if released, will form part of environmental flows that are not recorded as such and therefore not accounted for in environmental flows.

Living Murray

The Living Murray Initiative is a major environmental program by the NSW, Victorian, South Australian, Act and Commonwealth Government to improve the environment health of the Murray River. This is achieved by recovering 500 GL of water.

The Living Murray seeks to recovery water and invest in environmental works and measures for six icon sites:

- Barmah- Millewa Forest
- Gunbower and Perricoota-Koondrokk Forests
- Hatta Lakes
- Chowilla Floodplain (including Lindsay and Wallpolla Islands)
- Murray Mouth, Coorong and Lower Lakes
- River Murray Channel

$700 million is being invested to recover water to improve the environmental health of six significant ecological sites along the Murray, namely the Barmah Millewa Forest; Perricoota-Koondrook and Gunbower Forest; Hattah Lakes Complex; Chowilla wetlands and floodplain; Coorong and the Murray Mouth; and the main channel of the Murray River. Another $150 million is being spent on environmental works and measures.

The NSW target is to recover 249 GL for the environment and the NSW Government has completed or commenced work on a number of projects. By June 2010 197 Gls has been recovered in NSW. Completed projects include:

1. The $54 million Great Darling Anabranch Pipeline Scheme which involves the removal or modification of block banks and other water regulation structures which create a series of water pools and the installation of pumps, a pipeline and filtration system. This will save 47GL of water and allow the re- introduction of more natural flow conditions along the 460 kilometres of the Great Darling Anabranch.
2. The purchase of 12 GL of irrigation entitlement from the Poon Boon Irrigation Trust.
3. Edward River Savings Stage 1 which involved the construction of 18 regulators to stop unwanted flooding of the Millewa Forest saving 7.1 GL
4. Construction of a regulator to better manage the regulated flow to prevent unnatural flooding of Croppers Lagoon saving 8 GL.[32,34]

The Living Murray program (NSW) purchase of 100 GL of supplementary water shares in the Murray Water Source, saw 17,800 ML (estimated long-term extraction associated with 100 GL) retired per year from the NSW Murray Bulk Access regime.

In the Lower Darling Water Source, the 250,000 shares of supplementary water also purchased under the same program, saw 35,500 ML per year retired from the bulk access regime.

Barmah Millewa Forest entitlement

In 1990 the Murray Darling Basin Commission (MDBC) provided $400,000 for a consultancy to review the water needs of the forests, investigate options for meeting the water requirements and to develop a comprehensive water management plan. The Barmah Millewa Community Reference Group (CRG) was formed as a ‘result of that study’.

The CRG identified specific concerns for the future management of the Barmah and Millewa forests.

It was identified that the forest ecosystem was ‘suffering significant **under-watering** AND **over-watering** in different parts of the forest. This occurred because:

[32,34] DECCW & NSW Office of Water

- Regulation of the river (ie. Water storage and release)
- Lack of water-control structures to let water into the forest when required
- Lack of water-control structures to let water out of the forest when required
- Lack of water-control structures to keep water in the forest when required
- Lack of water-control structures to keep water out of the forest when required
- Lack of water-control structures within the forest, to spread water over the forest floor (to mimic natural flow patterns)[36]

The report went on to say "water supplied to the forest will be largely in-effective, unless there is a comprehensive system of river-bank and internal water-management –structures. In fact, extra water for the forest without these water-management structure" [36]

The plan of management identified two sources of water supply seasonal flows (non stored water) and stored water (eg Hume Dam).

In seasonal flow scenarios (known as 'low river-flow") it was not necessary to water the whole forest-ecosystem 'any one time'. Defined Water Management Areas would be watered on a 'rotating priority system'. Almost 1/3 or 38% of the forest-ecosystem can watered under this scenario.

In stored water flow releases (ie from Hume), proposals to water would be based in two phases (1st & 2nd releases) and on three conditions. The first release included up to 265 GL/mth for 'managed floods' and provisions around flood flows from the Ovens and Kiewa Murray tributaries, the combined storage volumes of Dartmouth and Hume Dams and the need to recognize the capacity constraints for such released in the Hume and Yarrawonga river channel. The report notes that based on 'historical weather simulations', this would occur about 2 years in 10.

The second release up to 50GL/year was to ensure environmental benefits from forest areas watered by the seasonal or (low river flow) events. This type of release could occur about '7.4 years out of 10 on average'

The CRG report recommendations included:

- a five year program for construction of water management structures (approx $650,000 /yr).
- water part of the forest ecosystem at a time, when appropriate, rather than the whole forest

The CRG noted that:

- there is no single solution to watering the forest (the Water Management Plan must be flexible)
- controllability of water into, out-of and within the forest is vital (due to roads, tacks and levees). "Hence the term 'Water-management plan' and not just 'Water plan'.
- The forest's "watering is already managed and has been for over 50 years. What's proposed is BETTER water-management"
- Money for Water management plan is just as critical as water supply. "In short, supply of water by itself will **not s**olve the forest's watering problems

[36] Barmah Millewa CRG

The Barmah Millewa Forum (community reference group), developed recommendations for water requirements for the Barmah Millewa forest in their Final Report – Barmah Millewa Forest Water Management Plan - (11th February 1994).

Governments did not implement the recommendations despite strong community support and a united committee endorsement. Government decisions indicated a preference to obtain 'more water' for the forest, rather than invest in infrastructure to enable proposed water plans to be implemented efficiently.

The initial CRG plan only proposed 50,000 ML of specific environment water, plus investments in regulators to efficiently deliver water and alternating watering events on both sides of the border. (NSW & Vic)

The Barmah Millewa Forest today, has an environmental water entitlement of 100,000 ML (Murray River Icon site) (50,000ML *high security entitlement* NSW /50,000ML VIC). This entitlement (100 GL) is specifically noted in the relevant NSW Murray and Lower Darling Water Sharing Plan.

A further 50,000 megalitres (50 GL) (25,000ML *general security entitlement* NSW /25,000ML VIC) can be accessed under certain conditions.

Barmah Millewa can store up to (700 GL) 700,000 ML in its account, however the accumulative account rules, however this can have some adverse operational risks. To store 700 GL equates to approximately 23% of the total Hume Dam.

The Barmah Millewa Forests are listed under the International Wetland Ramsar Convention – the Barmah (Victoria) in 1982 and the Millewa (NSW) in 2002.

The Barmah Millewa Forest was also an identified beneficiary under the $700 million Living Murray Project involving the recovery of 500 GL of water for the environment. Due to the severity and extent of the drought, water recovered under the Living Murray project has not been made available to the environment because of low inflows to storages.

However, in 2004/05, the Barmah Millewa forest did receive 512,000 ML of water as part of its water entitlement recognized in the NSW Murray and Lower Water Management Plan.

Before the watering event in 2004/05, throughout the 10 years prior, the forest received natural flood events five times during the period 1990 to 2000. (*note: despite this the MDBA Guide notes that only 20% of the forest is in healthy condition)*

In December 2009, the Natural Resource Commission (NRC) headed by Dr John Williams, (member of the Wentworth Group), released its Riverina bioregion Regional Forest assessment for the River Red Gums and Woodland Forests.

The NRC undertook the assessment on behalf of the NSW State Government as part of the regional forest agreements for future forest management.

The NRC report included:

- A transborder national park (Barmah Millewa)
- Significant water reforms

The NRC identified that about '54% of the long term, pre-development, mean annual flow at Yarrawonga (or 2000 GL)' would be required for the Murray river system ecosystem'. [37]

The report notes that to achieve this, will require the Murray Darling Basin Authority to set the relevant sustainable diversion limits under the Basin Plan.

Of the 2000 GL recovered through new sustainable diversion limits, 1200 GL was recommended to be specifically utilised for the Murray system. 1200 GL equates to approximately one third of the Hume Dam (3038 GL). [37]

The NRC recommendations were to be in addition, to water recovered for this forest as part of the Living Murray Project and the existing Barmah Millewa water entitlement of 100 GL plus another 50 GL under specific rules.

Koondrook-Perricoota Forest Flood Enhancement Project

The Koondrook (Vic)-Perricoota (NSW) forest site is a part of the Living Murray Initiative set up by the Murray Darling Basin Ministerial Council. (2002) The Forest is located on the Murray River between the towns of Echuca and Barham.

Under the program for Environmental works and measures, a channel is to be constructed "Torrumbarry Cutting" to enable forest watering to occur in non flood river levels.

The NSW Office of Water is the project director for the delivery of the Living Murray environmental works and measures program in NSW. Construction of the $57.7 million Koondrook-Perricoota Forest Flood Enhancement Project will divert water into and reinstate flooding in the forest.

The Koondrook-Perricoota Forest covers about 32,000 ha and is part of the second largest River Red Gum forest in the world.
The works include:

- Inlet regulator and a 3.8km diversion channel from the Torrumbarry weir pool
- Upper forest regulators
- Return channel to the Murray River
- Lower forest regulators
- Associated levee banks

Note: fish passages will be incorporated into structure design

It is estimated that the project will deliver, during a flood event, an initial flow of 6000 ML/day will be sustained for 50 days and then 3,400 ML/day for a further 50 days. Some 250 GL will be used in the forest in any one watering, with the remainder being returned to the Murray River.

The total assumed water requirement for the forest is 466 GL with an expected use within the forest and evaporation and infiltration use of 225 GL. It is estimated that if the maximum volume was used (466GL), then 222 GL would return to the river. [38]

State Forest in their Preliminary Environmental Assessment (Part 3A application) suggest that this would water up to 50% of the forest (16,000 ha).

---

[37]

[38] NSW State Forests

The design capacity of the Torrumbarry regulator is estimate to carry 6,000 ML/day. The works and measures program has included provisions to enhance flood safety levees to adjoining properties, a river road bridge, fishways and a range of regulators to manage watering events.[38]

New South Wales (NSW) River Bank

The RiverBank Program in NSW is a program operated by the NSW State Government. This $105 million project utilizes funds raised from the NSW Waste and Environment levy. The funds raises go towards the purchase of water licenses for the benefit of the environment. Approximately 32,000 ML of water has been purchased in the Macquarie, Gwydir, Lachlan and Murrumbidgee Valleys

> "Access licences will be purchased in inland regulated river valleys and managed for specific and measurable purposes that benefit river and wetland assets of high ecological value. In many cases, these uses will also support Aboriginal cultural values. Targets for environmental watering include:
>
> - Macquarie Valley - vegetation communities in the south and north Macquarie Marshes Nature Reserve, private Ramsar sites, part of the property 'Pillicawarrina' and smaller wetlands on the Macquarie River system upstream of the Macquarie Marshes
> - Gwydir Valley - disconnected wetlands in public ownership, private Ramsar sites, 'the property Old Dromana', and in-stream environmental health
> - Murrumbidgee Valley - wetlands on the Lowbidgee floodplain, primarily within Yanga National Park
> - Lachlan Valley - Lake Ita, Murrumbidgil Swamp, small wetland assets on the mid- and lower Lachlan creeks, 'Booligal Station' and the Great Cumbung." (source NSW Office of Water web)

NSW Murray Wetland Working Group

The NSW Murray Wetland Working Group is a 'community wetland rehabilitation group' which was established approximately 1992 in the Lower Murray-Darling and Murray Catchments of NSW.

The NSW Murray Wetlands Working Group was nominated to manage approximately 30,000 ML of water entitlements achieved through the NSW Government investments in seepage and control works, within the channel systems of Murray Irrigation, a private water supply company in the Southern Riverina.

The Group works closely with the relevant government agencies to determine water delivery for private and public wetlands. The adaptive nature of the group, mean that the base 30,000 ML entitlements, can be sold on the annual temporary market to raise funds for wetland infrastructure works.

Significant achievements have been realized by the Group and innovative solutions include the use of Murray Irrigation private channel system, to facilitate the efficient movement of

environmental water onto private wetlands. In 2000, a trial involved the use of 26,000 ML of AEW, to prolong a flood event in the Barmah Millewa Forest.

Despite the onset of the very dry conditions, the Group has delivered environmental water to a range of private and public sites including, Wanganella Swamp, Werai State forest, Gulpa Creek Reed Beds and Swamp, Duck Lagoon, Pollack Swamp, to name a few.

Waters for Rivers - Snowy Initiative

The Snowy Initiative has been established to achieve significant improvements in environmental flows into the Snowy and Murray River systems. The Commonwealth, New South Wales and Victorian Governments committed $375 million to fund and commission water efficiency project to provide environmental flows. Of this the NSW Government is investing $150 million.

The targets include returning 212,000 ML, or 21 per cent of the average natural flow, to the Snowy River's first 30 km. This is the section of River determined to be impacted by the Snowy Mountain scheme. Below the first 30 km, normal river inflows occur. The Snowy Initiative also seeks to return 70,000 ML to the Murray River in a staged approach over 10 years. The Snowy Water Inquiry Outcomes Implementation Deed is a Deed that the three partner Governments entered into to give effect to the outcomes of the public Snowy Water Inquiry in 1998 and the corporatisation of the Snowy Scheme, and it includes these water recovery targets. [34]

Waters for Rivers
Water is recovered through investments in "water efficiency projects and other measures (including license purchases) to recover water for environmental flows. The June target for water recovery by Water for Rivers is 14 % of average natural flow (initial 30km river section of the snowy), equal to 142 GL. At 30 June 2009, Water for Rivers has recovered 197 GL (131 GL for the Snowy River), with around two thirds of the total water recovery being from within NSW". [34]

"Once a water efficiency project is complete, the recovered water is converted into a water entitlement. These entitlements then receive water allocations into their water allocation account as available water determinations are made in each river system. The water in these accounts is then used to provide environmental releases for the Snowy and Murray Rivers.?" [34]

"Environmental water in the Snowy River, is stored and then released to provide 'flushing flows'. This decision made during the Snowy Water Inquiry to assist with sedimentation transport. Works were constructed between 2003-06 to facilitate this flushing flows and while under construction, the first three years (2002-2005) were delivered through the Mowamba River. Delivery of this water was made prior to full recovery of entitlement water and therefore the repayment of initial water released to the Snowy is referred to as the 'Mowamba borrow'."

"The allocation of water for environmental flows in the Snowy River in any year is prescribed in the SWIOID. Water available in the coming year, two-thirds is apportioned to the Snowy River and one-third is apportioned to the Murray River".[34]

[34] NSW Office of Water
[34] NSW Office of Water

On 11 August 2010, an agreement between NSW, Commonwealth and Victorian Governments allows for a total of 56 (or 62) GL in 2010-11 to be released into the Snowy River over the next two years. The agreement also enabled an immediate repayment of the Mowamba Borrowings Account that had been delayed due to drought.

Other Programs or Environmental provisions

The environment has received further benefits with major Government investments and programs. These are additional to benefits derived under NWI Water Sharing Plans and other State or Federal controls such as the Cap.

Programs can take the form of direct purchase of water entitlements to be reallocated for environmental or through investments in infrastructure to improve water delivery and use systems.

In conjunction with environmental shares for water being delivered through the Murray Darling Basin Cap on Diversions, the National Water Initiative State delivered Water Sharing Plans, there are a range of other mechanisms where benefits to the environment occur.

> "The Department of Environment Climate Change and Water (DECCW) manages planned environmental water (established through provisions of a Water Sharing Plan) and adaptive environmental water (held as Water Access License by the Minister for Climate Change and the Environment and others). DECCW may also manage environmental water owned or acquired by other parties, including non-government organizations." "Opportunities for environmental watering, at target sites across the State, depend on the availability of environmental water and the likely ecological response to water at any given time."[32]

Adaptive Environmental Water Plans are prepared by DECCW and approved by NSW Office of Water (NOW). Adaptive environmental water plans are determined when water is acquired or recovered for the environment and is held under a license. [32]

Adapative Environmental Water Plans have been prepared and approved for:

- Gwydir
- Macquaire
- Lachlan
- Murrumbidgee [32]

These regions have been identified within the NSW Government RiverBank program as " target valleys for environmental watering. Plans are linked to the objectives of the relevant Water Sharing Plans". [32]

Licensed water entitlement in the Murray and Lower Darling Valleys also include:

High Security	Moira Lake Water saving	2,027 Ml
General Security	Lower Darling Environmental Allowance	30,000 Ml

[32] NSW Government – DECCW Environmental Water Planning (website)

* Murray Additional Environmental Allowance (AEA) can be attributed 5,430 ML at the end of each water year if the allocations to High Security access licenses for the water year has not exceeded 97%[58]

The total of the NSW specifically identified environmental entitlements noted under the NSW Murray and Lower Darling Water sharing plan equal 77,027 ML. Note this should not be considered as the amount of water provided to the environment, rather it is the noted entitlements under this Water sharing plan. Overall environmental considerations are considered when developing a water sharing plan *(see pages 32 to 44)*

[58] NSW Dept Natural Resources

SECTION 2

THE MURRAY DARLING BASIN – Guide to the Proposed Basin Plan

In determining the needs of the environment, the MDBA has set targets for the recovery of water for the environment at:

3000 GL
3500 GL
4000 GL.

Prior to determining the basis for these additional requirements for the environment, it is important to assess the benefits for the environment achieved through existing water sharing arrangements.

The total resources available to the environment does not appear to have been evaluated prior to the assessment of more 'flow volumes' for the environment under the Basin Plan.

Major investments in the Living Murray and other environmental planning arrangements have also not been factored in the new environmental needs, determined by the MDBA.

In the event, that the MDBA claim, they have taken into account environmental benefits derived under NWI Water Sharing Plans, environmental programs such as Living Murray – it is difficult to ascertain how they have done so. The 'Millenium drought' has not enabled these processes and programs to be evaluated as low flow conditions experienced during severe drought, have prevented the delivery of water and therefore, appropriate analysis could not have been done.

It appears that without such evaluation, the set targets of 3000 GL, 3500 GL & 4000 GL are based on a perceived need in a specific location, rather than a more thorough analysis of environmental requirements for the Basin.

It is difficult to assess the basis for the additional environmental requirements prescribed by the MDBA Guide to the proposed Basin Plan, as the relevant Guide volumes, have been progressively released, with some only recently prior to the closing date of the submissions to the Guide. A number of technical documents relating to individual catchments are still not readily publicly available.

While the Guide and related volumes, indicate reference material, not all the reference material is available and the scale of the relevant volumes, short time frame for public accessibility and difficulty in location of specific information, makes public comment difficult.

Comments in this report, focus on the specifics of the Basin Plan from an environmental perspective.

In recognizing the considerable scale of water planning, including environmental achievements that have occurred, up to the Water Act 2007 and the development of the Basin Plan, further claims for the environment should undergo rigorous scientific analysis.

The MDBA have utilized a range of reports to support the proposed target options for water to be returned to the environment (3000, 3500, 4000 GL). The basis of some of these reports has been identified as a concern by the Basin Communities.

MDBA Baseline Data concerns

The Murray Darling Basin has relied and gathered information from a range of sources. This includes publications that date back to the beginning of a range of natural resource management reforms including the Salinity Audit.

There is considerable public concern that Australia, through its revised funding arrangements for science and research, has moved toward research, being more aligned to political policy objectives.

Due to the current funding arrangements, the shift in focus of research is probably now more closely aligned with attracting resource dollars, as Governments themselves, have set new boundaries in research, than previous research facilities, would have encountered.

This pattern has perhaps raised community doubts, about the influence of politics on scientific reports and the necessary need of relevant organizations, to attract funding. A perception exists that the 'independence' of such research could be compromised.

Murray Darling Basin Ministerial Council - Sustainable Rivers Audit (SRA) (2008)

There are significant concerns in relation to the reliance of the MDBA, on SRA 2008 report.

- Report prepared by the Independent Sustainable Rivers Audit Group (a group of independent ecologists)– for the Murray Darling Basin Ministerial Council (Peter Davies, John Harris, Terry Hillman, Keith Walker

- Report uses data gathered during period – 2004 to 2007 (MDB major drought period) on hydrology, fish & macroinvertebrates – report released in June 2008 (report notes – "1st step toward analysis of trends which will be a feature of later reports") *The reference to 'analysis of trends suggests that trends have been observed during a major drought.*

- Report itself notes: ' A severe drought has prevailed over the Basin during the Audit period – it is too soon to say how much this has affected fish & macroinvertebrates communities'

- The 'SRA is an audit, concerned with surveillance…….is concerned with signs of change of changes rather than causes'. (*note: this may suggest that drought impacts may not have been adequately considered)*

- 'SRA employs a concept of Reference Condition. This describes the patterns & processes that would be expected to prevail **now** had there been no significant human intervention in the landscape. It is open to some uncertainty, because it is estimated rather than measured' *note reference condition is not a target for management but is a comparison figure*

- Report itself notes: ‘ecosystems are conceptual entities…… generalisations may be elusive and comparisons may be difficult. The ‘health of an ecosystem cannot readily be judged by comparison with a database indicating ‘normal’ ranges for different variables, as ecologists do not have access to the kinds of reference data that a medical practitioner does’

- ‘historical data, expert knowledge and modelling are used where possible, but sometimes these may not be sufficient for reliable estimates of some variables’

- The Audit reports are scheduled at 3 year intervals – to the MDB Ministerial Council. The 1st of these reports which indicates ‘trends’ has been a key supporting document in developing the Basin Plan.

- The Murray Darling Basin Plan is being developed using a range of information but a key report is the SRA 1st report (developed during a major drought). The report concerns include:
    1. used data gathered during a severe drought
    2. employs a reference condition for ‘prior to human intervention in the landscape’ – which year or period of pre human intervention remains unclear and is open to interpretation. The report itself suggests a level of uncertainty (see above main dot points)
    3. the report acknowledges that the health of an ecosystem cannot readily be judged by comparison
    4. report is an analysis of trends eg ‘signs of change’ , detected in a period of major drought

The SRA determined river health for 23 River valley catchments. The basis of measurement used the following indicators:

- Hydrology
- Macroinvertebrates condition
- Fish condition

Audit Results:

- One valley (Paroo)- good health
- Two valleys (Border Rivers & Condamine) – moderate health
- Seven valleys – poor health
- Thirteen valleys in very poor health

It is important to note that the river health could be assessed as poor, on two indicators (eg fish & macroinvertebrates) and good health on hydrology – yet the river may still rate poor. An example of this is the Ovens River in Northern Victoria.

This is an unregulated small river with its origins in the Mountains of the Great Victorian Dividing range. Travelling through picturesque mountains and finishing in the Murray River, below the Hume Dam, upstream of Yarrawong, the Ovens River rates as poor because of poor findings on fish and macroinvertebrates, despite hydrology rating high.

The reports key findings note:

Fish: In assessing fish indicators, the presence of alien species (eg carp) could lead to a river health of poor. ‘Many upland and Montane zones were rated Poor or Very Poor, and

these can contribute significantly to their overall Valley score. These low ratings were often related to the dominance of alien fish in the upper catchments' (SRA)

Macroinvertebrates: 'most valleys show reduced macroinvertebrate diversity relative to their reference condition'.[39]

Hydrology: 'two thirds of the sites were Near Reference Condition for all hydrology indicators'. 'Further improvement is needed to in the hydrological assessment to account for the affects of change in groundwater and vegetation, and of farm dams, and to fully standardise the basis for modelling and analyses across the Basin'. [39]

Policy reversal from Integrated Catchment Management

The MDBA has focused on hydrology and flow volumes as the measure of Murray Darling Basin Health. This is a reversal of significant previous Federal and State Government policy and investments, that recognized total Catchment Management, as an appropriate way, to delivery holistic environmental sustainability.

Using flow volumes as a surrogate for broader river health objectives is contrary to the last decade of Government planning and policy.

CSIRO Sustainable Yield Report

Due to limited time, this report is unable to comment on the CSIRO baseline information at this time. However community concerns do exists with the reliance on models and the error factor that is recognized in most modeled scenario.

Use of Indicator Sites – as a measure of Basin Health

The MDBA has relied on indicator sites to determine environmental water recovery targets to achieve a new level of health for the Basin.

The MDBA has utilized existing information and data. The base of that data cannot always be seen as independent or derived for the purposes of which it is now used.

The MDBA have not provide specific details on how these 'indicator sites' have been assessed, nor has it been established how the sites will be watered or what flow volumes.

There is a strong reliance on existing data that provoke some community concern.

An example of this is the reference to the Millewa Forest in Southern NSW. The MDBA guide references a report that identifies that only 20% of the forest is in healthy condition. This raises community concerns about the reliance on such reports when the full range of other contributing factors remains unknown. Despite being references, efforts to track down this report have not enabled the community to assess the merits of the 'only 20% healthy claim'.[1]

It is worth noting that the Millewa forest received five floods from the period 1990 – 2000. The onset of the Millenium drought 2001-2010, naturally had an impact on some levels of the forest health. However the forest received an environmental watering event in 2004/05

[39] MDBC Ministerial Council; Sustainable Rivers Audit

[1] MDBA Guide to the Proposed Basin Plan

of 512,000 ML as part of its entitlement flows under the Murray & Lower Darling Water Sharing Plan.

This is a significant amount of water and together with the previous flooding events, raises the concern how much water does the forest require if such significant amounts of natural and environmental waterings have occurred, yet the forest rates as only 20% healthy.

In a broader sense, the use of indicator sites as a measure of health is a poor surrogate for a more comprehensive assessment of the Basin environmental status. The Water Act 2007 and therefore the Basin Plan, only addresses flow volumes as the measure of river health. This excludes all other factors and assumes that 'flows = health'.

The MDBA have identified that of the minimum 3000 GL to be recovered for the environment. However 2000 GL of this targeted to flow out to sea as end of system flows over the barrages.

This raises the question in the community, that the key driver for site indicators, appears to be 'end of system' flows, rather than addressing the specific range of needs beyond flow volumes.

There are key concerns that a 'bias' toward desired flows for end of system flows, will create the perception that bulk flows for set durations (as indicated in the plan), will achieve environmental outcomes.

It is not clear how the reliance on large flow volumes will be delivered within river system capacity constraints. There is a presumption that environmental flows can be 'stored' and then delivered in larger volumes on the back of high river or smaller flooding events.

Such a view ignores a more comprehensive assessment other than flow and a perception of desired duration.

In the Wakool River system, there have been two significant environmental disasters in the summer of 2009 when stock and domestic water was released into the Merran and Collingen Creek. The local community had sought smaller more regular flow releases to maintain ecosystem health and such releases would also provide for critical human needs for stock and domestic water supplies. However the releases were not delivered when localized knowledge advised and the resultant 'Blackwater' events occurred, causing major fish deaths.

Blackwater events impact on water quality as carbon is leached from (leaves, twig and bark on the forest floor or floodplain)[59]

Blackwater flows have very low levels of dissolved oxygen and these flows caused significant deaths for Murray Cod, crayfish, aquatic animals and other native/non native fish. Thousands of species perished, including hundreds of Murray Cod, some up to 80 years old.

Significant local community concern had been raised over an extended period that argued strongly for more regular water releases into the system. This did not occur when requested and when flows did arrive in hot weather, the scale of Murray Cod deaths, was of an unacceptable magnitude. Local knowledge should have been used in determining flows.

[59] Murray Darling Freshwater Research Centre

Another blackwater event in October 2010 saw approximately 200 km of the Wakool River, subject to a further environmental disaster. The river lies 35km east of Swan Hill and is a well known nursery for Murray Cod.

In both cases the scale of fish deaths and other invertebrates was in the thousands. The age of the Murray Cod that died reinforced what local communities knew – that is – the importance of the Wakool River System as a major breeding ground for the Murray Cod. When Murray Cod were listed under the EPBC Act as a vulnerable species, due to perceived low number, locals did not agree with the scientific assessment of low cod populations.

Photo: Pastoral Times Newspaper Feb 2009 Blackwater event photo: Wakool River Association
Stewart Ellis removing dead Murray Cod – Niemur River Marcus & Graeme Nalder February 09

The MDBA Plan aims to increased flows to the sea through the Murray Mouth, by a minimum of 2000 GL. This focus on end of system flows totally ignores the wider needs of the Basin's environments and reflects the Authority's view that the icon sites, particularly Coorong, Lower Lakes and Murray Mouth, have priority in the Basin Plan.

There is considerable debate by those communities adjacent and familiar with the systems about the scale of water required and the length of flood duration being proposed by the authority.

Absence of environmental water delivery plan

It is difficult to determine whether flow volumes proposed will provide the desired environmental outcomes. Without stakeholder consultation on the delivery of such flows, there is a real risk that mistakes will occur. The fish deaths in the Wakool River system identify the critical nature of local stakeholder knowledge and input into decision making.

The MDBA has failed to adequately address community concerns about the delivery plans for the volumes of water proposed for the environment.

In 2010, the onset of major flood events highlights the cyclical nature of the Basin water resources. There has been a strong belief in the Canberra bureaucracy that 'flood events' would not occur again. This was articulated over many years and prior to 2010, appears to be a widely held belief by many decision makers.

The basis of this belief was modeled predictions for climate change.

It is worth acknowledging that the Basin's history of water planning was built around the natural variations of rainfall and runoff, that have historically occurred in the Basin.

The MDBA has articulated a desire to 'reinstate' flood events and overbank flows. While this may feasible at certain times of the years and in certain locations, there are however a range of factors to consider.

A confidential briefing note obtained under the Freedom of Information laws, 'advises the government it may have to consider compensating farmers for any flooding caused by increased environmental flows' [40]

Communities at risk of flooding have identified potential problems, however have been excluded from providing detailed advice to minimize risk due to the nature of public consultation.

In the absence of an environmental water delivery plan, the community is unable to assess the total impacts, proposed by the plan.

It widely acknowledged that community participation in natural resource planning is essential for long term gains.

In the event of creating further environmental flows, local knowledge and data is critical to ensure that the timing of releases are maximized, that flow volumes are delivered at appropriate time frames and flow behaviour is as planned. Utilising local knowledge may ensure that environmental flows are maximized in some areas more quickly, but minimized in others, to prevent adverse impacts.

The MDBA will be aware of flow capacity constraints from the major storages such as Hume and Blowering. The floods occurring in the Murrumbidgee and Murray system in 2010 in an unnatural flood period scenario, is worthy of reflection in relation to risk.

In the Murray system during the week of 13th December 2010 to 17th December, considerable rural areas were subject to flood risk as a result of predicted flow heights at Tocumwal. The merging of the Hume releases, Kiewa and Ovens unregulated tributary inflows, combining and causing water releases from Yarrawonga, posed significant high flow and low level flood events. As the predicted heights of the Murray River at Tocumwal were lower than expected, the risk of broader flooding were minimized.

The results of this scenario could have been vastly different, had environmental flow entitlements been released, either preceeding or post such flows.

A relevant factor in this event, was the flow height variations in other associated empheral streams. Add to this, inflows from Victoria from the Goulburn and Campaspe just above Echuca and the flood behaviour would have been varied again.

This highlights the lack of awareness of the MDBA in assessing flood 'risks'. With no overall environmental water plan delivery analysis – the MDBA's recommendation may pose considerable additional economic and social costs.

[40] Australian Newspaper 18.12.2010

In the expenditure of such significant quantities of taxpayers funds, it should be accepted standard of governance to ensure that the flow volumes are determined on need and developed, on the basis, of a well constructed water delivery plan. These parallel events have not occurred in the Guide to the Proposed Basin Plan.

In ensuring that social and economic impacts are minimized, a water delivery plan should be a critical component of planning. Further, while the MDBA have identified no greater than 40% impact to a region by the determination of new SDLs under the proposed plan, without a water delivery plan, it is impossible for the MDBA to make any sense of the impacts.

An environmental water delivery plan is essential to understand potential 3rd party flood risks and/or any potential risks for current water entitlement holders accessing their announced allocations in periods of peak demand.

Social and economic studies – limitations

The MDBA Guide itself and MDBA employees have identified that risks exist, to the 'reliability' of entitlements, particularly when the initial planning phase moves to the delivery phase under State arrangements.

Social and economic analysis commissioned by the MDBA has failed to include any consideration of impact on reliability of entitlements. The MDBA Guide seeks to reduce impacts from the Basin Plan to within or below a 40% impact. However the impact on reliability will not be known until the Basin plan is fully implemented under the relevant State water sharing plans. The determination of impact therefore is subsequent to the social and economic studies and subsequent to the setting of the sustainable diversion limits for each valley.

There has been no assessment of 3rd party flood risks. Flood risks (cost incurred) are not limited to the immediate flood event, but also extend to increased rate charges on landholdings, as Councils seek to recover costs of damaged infrastructure in the event of 'managed environmental flows', moving to an 'unmanaged environmental flood'.

The MDBA objective is to reinstate over bank flows and reinstate flood events. The Guide said it will not cause adverse flood risks. It has not identified to the community how these two scenarios's can be achieved. Particularly assessing the risk associated with piggybacking environmental flows on high river events.

In the event that the MDBA has failed to do ensure a proper and thorough analysis of risk, the MDBA is not in a position to ensure that their 'unacceptable 40% level of impact' can be avoided.
The claims of 800 job losses by the MDBA, as a result of the plan is not worth exploring and perhaps this assessment is a reflection of the wider issues of concern relating to the details of the proposed Basin plan.

South Australian Government - 'Securing the Future – A long term plan for the Coorong Lower Lakes & Murray Mouth (CLLMM)

In June 2010, the South Australian Government released a report 'Securing the Future – a long-term plan for the Coorong, Lower Lakes and Murray Mouth (CLLMM)

This report has been funded by the Federal Department of the Environment, Heritage and the Arts, as part of the South Australian Government's $610 million Murray Futures Program. Funding was part of the Federal Governments – Water for Futures Program

The South Australian Government website refers to the developing and implementation of the long-term plan, funded by the Australian Government's, Water for the Future Program.

There is a strong correlation between the MDBA's - Guide to the Proposed Basin Plan and the South Australian Government and Department of Environment, Water, Heritage and the Arts policy objectives for the CLLMM site.

The Guide to the proposed Basin Plan, sets very clear objectives for end of system flows.

Of the minimum **3000 GL proposed by the MDBA**, to be **recovered for the environment**, a minimum **2000 GL** is targeted to flow over the barrages **through the Murray Mouth**, into the Southern Ocean.

The MDBA identify that long term modeled average flows currently out the Murray Mouth is 5100 Gl/year. The South Australian long term plan for the CLLMM site, note that "average annual outflows through the Murray Mouth are 4,700 GL" [13]. This SA report notes that **at 4,700 GL, the CLLMM ecosystem would probably be in good condition**" [13] but that is "years of below-average flows that cause concern" [13]

The MDBA, as a minimum recommendation, identify end-of-system flows to be increased to 7100 – 7600 GL (ie >2000 GL/y). This would appear consistent with an objective to raise average flows to this high figure, thus in periods of lower flows, the average flow could potentially be 4,700 GL, thus ensuring that the CLLMM site can be maintained under current operating procedures, with limited other actions or investment upgrades required.

This appears as the most striking example of a pre-determine position of the MDBA and reflects the long term planning for the site by a range of interests. In the MDBA 'Guide to the Proposed Basin Plan' and the focus on 'end of system flows' appears entirely consistent with the desired objectives of the South Australian Governments report, Securing the Future – a long term plan for the Coorong, Lower Lakes and Murray Mouth.

This bias towards end of system flows appears consistent with the view expressed by the MDBA's Rob Freeman, that "a system with 80 % outflows' determines a healthy environment.[41]

The desire for the scale of 'end-of-system flows' is consistent with the Wentworth Groups & Associated names whose 'analysis of options for achieving a sustainable diversion limit in the Murray-Darling Basin', determine that a 'working river' is not healthy unless two thirds of natural flow levels are in place.

The summary section of the SA Plan - 'Securing the Future – a long term plan for the Coorong, Lower Lakes and Murray Mouth', identifies that:

> 'large flows down the Murray River will maintain an open mouth and transport salt and other pollutants to the ocean via natural processes'. [13]

[13] Government of SA – Securing the Future CLLMM
[41] MDBA – Melbourne Consultation meeting 28.10.2010
[13] Government of SA – Securing the Future CLLMM

> ‘When **flows are adequate to maintain the Lower Lakes at or near an optimal operating range**, **minimal intervention is required** and adaptation actions that aim to build and maintain a resilient ecology at the site are possible’:13
>
> These include:
>
> - Management of the lakes at variable levels to achieve ecological improvements
> - Enhanced diversions of water from the South-east of South Australia to the South Lagoon of the Coorong (via wetlands and watercourses where possible)
> - Vegetation plantings to restore ecological processes
> - The operation of fishways’ 13

The Plan includes in its objectives:

- Lake Alexandrina & Albert remain predominantly freshwater
- The Murray Mouth is predominantly kept open by end-of-system flows
- There is a return of amenity for local residents and their communities
- Tourism and recreation businesses can utilize the lakes and Coorong
- Productive and profitable primary industries continue 13

These objectives are consistent with the section stating implications of the regions, in the MDBA Guide to the proposed Basin Plan:

> ‘For the SA Murray below lock 1, more reliable water levels in the river and the Lower Lakes as a result of reductions in current diversion limits across the Basin may include a number of important social and economic benefits to the region, including boating, commercial fishing, experiential and eco-tourism, as well as the potential for greater well-being of the community’.[1]
>
> Section 6.5 of ‘Securing the Future’ (page 80) identifies that drawing from the best available information (CSIRO) it is **reasonable to base the plan for the Lower Lakes around fresh water.** The development of the **Basin Plan is a most significant initiative contributing to an adequate end-of-system freshwater flow’**. ‘Given these predictions for fresh water, the option of admitting seawater into the Lower Lakes by permanently opening the barrages is not seen as a necessary, desirable or long term approach’. 13

The MDBA Guide identifies many negatives for other valleys as a result of new SDLs proposed by the Guide to the Basin Plan. South Australia below Lock 1, as noted in the MDBA guide, will be a key beneficiary.

It is of concern that the MDBA and the South Australian report (Securing the Future) has ignored a suite of information including previous recommendations of the Murray Darling Commission – *River Murray Barrages, Environmental Flows ‘An evaluation of environmental flow needs in the Lower Lakes and Coorong’* – a report for the Murray Darling Basin Commission – June 200.

[1] MDBA Guide to the Proposed Basin Plan

Key recommendations from this report that are important but appear not specifically addressed by either the Murray Darling Basin Authority or the South Australian Report Securing the Future for CLLMM include:

- Automate barrage gates for more flexible operations and sensitivity to ecological needs
- Modify Mundoo Barrage to increase flow capacity and operate preferentially to limit sedimentation in the Murray Mouth
- Evaluate options for relocation and revised management of the barrages to enlarge estuarine area to increase the range of habitats[42]

There is also a range of other information that is extremely relevant to the future management of the site – specifically flow issues versus natural coastal actions. Again this information has not been utilized by the MDBA, instead focusing on an 'end of system flow' model, for addressing environmental needs of the broader Coorong, Lower Lakes and Murray Mouth site.

It is note worthy that literature associated with the site, particularly since mid 2000s, is more closely aligned with a view to increasing flows from the Murray River via end of system flows, as a solution for sedimentation (sand) build up at the Murray Mouth.

The Coorong, Lower Lakes & Murray Mouth - Ramsar site

The Sustainable Rivers Audit 'framework' established by the Murray Darling Basin Ministerial Council, stated that 'this river zone, being at the downstream end, is under the greatest hydrological stress of any in the River Murray System'.[43]

In reviewing this statement, it is prudent to explore historical influences of the region.

The Australian Federal Government listed the Lower Lakes, Murray Mouth and Coorong as a wetland of significance under Ramsar in 1985. A Ramsar listed site does not reflect a 'pristine' or necessarily, a natural environment. A site can be significantly altered from an original state and still achieve Ramsar listing (eg Coorong, Lower Lakes)

In line with Ramsar protocols, once a Ramsar site is listed, a plan of management is developed, which includes an ecological character description, which enables future monitoring to be measured. The hyper saline conditions of the Southern Lagoon was specifically noted as part of the character description of the Coorong.

From the time of the site's original listing in 1985, it was not until 2000 that the actual plan of management was developed, with the subsequent more detailed 'ecological character descriptions', completed in 2005.

Lower Lakes:
The Lower Lakes system holds approximately 1900 GL of water. Alexandrina (1570 GL) Albert (280 GL) and tributaries of Currency Creek and Finniss River (50 GL)

Lake Alexandrina the largest of the two lakes covers an area of approximately 76,000 ha and is generally no more than 4m in depth. Lake Albert is approximately 16,500 ha and generally much shallower. On average the Lakes **evaporate approximately 750,000 ML to 900,000 ML per year**

[42] MDBC – River Murray Barrages, Environmental Flow Report
[43] MDBC – Living Murray Foundation Report

Prior to the construction of five concrete barrages in late 1930s-1940 (distance 7.6 km), the natural tidal ecosystem of the Lower Lakes comprised, merged freshwater flows from the Murray and tidal inflows from the Southern ocean. The construction of the five barrages removed 90% of the natural tidal prism that historically influenced the estuarine environment.[44] The flows from the lakes through the barrages to the Murray Mouth, have been operated by 593 independent and manually operated gates.

The Barrages artificially raise the Lake levels and lower Murray River levels up to Lock 1 (274 km upstream) at 0.75m higher than mean sea level (AHD) [43]

When Murray River flows are limited to South Australian entitlements flows in summer, evaporation rates (part of the noted evaporation rates of 750,000 – 950,000 ML/yr) may exceed inflows and therefore the Lower Lakes were levels will drop.

To avoid this, Lake Levels are surcharged by 100mm to 0.85m AHD at the beginning of summer. **Barrages are closed and by autumn**, evaporation rates generally drop the Lakes back to an operating level of 0.6 AHD. This is the level where 'gravity' fed irrigation can occur without requiring pumping, in the Lower section of the Murray River ie between Lock 1 and the lakes.

When seasonable conditions are favourable and additional water above South Australia's entitlement flow can occur, the Lakes can be managed at more varying levels. [43]

Securing the Future, A Long Term Plan for the Coorong, Lower Lakes and Murray Mouth (June 2010), claims that "before water resource development, severe drought inflows to the Lower Lakes never occurred. Under these conditions, the minimum annual inflow to the Lower Lakes were 2,250 GL". [13]

This appears contradictory to photographic and historical references which identify that the Murray River itself, including in South Australia, has dried to a series of salty pools during major drought periods. Therefore, it may be assumed that the referred, 'minimum annual inflows to the Lower Lakes of 2,250 GL', must have been localised inflows derived with the Lakes region itself.

Prior to building of the barrages to convert the estuary into permanent freshwater lakes, 70% of the historical flows from the Murray River would move through the Goolwa channel (released now controlled by the Goolwa barrage). 10% of flows would flow through the Mundoo Channel and the remained through the Tauwitchere, Boundary Creek and Ewe Island (Oliver and Anderson 1940) [11]

The construction of the barrages has negatively impacted on the natural estuarine interactions with the Southern Ocean. The initial barrage built over the Mundoo channel limiting sea water inflows in 1915 (Johnston 1917) created the first artificial barrier to sea water entering the Lower Lakes. The subsequent five permanent barrages completed in 1940 reduced the river flows to the sea and changed the natural tidal prism by 90%.

[44] Bourman R & Barnett E – Impacts of River Regulation on the Terminate Lakes & the Mouth of the River Murray
[43] MDBC Living Murray Foundation Report
[13] Government of SA – Securing the Future CLLMM
[11] Bourman R; Rapid coastal geomorphic change in the River Murray Estuary

Historically, during periods of low flows in the Murray River, the Murray Mouth was kept open by natural tidal flushing. 11

Coorong:
The Coorong and Murray Mouth areas is outside the Lakes system created by the concrete barrages and this section makes up 11% of original estuarine area that still remains. The volumes of this area are now largely determined by the seasonal events (eg local rainfall), marine waters from the Southern Ocean and barrages operations, that release fresh water flows, from the Muray River and localised tributaries.

The Northern Lagoon of the Coorong is largely influenced by tidal events, through the Murray Mouth and Murray River freshwater flows releases, via the concrete barrages.

The Southern Lagoon of the Coorong was naturally supplied with fresh water flows from the natural drainage patterns of South East of South Australia.

The South East region of South Australia has no natural drainage that would discharge large volumes of floodwaters to an ocean outfall. Some waters did gravitate to the Southern Ocean, primarily through the Glenelg River and localised springs.[45]

The landscape's geological formation, resulted in natural drainage patterns ending in wetlands, swamps and marshland. This complex series of wetlands would eventually drain north westerly, with much of the overland and sub surface flows flowing into the southern lagoon of the Coorong.

The ecology of the Southern Lagoon of the Coorong has evolved from these natural drainage flows, wetlands and marshlands. The Southern lagoon is a land locked system, almost separated from the northern part of the Southern lagoon by a narrow land formation near Parnka Point. Here the two lagoons are linked by a relatively shallow narrow channel.

Marine influence in the Southern Lagoon from the Southern Ocean has been minimal. The Department of Water, Land and Biodiversity (DWL&BC) as part of the water quality assessment under Upper South East Drainage (USE) Program, commissioned a report titled - A Palaeoecological Assessment of Water Quality Change in the Coorong (Gell P).

Using diatom analysis and dating techniques the study determine the timelines for changing water quality conditions for the Coorong Lagoons. [46]

The report's executive summary stated:

> 'Before European settlement the northern lagoon of the Coorong was dominated by tidal input of marine water. Marine flushing also strongly influenced the southern lagoon but less frequently or to a lesser extent. At no time in the 300 years before European settlement has the Coorong been noticeably influenced by flows from the Murray River.' 46

There have been two major land drainage and reclamation schemes that have impacted on the ecological condition of the Coorong.

[45] DWLBC report 2006/25
[46] Gell P – A Palaeoecological Assessment of Water Quality change in the Coorong

The construction of the South East Drainage Scheme in South East of South Australia drained this naturally wet landscape. Over a period from 1863 through to 1975, wetlands, swamps and natural drainage lines were 'reclaimed' for human passage and agriculture. [47]

A subsequent drainage scheme was initiated in 1993 and approved in 1996. This Upper South East Drainage and Flood Mitigation Scheme was developed in response to growing concerns about modelled prediction on salinity risks to the region and for flood mitigation. Funded under the Natural Heritage Trust, addressing salinity risks and managing flood waters, saw the natural water flows of the Upper South East area further amend the natural drainage flows of localised swamps and marshes. This stage drainage scheme together with the main South East Drainage Scheme, added to the changed drainage patterns, for the whole South East region.

The original lower South East Drainage scheme and the more recent Upper South Drainage Flood Mitigation Scheme, together continue to impact on the ecology of the Coorong.

When the Coorong was listed as a Ramsar site in 1985, there was a specific reference to the 'hyper saline conditions of the Southern Lagoon'. The Coorong and Lake Alexandrina and Albert Management Plan note in (section 5.6):

> "to conserve the ecological character of the southern lagoon as a mostly hypersaline lagoon, manage the timing and volumes of discharge under the Upper South East Dryland Salinity and Flood Management Plan (USEDS & FMPs) into the Southern Coorong, is based on the approved discharge of 40,000 Megalitres/year as the mean of a rolling ten-year average with most discharge through winter and early spring"

Note: The Commonwealth of Australia has imposed, as a condition of its approval and financial support for the Upper South East Dryland Salinity and Flood Management Plan, a maximum discharge of 40,000 megalites/year on ten-year rolling average is permitted into the Southern Coorong. (note: this is to maintain the hyper saline state – an ecological character criteria at the time the site was listed under RAMSAR)

In determining the environmental needs of the Coorong, Australians may be rightly confused.

On the one hand the ecological decline of the Coorong is blamed on river extractions within the States of NSW, Victoria and Queensland. However, on closer examination, the significant ecological changes that have occurred to the Coorong, have largely resulted from historical planning to drain and reclaim land for agriculture in the South East of South Australia from 1863 – 1975. Further major investments in drainage schemes occurred more recently as part of the salinity and flood mitigation strategy funded by the Australian Government Natural Heritage Trust Program.

Major changes to the natural flow patterns of the South East of South Australia have drained freshwater flows away from the Coorong directly out to the Southern Ocean, or alternatively, limited freshwater inflows (ie from the USEDS & FMPs) as rule to maintain the hyper saline state of the Southern Lagoon.

An example of flow volumes re-directed away from the Coorong out to sea, by the (Lower) South East Drainage schemes include:

[47] SRI – Advice to the MDBA Lower Lakes Coorong

> "The combined average annual discharge to the sea from the Blackford Drain, drain L and drain M = 136.4 GL. Discharge is variable and in high rainfall years very large volumes flow to the sea through these drains"[13]
>
> For example in 2000 the combined total discharge was 449.9 GL. Without the drainage network in place, a considerable proportion of this water would have flowed into the Coorong's Southern Lagoon. To put these volumes in context, "the total volume of the South Lagoon varies from approximately 140 GL when full in winter, to 90 GL in late summer". [13]

Murray Mouth

Lake Alexandrina and Lake Albert formed part of an open estuarine system 7000 – 6000 BP (before present). (Walker D.J.) As sea levels rose subsequent to that period (6000-1940 approx), the sand barriers of the Sir Richard and Younghusband Peninsulas, were formed and 'enclosed the lower lakes' (Walker D.J.)

The Murray Mouth movement in line with Southern Ocean influences, migration is recorded over 1.6km since the 1830s and up to 6km over the past 3000 years.[43] Migration of 1.4 km has been recorded in the last 160 years. [11]

The Murray estuary is geomorphologically dynamic (Bourman 2000) and movements of 14m over 12 hours, have been recorded.[43]

The Murray Mouth for thousands of years has represented the end most connection between the estuarine areas of the Lower Lakes, the Coorong, the islands and tidal regions that now form the coastal zone bounded by the Sir Richard Peninsula and the Younghusband Peninsula.

The Murray Mouth itself has undergone significant changes through the construction and operations of the barrages and river regulation.

> "based on observations at the time it was suggested that flows of 25,000 to 30,000 ML/day were required to maintain and expand the artificial opening. This then led to the estimate **that 20,000 ML/day for four weeks** should restore a **severely restricted mouth** to a healthy state. **This figure has been quoted ever since** (Harvey, 1988, Bourman and Barrett 1995). [49]

Early studies in 1914 identify that, prior to the construction of the barrages, the tidal prism influencing the estuary and the Murray Mouth was estimated to be 16,900 ML. At this time, the area of the Lower Lakes affected by the tidal prism was 97.3 km2 (Johnston, 1917). Following the construction of the current barrages in 1940, 90% of the tidal prism has now been removed. [11]

A further calculation of the pre barrage tidal "spring" prism was done by Walker (1990), who estimated that the tidal prism was approximately 20,000 ML.

---

[13] Government of South Australia – Securing the Future CLLMM

[11] Bourman R; Murray-Wallace C; Belperio A; Harvey N – Rapid Coastal Geomorphic change in the River Murray Estuary of Australia

[43] Living Murray Foundation Report

[49] Walker D – the Behaviour and Future of the River Murray Mouth

[11] Bourman R, Murray-Wallace C; Belperio A; Harvey N – Rapid Coastal Geomorphic change in the River Murray Estuary of Australia

A more recent estimate of the **current** tidal prism show a tidal influence in the range of **643 and 2,200 (**Murray Mouth Advisory Committee 1987).

It is a common misconception today, that traditional Murray River flows were of the vicinity of 20,000 ML and this may be viewed as the required amount of mouth outflows to ensure continually scouring of sand deposited by incoming tides.

This perception ignored the historical flows out the Murray Mouth that would have consisted of fresh water flows from the Murray River and tidal influences from the Southern Ocean.

In 2002, a report was done by D. J. Walker, Centre for Applied Modelling in Water Engineering, Department of Civil & Environmental Engineering, Adelaide University - The Behaviour and Future of the River Murray Mouth.

The models map a ten year period 1990 -2000 and compare modelled predictions on a natural flow and a regulated flow.

> 'figure 2.3, identifies predicted flows at the Murray Mouth under natural and regulated conditions for a ten year period. The flow predictions, supplies by MDBC, were based on a computer simulation that uses known river flows at a lock some distance from the Mouth and takes into account water extractions, losses due to seepage and evaporation, barrages operation and lower lake levels. These predictions are necessary because the actual flow over the barrages is not measured.'
>
> 'the changes at the Mouth have been linked to the construction of the barrages and a possible course of action would be to remove the barrages and return the Mouth to 'its natural state'. Havey (1996) quotes estimates to tidal prism that indicated the construction of the barrages reduced the flow by around 90%. This would have a significant effect on the size of the Mouth under normal conditions. The micro-tidal wave dominated coastal environment means that the River Murray Mouth is likely to have excessive sedimentation inside the Mouth area and in the past the tendency to close would have been balanced by the consistent pattern of river flows flushing sediment from the Mouth'.
>
> 'The report uses 'data collected while the barrages were in place it was not possible to use it model the effect of removing the barrages'. '

River flows are necessary and integral part to 'the long-term maintenance of the current Murray Mouth, but it is evident that during periods of **low river discharge**, the **mouth has** been maintained by **wave action and tidal flushing'.**[11]

The Murray Mouth represents a tidal inlet, restricted by the sand barriers of Sir Richard and Younghusband Peninsulas. Narrow inlets can restrict flows which creates a higher gradient 'flood tide'. (Bourman & Harvey) As the flood tide pushes through the inlet, it scours and deposits sedimentation inside the inlet which creates 'tidal deltaic deposits' As the tide goes out, the situation is reversed as the hydrologic gradient pushes sedimentation back towards the ocean. [50]

[11] Bourman R; Murray-Wallace C; Belperio A; Harvey N; Rapid coastal geomorphic change in the River Murray Estuary of Australia

[50] Bourman R; Harvey N – the Murray Mouth Flood Tidal Delta

Tidal fluxes are strongly related to the tidal prism, ie volumes of water that enters and exits the delta during one tidal cycle.[51]

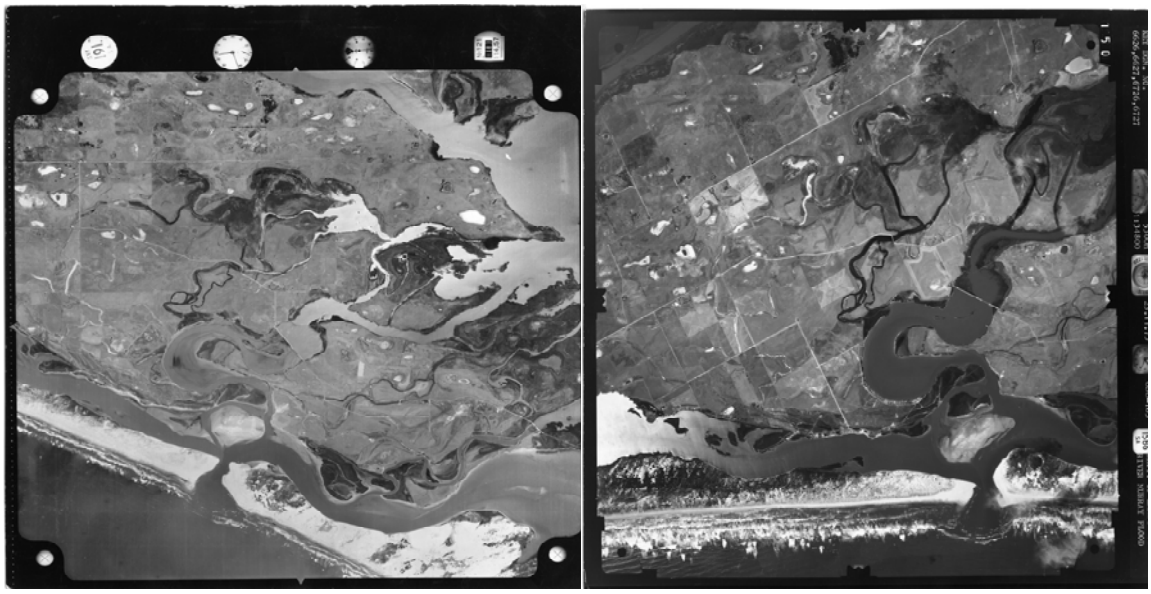
Murray Mouth restriction can be attributed to a range of factors throughout its history. Described in early periods as 'sand shoals', Johnston 1917 noted such sedimentation events in the Mouth 1839, 1857, 1876 and 1914. A photograph in 1938 identified 'plumes of deltaic sandy sediments' in the Murray Mouth. 50

The Murray Mouth nearly closed during the drought periods of 1914, 1967 and 1973. The explorer Sturt noted in his journals in 1836, that it was impossible to navigate safe passage through the sand shoals of the estuary to the sea.

Studies indicate that the construction of the barrages in 1940, 'reduced the median annual flow to the estuary by 75% and reduced the tidal prism by up to 90% and facilitated the development of Bird Island. The continual development of Bird Island suggests considerable potential for more blockages in the future.'[52]

The Murray Mouth is influenced by 'fluvial, wave, tidal and aeolian processes' (Bourman & Harvey).50

During the 1956 high flow and flood period, 326,000 ML/day, the mouth was 'significantly widened' which scoured the 'deltaic sediments'.50



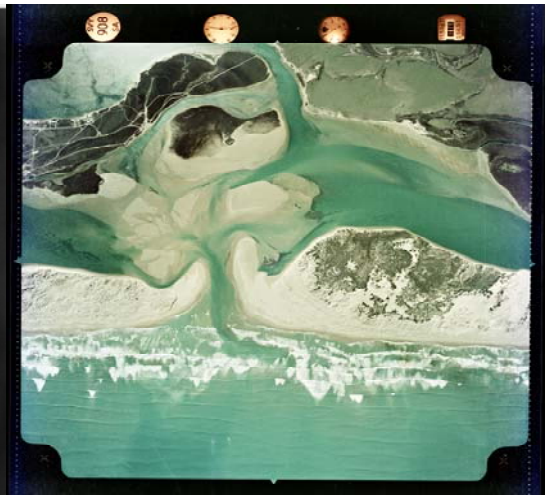
Murray Mouth – January 1956 (SA mapland) Murray Mouth –November 1973(flood)(SAmapland)

[51] Fagherazzi S – Self-organisation of tidal deltas

[52] James Kristine – The bio-geomorphological evolution of a former flood tidal delta (Bird Island) in the Murray Mouth Estuary of SA

Murray Mouth – February 1988 (SA mapland)

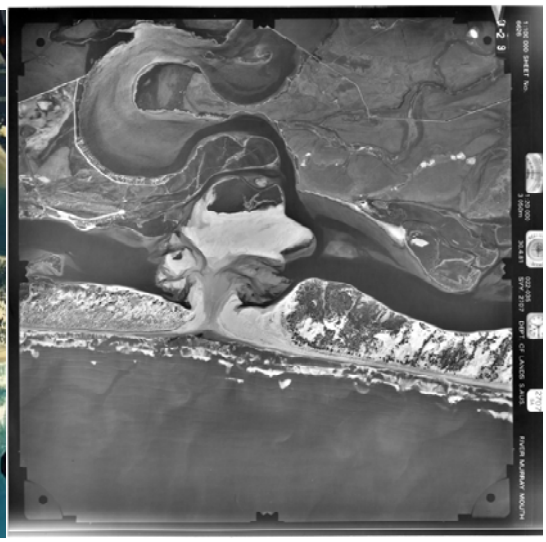
Murray Mouth – March 1949 (SA mapland)



Murray Mouth – 1966 (SA mapland)

(note: 1949 flood tidal delta – 90 days of no river flow: Bourman;Barnett)

Murray Mouth – March 1995 (SA mapland)



Murray Mouth - April 1981 (SA mapland)

Muray Mouth – January 2001(c SA mapland) Murray Mouth – March 2003 (SA mapland)

Following the construction of the barrages in 1940, the Murray River has ceased to flow in dry periods, for '100 or more consecutive days'. These low flow events enabled increased sedimentation within the tidal delta of the Mouth. [50]

Photographs on the 24th April 1945 (5 yrs after construction of the barrages), show increased sedimentation and the formation of a tidal delta following 250 days of no flows (Bourman & Harvey). This event reoccurred after 90 days of no flow and was captured by a photograph on 23rd March 1949.

The risk of the sand deposition or 'shoaling' was first predicted, prior to building the original Mundoo Barrage in 1915 (Moncrieff 1903).[52] Today, the continued growth and stabilisation of Bird Island, has been progressive since the more construction of the permanent Mundoo barrage, built in 1940. The inefficient and archaic operating features of the Mundoo barrage, meaning that rapid reaction to the climatic conditions is not possible. This prevents the ability to mimic natural tidal actions through barrage releases, to assist scouring action at the Murray Mouth.

The continued growth of Bird Island is of concern and will further impact on channel flows in the vicinity of the Tauwitchere Barrage impacting on tidal flows to the Coorong. [50]

Bird Island in 1960 had 'increased in size' and the stability of Bird Island allowed vegetation growth to occur. At this time Murray River flows were 63,000 ML/day. [50]

Sedimentation of the Mouth estuary was evident in 1966 following 181 days of the barrages being closed (Bourman & Harvey). This build up of sedimentation occurred again in the 1967-68 drought when the barrages were shut for 529 days (Bourman & Harvey). A storm event in 1968 reopened the mouth and scoured the build up of sedimentation. [50]

The Murray Mouth's tidal has two main factors affecting its function, river flows and the coastal climate. Coastal climate factors are tides, wave energy and littoral transport (Walker D.J.)

Walker report states

> 'given the micro-tidal conditions and the domination of wave energy on the coast the large flood tidal delta is to be expected (Hayes, 1991, Harvey 1996). The

[50] Bourman R; Harvey N – the Murray Mouth Flood Tidal Delta

[52] James K; The bio-geomorphological evolution of a former flood tidal delta (Bird Island) in the Murray Mouth estuary of SA

[50] Bourman R; Harvey N – the Murray Mouth Flood Tidal Delta

49 Walker D J; The Behaviour and future of the River Murray Mouth

tendency for inlets of this type to close periodically has been observed in many seasonally open inlets both in Australia and around the World. (Australian Parliament Senate Standing Committee 1981;Bally, 1987;Ranasinghe and Pattiaratchi, 1999)"

Perhaps the most recognised and misunderstood mouth closure was on 30th April 1981, when the Murray Mouth was completely closed off from the Southern Ocean by a build up of sedimentation deposited by incoming tides (20,000 tonnes). At this time the barrages were shut for a period of 196 days. [50]

The photo of Murray Mouth closure in April 1981 (at low tide), has become the iconic symbol of declining river health and over extraction of water in the Murray Darling Basin.

(photo: April 1981. source Websites: Living Murray)(c SA Mapland)

Post the Murray Mouth's closure in April 1981, dredging re opened the passage to the sea in July 1981, with subsequent winter flows maintaining the opening.

The April 1981 photograph of the Murray Mouth closure has ever since been portrayed as a symptom of 'over allocation' of water in the Murray River system for the purposes of irrigation.

During the Australian Parliament Senate Standing Committee 1981, Culver was quoted 'that in addition to low flows, calm seas and reduced tides appear necessary for a complete closure (mouth)'. (Walker D. J.)[49]

The image itself however, should be viewed in conjunction with the historic photographic references. Photographic images of the Murray Mouth since 1945, identify the continual actions of a tidal delta system with the mouth estuary which have caused severely restricted flows through to the Southern Ocean.

Regular sedimentation of the Murray Mouth estuary has a range of contributing factors, including river regulation, tidal flows, the location and operation of the barrages and the natural tidal and coastal conditions of the Southern Ocean.

The April 1981 physical closure of the Murray Mouth, can be attributed to the 'lack of fluvial action, unusually calm sea conditions, and a period of low high tides'.[50]

---

[50] Bourman R; Harvey N – the Murray Mouth Flood Tidal Delta
43 Living Murray Foundation Report

The Southern Ocean experienced a particularly calm period between August 1980 and May 1981. According to Bourman & Harvey, a high tide event of 1.8 m on 6th May 1981 re-opened the mouth but it closed again 14th May.

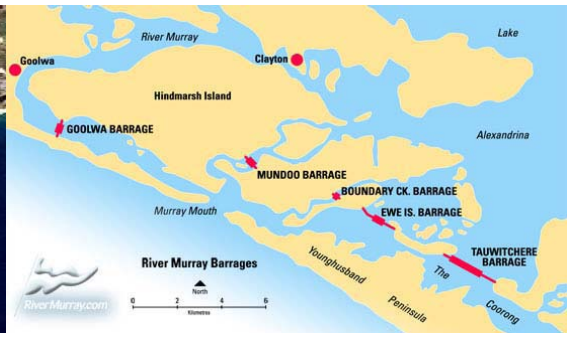
The Living Murray's Foundation report note that the when the blockage of the Murray Mouth occurred in 1981, there was also a build up of the Bird Island flood delta over the previous months.[43]

This report acknowledges the future risks of Bird Island continued growth in size due to increased sedimentation.

The growth of Bird Island has been progressively noted since the 'Mundoo Channel was closed in 1915 by an original barrage with timber sluiceway'[43]

The micro tidal delta of the Murray Mouth operates in a similiar function to other tidal 'deltaic' forms on the Coast of Victoria and New South Wales. [50]

Victoria: Mallacoota (Web; Near Maps)



South Australia: Lower Lakes, Murray Mouth (web; RiverMurray.com)

The Shoalhaven River in New South Wales (NSW) has a similar tidal feature where incoming coastal tides deposit sand at the mouth of the river. The next high river event re-creates the scouring action and re-opens the system to the sea. Freshwater River flows at Mallacoota in Victoria, is also reflective of a tidal inlet system. Dominated by sand deposition, with coastal conditions and river flows, influencing the sand bar formations.

> 'The Murray Mouth appears to be a classic landform example from a micro-tidal environment on a high energy coastline. The barrages, a short distance upstream from the delta, not only artificially restrict or cut off river flow, but also reduce the magnitude of the tidal prism. In addition the southeast drainage modifications have reduced freshwater inputs into the Coorong. The consequences of the altered regime at the Murray Mouth has been the progressive stabilization of the formerly ephemeral flood tidal delta' [50]

Periods of Murray Mouth sedimentation have occurred during periods of low flows, drought or even within normal flow years. The normal management operations and flow releases of the barrages, also influence the behaviour the Murray Mouth.

Normal operations of the lakes are managed to maintain water levels at 0.75 AHD. As higher spring flows from the Murray River enter the lakes, lake levels are surcharged (increased) to an operating level of 0.8 AHD. This enables a drawdown of water for

[50] Bourman R; Harvey N – the Murray Mouth Flood Tidal Delta

irrigation during the warmer months and ensures that evaporation rates between 700,00 to 940,000 ML/year, do not reduce lake levels for most periods below 0.75 AHD.

The restricted releases from the barrages at certain times of season in order to maintain lake levels at 0.75 AHD, contributes to reduced scouring action of the Murray Mouth.

Operation of the barrages has led to significant alteration to the hydrology of the Lower Lakes and Murray Mouth area, and of course, flows are affected by all the regulating structures upstream (Living Murray foundation report)

Yet in determining the needs of this Ramsar listed environment, historical changes that have significantly impacted on the site are not discussed/noted in the relevant literature. The Murray Darling Basin Authority (MDBA) specifically targets hydrological flows from the Murray River to meet environmental challenges for the region. The MDBA set target objectives for increased over barrages flows from 5100 –7700.

This proposed increased flows, should not be the sole solution to remedy environmental challenges to the site. Further investigation is required in relation to:

- Improved understanding of Murray River fresh water flows and their scale of influence being limited to the mid to Northern section of the Northern Lagoon.
- The lack of influence of Murray River flows on the hypersaline conditions of the Southern lagoon of the Coorong.
- An assessment of freshwater flows redirected to the Southern Ocean from the South East of South Australia drainage schemes and the limitations placed on the inflows to the Southern lagoon from the Upper South East Salinity and Flood Management scheme.
- The construction, operation and current management regimes of 5 barrages and this impact on the historical tidal interaction in the estuarine system of the Lower Lakes, that have lead to significant ecological changes.
- The impact of the barrages on increased sedimentation of the Murray Mouth

Note: the MDBA received a report in April 2010 – Advice to the Murray Darling Basin Authority – Lower Lakes, Coorong (L Burge, SRI NSW)

Conclusion:
the Lower Lakes, Coorong and Murray Mouth site have undergone significant change due to human intervention in the landscape and river regulation (locks/weirs/barrages). Environmental issues, require a comprehensive approach, where the solution does not lie with a simplistic approach of increasing 'end-of-system flows'.

Photographic evidence in 1945, identifies that significant sand accumulation at the Murray Mouth (deposited by incoming Southern Ocean tides) was noted five years after constructions of the barrages. The continued growth of Bird Island continues to pose a risk – this cannot be resolved by 'end-of-system flows'.

Historically, tidal action has been instrumental in maintaining the openness of the Murray Mouth during periods of low Murray River flows. There have been periods up to 529 days of no flows from the Murray, when tidal scouring and storm surges would keep the mouth to the Southern ocean open.[44]

[44] Bourman R; Barnett E – Impacts of River Regulation on the Terminal Lakes & Mouth of the River Murray

The iconic photograph of the Murray Mouth closure of 1981, a symbol of poor river management, had a number of influencing factors that have been ignored. Prior to this event was a period of unusually calm seas and a lack of storm surges. This was combined with a period of no flows of the river for 196 days. Such low flows had occurred previously, with no mouth closure resulting.

The MDBA should adopt a more comprehensive approach to addressing the range of contributing factors to the decline in environmental conditions in the Lower Lakes, Coorong and Murray Mouth during low flow periods. In particular, identifying investment for operational efficiencies for the barrages and localised solutions, to address environmental issues of the Coorong.

In period of extreme drought, an adaptive management approach to the Lower Lakes and Murray Mouth is required to address low inflow periods.

Salinity

The World Health Authority's (WHO) raw drinking water standard is 800 EC.

Salinity levels in the Murray River since the spike of 1982, have progressively fallen and remain well within the World Health Organisation's raw drinking water standard of 800 EC.

Salinity is a natural component of the Murray Darling Basin soils reflecting its ancient marine history. With marine waters covering extensive areas of what is now known as the Murray Darling Basin, the movement of natural salts in the landscape can be attributed to a range of causes.

When the explorer Sturt, first sighed the Murray River in 1820, it was a series of salty pools.

During periods of lower flow, sea water would regularly influence the lower Murray River inland, up to 250 km. (MDBC 2002)

In the 1914 drought, salinity readings in the Murray River at Morgan contained 804 p.p.m (*1436 EC) of salt. [14]

The Murray River at Murray Bridge which is approximately 110 km upstream from the river mouth, the readings were 6,929 p.p.m (*12,373 EC). Studies at the time concluded that "this salt appears to have largely originated directly from the sea." [14]

In 1940, five concrete barrages (7.6 km length) were completed, which converted the estuarine areas of Lake Alexandrina and Lake Albert into permanent freshwater water bodies. The 1945 drought, 'when no fresh water passed over the barrages for 12 months, corresponding salt contents were 782 p.p.m (*1396 EC) (Morgan) and 833 p.p.m. (*1487 EC) (Murray Bridge)respectively. [14]

* SA Saltwatch conversion

[14] de L'Association Internationale des Sciences – Sea Water Exclusion from Australia's River Murray

Historically the Murray and Darling River salinity readings have varied with climatic conditions, but growing concern on modeled risks for salinity led to the 1987 Salinity Drainage strategy. This sought to ensure that the Murray River's water quality target was to retain salinity readings at the official Morgan site (in SA) at or below 800 EC.

Salinity had became a major environmental policy issue in the mid 1990's, following wetter than average years in the 1990s. There were two major reports that contributed to political elevation of salinity. The Salinity Audit of the Murray Darling-Basin (Murray Darling Ministerial Council 1999) and the Prime Minister's Science, Engineering and Innovation Council (1999). [53]

The National Salinity Audit 2000, was identified to be "Australia's most comprehensive national assessment of dryland salinity". However this report itself, refers to the term 'best available science'.

The National Salinity Audit predicted that 5.7 million hectares were considered currently at risk of dryland salinity. The report predicted that by 2050, 17 million hectares of land would be subject to risks of salinity, mainly in Western Australia.

Prior to 2003, the CSIRO Land and Water Website stated:

> "the Murray-Darling Basin, shows the nature of the problem we face. Salt levels are rising in almost all the Basin's rivers and now exceed WHO guidelines for drinking water in many areas. Business as usual is not an option. If we do nothing, the salinity of the Lower River Murray – where Adelaide pumps outs its drinking water – will eventually rise to exceed WHO guidelines". [54]

Salinity predictions led to the National Action Plan for Salinity and Water Quality and a $1.4 billion investment from the Natural Heritage Trust, over seven years (to 2008) to address the risks.

The National Action Plan website refers to "the area of salt affected land in Western Australia is increasing at a rate of **one football field per hour**" and "if salinity is not effectively managed within 20 years, the salt content in Adelaide's drinking water may exceed World Health Organisation standards for desirable drinking water in two of every five days". [10]

Salinity is the term to describe the salt content of soil or water. The National Action Plan refers to 'salinity increases are usually caused by a rise in the level of underground water-tables bringing naturally occurring salt to the surface" (NAP)

In **South Australia**, estimates of areas affected by dryland salinity went from **55,000 in 1982** to **393,000 ha in 1993** [55]

In the National **Land and Water Resources Audit – *Extent and impacts of dryland salinity in South Australia*** (SA) (December 2000), agricultural land estimated to be affected by dryland salinity, was 421,000 ha in 2020 and 521,000 in 2050. [55]

[53] Pannell D – Politics and dryland salinity; history, tensions and prospects
[54] Marohasy J – Myth and the Murray (IPA)
[10] AFG; National Action Plan for Salinity & Water Quality
[55] National Land and Water Resources Audit – Extent & Impact of dryland salinity in SA

Initial predictions, of rising groundwater and corresponding salinity risks, led to major Federal and State Government investment in addressing the risks. In SA, this included the Upper South East Drainage and Flood Mitigation Plan.

As in other parts of the Basin, the incidence of salinity risk associated with wetter periods, occured in areas where there is a strong correlation between the permeability of local aquifer, higher rainfall events and localized rising groundwater. The wetter events during the 1990's in many parts of the Basin, particularly 1992/1993 in South Australia, contributed to the heightened concerns about salinity risks. 55

In referring to the extent and trends of dryland salinity, the audit identified "the dramatic increase in areas affected by dryland salinity in some regions is most likely the result of increased awareness and better recognition of the problem, rather than the physical expansion of salinisation (however in some areas, salinisation has increased significantly, especially after very wet years)".55

The report in South Australia stated though, that these estimates in conjunction with estimated costs of dryland salinity even in 2050, would be less than 1% of South Australia's agricultural production. The report indicates that dryland salinity is of "less significance in South Australia than some other mainland states". 55

The audit referred to groundwater modeling in the Mallee region that predicted a rise in salinity of 118EC by 2050, costing consumers $17.4M/year (extent.) The rise in groundwater and associated risks to land salinisation was estimated as a result of vegetation clearance in the Mallee. However, differences of views exist about the predicted impacts of groundwater modeling and associated salinity risks. Reliable information on the risks of the Mallee salt movement, is difficult to obtain. Currently there is still a reliance on the MDBC earlier position.

In Myth and the Murray, Marohasy refers to the MDBC Basin Salinity Management Strategy 2001-2015 and the claims that the 'Mallee region, represents the greatest potential risk in terms of salt contribution to Morgan'.

Marohasy paper refers to the CSIRO technical paper, Groundwater Recharge in the Mallee Region, and salinity implications for the Murray River – A Review.

Findings in this technical paper include:

> "….the time for the increase in deep drainage to reach the water table is related to the deep drainage rate, the initial watertable depth, and the soil water content within the unsaturated zone. Throughout most of the (Mallee) area, water tables are more than 20m below the land surface, and this time delay is of the order of tens of years'. Because much of the Mallee region was cleared between 50 and 100 years ago, watertables should now be rising over much of the region'. The report also notes that trends could not be determined due to the 'scarcity of data.[54]

As was noted in many other parts of the Basin, the National Land and Water Resources Audit – Extent and impacts of dryland salinity in South Australia, identified similar observations:

> "because most of the groundwater trends are strongly controlled by rainfall, watertable levels have been falling throughout SA for the last 2-3 years up until the

[54] Marohasy J – Myth & the Murray

year 2000, due to well below average winter rainfall. Some drier catchments have experienced falling groundwater levels since 1993.

The Audit identified;

> "that a continually rising groundwater trend is only evident in the 'regional flows systems of the Murray Darling" and "future groundwater trends will depend on future rainfall patterns which are notoriously difficult to predict. The greenhouse effect is expected to lead to lower winter and higher summer rainfalls, however the degree to which other cyclical patterns (eg the eleven year solar cycle) will impact on these trends is unknown" [55]

Subsequent to the period surrounding the peak of the 'salinity crisis', affecting many parts of the Murray Darling Basin, concerns were raised about the accuracy of the original modeled predictions.

The Australian Farm Institute "… Individual research says the figure doesn't look right because the model that underlay it – basically - isn't what's happening in practice".[56]

In 2005, Professor Wayne Meyer, chief scientists at the CRC for Irrigation Futures in ABC Science …. 'there's no question that salinity fears have been exaggerated in some parts of Australia… this could be a short-term effect caused by environmental factors,… but adds 'now is a good time to revisit the 2000 figures'. 'We're five years down the track so it's probably time to have another look at that information … and it may well change'. 56

In the report, Myth and the Murray – Measuring the Real State of the River Environment: Jennifer Marohasy (IPA 2003), noted that a 'plot of average salinity levels for the last 20 years indicate that salinity levels have dropped since the drought of 1982".

The Myth and the Murray report notes the MDBC's agreement with these findings and the MDBC comments …...'average salinity in the River Murray has in effect improved during the last decade'. 54

Salinity will require continued monitoring, however assumption on rising groundwater which influenced higher modeled predictions of risk, proved incompatible with practical observation. While salinity management remains an issue in specific parts of Australia, a more cautious and comprehensive approach now seems to prevail.

A report published by the Murray Darling Basin Commission in 2003 – Modelling the Effectiveness of Recharge Reduction for Salinity Management - Sensitivity to Catchment Characteristics, notes that 'large parts of Australia have a lack of detailed hydrolgeological data on which to base future predictions of changes in land and river salinity'.

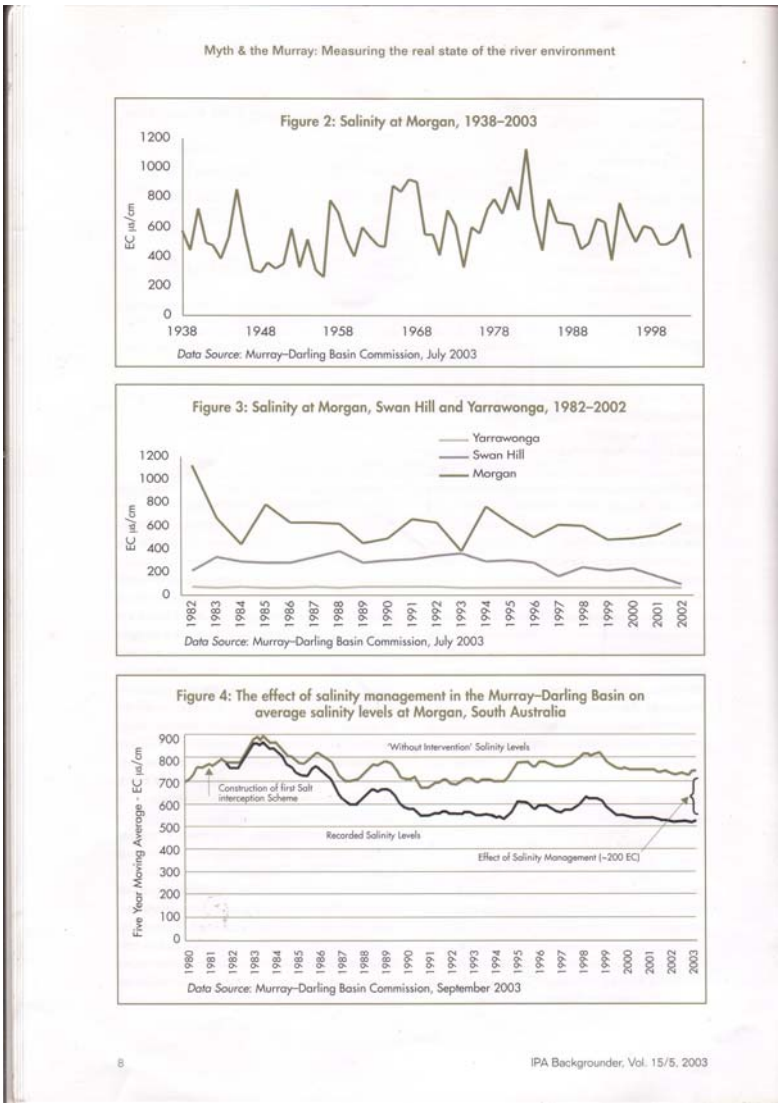
There has been significant investment in addressing salinity risks in many areas. Salt interception works at strategic locations adjacent to the Murray River, have contributed to water quality objectives.

The MDBC have determined that "on a five year rolling average, by modeling the situation without salt interceptions, the MDBC has calculated that salinity has dropped by approximately 200 EC units as a consequence of the salt-interception schemes".

---

[55] National Land and Water Resources Audit – Extent & Impact of dryland salinity in SA

[56] ABC Science: www.abc.net.au/science/articles/2005



Salinity issues for the lower reaches of the River Murray, Lower Lakes and Coorong are varied and have a range of influencing factors.

The ecosystem function of the region has been substantially altered since the construction of the barrages which changed the dynamics of the Lower Lakes and the natural interaction with the Southern Ocean and the lower reaches of the Murray River.

The Murray between Lock 1 and Wellington, where river waters enter the Lower Lakes, has also been substantially modified. In this section low lying marshes and wetlands were drained, with the Murray River bank built up by levees as part of land reclamation for agriculture. This allowed reclaimed areas of farmland to be irrigated using natural gravity, as the river in effect became perched with the construction of banks and thus at this point the Murray is a 'perched' river, higher in elevation than the surrounding farmland.

The Living Murray Foundation report describes:

> "The River Murray estuary would have naturally offered a wide range of fresh, brackish, saline and hypersaline systems (Newman 2000). The Lakes would have fluctuated in level over a range of about 0.0 – 00.5m AHD (Australian Height Datum) giving water depths in average hydrological years of 1-2m (Newman 2000).[43]

> "Salinity would also have varied with water level. There would have been a natural interchange of water between the Lower Lakes and the Coorong/Goolwa channels and the Southern Ocean. As well as water exchanging through the main deep channels, flow would also have passed through the smaller and more elevated channels on Hindmarsh, Tauwitchere and Mundoo Island." [43]

'Securing the Future, a long-term plan for the Coorong, Lower Lakes and Murray Mouth' states when referring to the Lower Lakes salinity suggests that salinity 'used to be less than 1000 EC units' (suitable for stock, domestic supplies and irrigation).

This section does not suggest an **average** salinity figure or specifically identify the basis or timeframe of 'used to be less than 1000 EC' . The report also, notes that typically salinity in the Lower Lakes varies between 400 EC to 2,300 EC.[13]

This report further identifies that in 2010, 'the current readings are more than five times, that levels, in Lake Albert, salinity levels are more than 10,000 EC, and are likely to increase unless freshwater can be made available'. (seawater = approx 50,000 EC units). Reference is also made to the current drought, where Lake Alexandrina reached 6,430 EC and 35,100 EC in the Goolwa channel.

During the recent extreme drought in the Basin, in September 2009 the South Australian Government, Department of Water, Land and Biodiversity Conservation – River Murray Water Resources Report (issue 45:4 September 2009) noted that despite lower than minimum entitlement flow "**salinity levels above Lock 1 remain fairly low"**. However downstream of Lock 1 salinity levels remain high due to low water levels. Average salinity in Lake Alexandrina is currently 5,400 EC. Average salinity in Lake Albert is currently 8,875 EC."

These salinity figures reflect that the Murray River itself remained relatively low above lock 1, (September 09) but salinity levels rose in the Lower Lakes as under drought conditions the remaining pooled water evaporated.

In the modified Lower Lakes environment created by the barrages, salinity is influenced by salt contents of Murray River water, but a strong factor, is the presence of historical regional marine salts, natural saline groundwater flows, salt spray borne by winds, saline contributions from localised Lake inflows eg Finnis & Currency Rivers, natural sea water seepage from the Southern ocean under the barrages and deep below the sand dunes barriers, that form the natural boundary to the Southern Ocean.

Salinity in the Coorong has been identified as a major environmental issue and hyper salinity in the Southern Lagoon of the Coorong has been used as an indicator of overall Murray River environmental decline.

The Southern Lagoon of the Coorong was included in the broader region - Coorong, Lower Lakes, Murray Mouth wetlands of significance and the resulting listing under the International Agreement for wetlands of significance under RAMSAR in 1985.

[43] Living Murray Foundation report

[13] Government of SA – Securing the Future CLLMM

At the time the site was included as an Australian recognized site under Ramsar, the Southern Lagoon was specifically noted as Hyper Saline and this is reflected in the management plan.

> 'Pre European salinities in the Coorong's South Lagoon were typically 8,300 EC to 58, 333 EC. European settlement of South Australia and the Murray-Darling Basin has led to greatly reduced freshwater inflows to both ends of the Coorong. Construction of the South East drainage network, which commenced in 1860s, significantly limited flows from the South East. River regulation and irrigation in the Murray Darling Basin reduced flows into the northern Coorong. Southern Lagoon salinities of less than seawater have not been recorded since the River Murray floods of 1974-75. When the CLLMM site was listed as a Wetland of International Importance in 1985, the typical salinity range in the South Lagoon had risen to between 90,000 EC and 230,000 EC.' [13]

Salinity records on the Murray River at Morgan, reflect that salinity levels remain within World Health Organisation (WHO) raw drinking water standards of 800 EC. This is consistent with the targets of the Murray Darling Basin 1987 Salinity and Drainage Strategy (800 EC).

Higher salinity readings in the lower Lakes and Coorong, should be expected in this highly modified environment, during severe drought periods. River regulation, despite lower than average flows, did not impact on the Murray River salinity readings at Morgan.

Based on experiences of wet decades in the 1970's, the MDBA Plan to increase flooding, may enhance salinity issues in some areas.

Carbon plantations

When Australia signed the United Nations Conference on the Environment & Development in Rio de Janeiro in 1992, natural resource policies were framed by a new set of objectives and management approach.

The UN Framework Convention on Climate Change was established in March 1994.

In 1997 Australia signed but did not go on to ratify the Kyoto Protocol. International negotiations enabled inclusion in the Kyoto Protocol of the Australia clause (article 3.7) which enabled Australia to rely on afforestation and deforestation measures to meet its international treaty obligations, on Greenhouse Gas emissions.

Australia approach to its emission reductions may have long term unintended consequences to the environment. Australia's afforestation policies, may produce perverse environmental outcomes with the full extent yet to be realised. In particular on catchment hydrology and future fire management.

There has been no effective analysis of potential negative environmental impacts from Australia's policy position under Kyoto. The long term impacts on catchment water yields, are not factored into consent provisions or overarching Federal or State Government policy.

A further complication is the contract time frame for Kyoto compliant carbon plantings that have a mandatory life span in excess of 70 years.

[13] Government of SA – Securing the Future CLLMM

Plantation forestry on the scale to meet Australia's afforestation targets was underpinned by Managed Investment Schemes. The financial fallout of Managed Investment Schemes has been well documented in recent times. It is not clear however, the fallout to the environment from poorly planned afforestation targets.

In a published report to Science (American Association for Advancement of Science) in 2005, which included contributions from the CSIRO, environmental risks from carbon sequestration strategies were identified, in particular tree plantations. Research identified that "plantations decreased stream flow by 227 millimeters per year globally (52%), with 13% of streams drying completely for at least 1 year".[1]

As part of a global assessment, '504 annual catchments observations' identified that afforestation substantially reduced stream flow within a relatively short time frame from initial plantings.[57]

The report identified the 'co-benefits and trade-offs of plantation need to be taken into account when negotiating exchange agreements'. The report goes on to say 'decreases in stream flow and changes in soil and water quality are likely as plantations are increasingly grown for biological carbon sequestration'.[57]

It seems short sighted in this era of public and political concern with climate change, that the very policies design to meet emission obligations, could adversely affect long term Catchment yields. This is particularly relevant for the MDBA in assessing the impact of climate change on inflows from the headwaters of the Murray Darling Basin and more localized inflows to environmental asset sites from plantations.

In developing future sustainable diversion limits for the Murray Darling Basin, it is possible to conclude that current forestry interceptions are taken into account prior to determining sustainable diversion limits for existing entitlement holders. It is not clear how future interception impacts will be addressed for future Carbon Plantations.

Bushfires

Victorian High Country Falls Creek (photo L Burge 2004)

[57] Science AAAS – Trading water for carbon with biological carbon sequestration

Kosciuszko National Park (Photo L Burge Feb 2010)Evidence of 2002 Wildfires

Victoria is one of the most affected States from Bushfires. According to Forest Fire Victoria, 'three quarters of bushfire-related deaths and more than half of economic losses' incur in Victoria.[20]

From the period 1896 to 1945 approximately forty fire seasons experienced bushfires. Major bushfires occurred in 1898, 1905, 1906, 1914, 1926 and 1932.[20]

Major fires in recent history include:

Victorian Bushfires	**Hectares burnt**
1939	1,364,410
1942 & 1943/44	160,000
1952	> 100,000
1961,62	100,000
1965	378,000
1983	210,000
2003	1,067,500 forest & 90,000 ha private land

(statistic source: Forest Fire Victoria)

According to the Forest Fire Victoria 'The Facts behind the Fire', a Scientific and Technical Review of the Circumstances Surrounding the 2003 Victorian Bushfire Crisis, fire behaviour in forest fires, will be determined by:

'The amount and type of accumulated fuel in the forest;

- Fuel quantity
- Fuel size
- Fuel arrangements and distribution
- Moisture content and curing of living plant tissue
- Moisture content of dead or cured material; and
- Fuel availability

[20] Forest Fire Victoria: Dexter B; Hodgson A – Facts behind the Fire

Fire weather:

- Climate – the prevailing weather over a significant period of time
- Weather – local and regional; the condition of atmospheric elements such as atmospheric pressure, temperature, humidity, wind and stability, vertical motion and turbulence of the atmosphere'

This report stated that the 2003 Victorian Alpine fires were different to past fire events. The intensity of the fires scorched 53% (527,100 ha) of all the trees, either severely scorching their crowns or incinerating their crowns.[20]

> "None of this intense fire behaviour occurred in the first week the fires burned and practically all of it occurred on just 4 days of the 59 days they burned, namely 18, 23, 26 and 30 January 2003. (Figs 26, 27, 28 and 29 DSE fire narrative(24)). It is very doubtful if more than half of such a large area of alpine forest was burnt so severely in the past by fires started by lightning; certainly not since European settlement started and unlikely before then. Nature caused the fires but the 2003 fire event was not natural"

In recent decades, there has been a fundamental shift in management of Australian native forests, with a corresponding build up of fuel sources. This continues to be a vexed issue for future fire risks.

Forest Fire Victoria report refers to "Mr. Pat O'Shaughnessy's preliminary estimate of the total area of alpine ash forest destroyed is about 73,700 ha". The section of the report referring to the alpine ash forest (73,700 ha) further identifies that the total losses in water yield over 64 years equates to 195ML/hectare or 14.4 million megalitres. An average of 225,000 ml/year.20

The report notes when referring to the sample of 73,700 alpine ash impacted by the fires, that there will be initial runoff of 184,000 Ml/yr that would drop off to 313,000 ml/y by year 17, still delivering a total loss of 221,000 Ml/y.

In the period of the inquiry and report on the Victorian Alpine fires, Journalist Peter Hunt (Weekly Times 11.8.04) reported that:

> "CSIRO Land and Water Chief Rob Vertessy said water run-off from the forests would fall significantly, leading to a review of entitlements under the National Water Initiative". "Its pretty certain there will be negative impacts in the next 10 to 20 years," Dr Vertessy said. "We're talking about large reductions in yields".[20]
>
> The Murray Darling Basin Commission former CEO, Mr Don Blackmore, also forecast a significant reduction in water yield during the next 20-50 years.20
>
> "The Director of Australia's Co-operative Research Centre for Catchment Hydrology, Roger Grayson said run-off from the burnt-out forests could drop by 20 to 40 per cent I the next 10 to 20 years. Professor Grayson has been commissioned by the Murray Darling Basin Commission and Victorian Government to determine the impacts of the fires".20

[20] Forest Fire Victoria – Facts behind the Fire

[20] Forest Fire Victoria – Facts behind the Fire

In planning for the environmental and social and economic needs of the basin, it is imperative for the MDBA to take a broader long term view of the range of policy decisions in Australia that will cumulatively impact on long term inflows.

This includes, the design of Australia's future Emission Trading Scheme and the extent of future carbon forestry plantations and the long term environmental management policies for the natural Forests in the headwaters of the Murray Darling Basin (NSW and Victoria).

Under climate change predictions, it is argued that temperatures will increase and rainfall will decrease, particularly in the Southern part of the Basin. Under this scenario the increasing plantations in the catchment and the changed management scenarios of crown forests to conservation reserves will impact on future catchment hydrology.

(note: during consultation, it was identified that the MDBA is aware of reduced inflows resulting from extreme wildfires, but has made no provision for it in the objectives to increase end-of-system flows)

CONCLUSION

The Murray Darling Basin resources and its communities have evolved due to Federal and State Government investments, planning and recognition of the economic wealth creation that have contributed to Australia's economic prosperity. The ingenuity, economic wealth and Australia's key food bowl is now subject to significant and permanent changes.

In part this can be attributed to meeting revised needs of the environment and perceptions around Australia's international agreements. However, it will also be determined that fundamental changes to Australia's food bowl, have resulted from political reactions during one of Australia's major drought events. In this context the political strategy to obtain a level of power over water - will reshape Australia's key agricultural region.

The MDBA objective to recover water for the environment (minimum 3000 GL) under the Basin Plan, means that 2000 of the 3000 GL is to flow out to the Southern Ocean through the objective to increase end-of-system flows.

To increase end-of-system flows under a reduced future 'inflow' scenario, appears to defy logic. A key reason for such an objective is the need address ecological issues in Lower Lakes, Coorong and Murray Mouth that have a range of contributing causes outside Murray Darling Basin extractions.

There is no recognition by the MDBA of the cumulative risks to inflows from future Bushfire and Forest Management policies.

Future impacts from Australia's policy response to Climate Change under an Emission Trading Scheme has also been ignored. Australia's reliance on offsets in the short term planning period before industry moves to less emission intensive options may lead to long term ramifications on the Murray Darling Basin.

Forestry offsets legal obligations will continue in excess of 70 years and as new science emerges, the contractual framework will ensure, that limited actions, can be taken to reverse impacts on catchment hydrology.

In determining the future environmental needs of the Murray Darling Basin, there needs to be clear distinction between natural drought sequences and the concept of 'over allocation'.

Understanding natural drought sequences are imperative to inform planners when determining additional water to be allocated for the environment. It should be noted that the Murray River continued to flow as reasonable levels and water supply to the city of Adelaide has been maintained during this most serious drought - despite a supposedly flawed and over allocated system.

Therefore, as a baseline point, Australians need to understand what standard or benchmark for the environment is sought. There may be an inaccurate presumption, that re-acquiring water entitlements can drought proof the nation. In reality, water recovered for the environment will not provide more certainty to irrigation supplies, as the environment will become another 'water user', competing with storage space in our major dams.

Despite modern infrastructure such as the Hume and Dartmouth dams, the Snowy scheme and many other dams in the Murray Darling Basin, Australia can never achieve the concept of 'drought proofing the nation'.

The Murray Darling Basin has been subject to significant planning and water reforms to date. This often not appreciated by the wider Australian community. The benefits of a regulated water supply system on the Murray River have delivered multiple benefits to the environment and to the nation.

If Government policies are to substantially change this, then policies should be built on strong foundations.

SECTION 3

HOUSE OF REPRESENTATIVES STANDING COMMITTEE – REGIONAL AUSTRALIA – MURRAY DARLING BASIN PLAN

TERMS OF REFERENCE:

The House of Representatives Standing Committee on Regional Australia inquiry on the Murray Darling Basin Authority – Proposed Basin Plan, will conduct the inquiry under the following terms of reference:

- The direct and indirect impact of the Proposed Basin Plan on regional communities, including agricultural industries, local business activity and community wellbeing;
- Options for water-saving measures or water return on a region-by-region basis with consideration given to the analysis of actual usage versus license entitlements over the preceding fifteen years
- The role of Government, the agricultural industry and the research sector in developing and delivering the infrastructure and technologies aimed at supporting water efficiency within the Murray-Darling Basin

In examining the issues, the Committee will also consider community views on:

- Measures to increase water efficiency and reduces consumption and their relative cost effectiveness
- Opportunities for economic growth and diversification within regional communities
- Previous relevant reform and structural adjustment programs and the impact on communities and regions

Comment:

The terms of reference are extremely limited and are inadequate for considering the broader social and economic impacts, of the proposed changes to the social and economic capital, of the Murray Darling Basin.

The terms of reference for the House of Representatives Standing Committee, mean that the broader impacts of this plan will not be included in the inquiry analysis. This is a major flaw in the terms of reference, as the impacts of the Basin Plan are not limited to the ‘direct and indirect impact of the proposed basin plan on regional communities’.

The economic costs in relation to the Water Act 2007 and the Murray Darling Basin Plan, go far beyond the $10 billion identified. Therefore the magnitude of this expenditure should require a more extensive inquiry process, that is not confined to the limitations of the Terms of Reference.

The **Committee is encouraged** to ensure, that **issues outside the limited terms of reference, are included in their report.**

In relation to direct costs of the proposed Murray Darling Basin plan, Government identified expenditure is not the only cost.

It is imperative that Government understand the true costs to Australia, particularly investments by communities, individuals, businesses and local Government, in the unfunded consultation process.

There is a major risk that the identified cost of implementation of environmental policy changes in the Darling Basin, will pail into insignificance, when the total cost to Australia in the long term is finally realised. The long term economic impacts on agricultural production resulting from the basin plan is the critical, but not, the only consideration.

Investments by previous generations and Government to build foundations for economic growth through major investments in water storages will in future, be under utilised as 'productive' water is transferred to 'flows out to sea', over and above existing flows.

In this scenario, the cost of future maintenance and operating arrangements, will mean 'cost recovery' from an increasingly shrinking, water resource base.

Government's currently bare a component of the cost sharing arrangements for the operation and maintenance of the Basin's regulated water systems on behalf of,'other users', such as the tourism industry and general water supplies for human and recreational needs.

Under current Government policies of 'full cost recovery', irrigation entitlement holders bear a large component of operational costs.

As water entitlements are reduced under the Basin Plan, inevitably, the operational costs of the Basin's water supply systems, will be have to be met by a reduced number of entitlement holders.

Government share of future operating costs will also increase as the water entitlements are transferred from existing productive purposes to environmental purposes. Governments have confirmed that that water entitlements purchased for the environment, will retain their current characteristics. As confirmed by Government, the cost of sharing arrangements relating to 'full cost recovery' for operating the water supply system, will mean that the Governments will also face increase costs, as will individual entitlement holders.

Water prices for agricultural water entitlement holders will be further increased, as irrigation infrastructure operators, faced with 'the full cost recovery policy' and resulting increased costs from the Government, pass on those costs. In this case current long term business plans, in relation to the cost of agricultural production, will have to be reviewed. This may have serious implications for local industries, support industries and for the value added food supply production industries.

Future costs of water, borne by fewer entitlements holders, may impose impossible production conditions, that could affect Australia's balance of trade and internal economy.

In addition, the long term ramification of continued cumulative social and economic impacts on regions, from Government reform or political programs is real. There is clearly '**reform fatigue'** in regional Australia. This is having a permanent detrimental impact on current and future economic investments, the social capital and future employment planning.

Reform fatigue is leaving a **lasting legacy of mistrust** of Government programs and policies.

It is clear that a strong disconnect exists between the Federal Government (of any political persuasion) and their agencies, with regional communities in the development of the basin plan. It is a top down approach that inevitably will have greater economic affects than predicted, will fail to attract community support and leave a long term legacy on regional communities.

An **unidentified** cost is the strong resentment building towards Governments and their agencies, **where sensible local knowledge is disregarded**.

This is increased when particular agencies have been shown to push environmental policies that defy logic or common sense. The consequences of such alienation are 'lost opportunity and partnerships' for future environmental programs.

As Government's environmental budgets are decreased over time, there will need to be an increased reliance on 'voluntary participation' in delivering natural resource management outcomes on the ground. Every time major Government programs are changed 'mid stream' or alternatively are developed without the support of local communities, the lessons learnt from rural communities, means that developing future programs will be made, much more difficult.

It should not be underestimated how poor policy has impacted on the attitudes of rural communities. Establishing strong partnerships between Government and the community in which policies are being imposed, is critical for long term planning. **Traditionally, Government and community partnerships, have been a testament to good planning** and have produced appropriately valued, sustained long term outcomes for natural resource management.

A few examples that clearly identify such success include:

- Southern Riverina – Land and Water Management Plan (15 year partnership sustainability program)
- NSW Murray Wetlands working Group – delivery environmental water to private land
- Holdbrook Landcare
- Murray Catchment Management Authority
- Ricegrower's of Australia – Environmental Champions Program

The key to the success of such Natural resource management programs is localised community participation.

In more recent years, a **new Government approach has meant this has operated in reverse**. Current natural resource management reform will result in policies becoming unnecessarily expensive for the Australian taxpayer and mistakes, will be made.

The Murray Darling Basin Authority has not engaged the local communities in the development of the Basin Plan.

The economic and social consequences of this are all too evident to those communities, who will be impacted by the plan.

Most Australians however, **have been largely shielded** from understanding the **true costs** to the nation.

The economic implications of the Basin Plan extend beyond the impacts on food production, regional industries and Australia's balance of trade.

The Queensland flood situation should be a timely reminder, of Australia's natural climatic extremes, of flood and drought.

The recovery phase and business implications for rural and urban economies, of this flood, should identify that, there will be significant impacts on Australia's and the State of Queensland budget plans.

It has been frustrating for many in rural Australia, that **earlier warnings** to the Murray Darling Basin Authority, that '**flood risk'** should be a key component of planning changes under the Basin plan, have been totally **ignored.**

This submission encourages the House of Representative Committee to protect the interests of Australian taxpayers by ensuring that the Murray Darling Basin Authority, develops in full consultation with rural communities, an environmental water delivery plan.

Without this, a key aspect of social and economic impacts, cannot be understood.

Expenditure issues in relation to several major Government stimulus programs, should reinforce the importance of building strong relationships and utilising regional and local community or business expertise. **In regard to the Murray Darling Basin,** major **public policy mistakes** are set to be **repeated.** The consequences though, may be more extreme and over a much longer term.

The House of Representatives Inquiry on the Murray Darling Basin under the terms of reference, cannot provide the necessary analysis of social and economic impacts of the Basin Plan or indicate overall costs associated with **policies on the environment**. However it is worth noting some examples of **expenditure** on '**Saving the Basin' environments**. These include:

$3.1 billion Restoring the Balance in the Murray-Darling Basin entitlement purchasing program

$5.8 billion Sustainable Rural Water Use and Infrastructure Program under Water for the Future Program

$2.0 billion Northern Victorian Irrigation Renewal Project

$700 million Living Murray to purchase 500 GLs water for the six icon sites

$425 million Water for Rivers – to recover 282 GL (212 GL Snowy River and 70 GL for the Murray

$176.7 million NSW Rivers Environment Restoration Project
$26.8 million Macquarie Marshes and Gwydir Wetlands (NSW)

$1 billion – Natural Heritage Trust of Australia

- Bushcare
- Landcare
- Rivercare

$318 million (5 yrs) National Vegetation initiative

$32 million (5 yrs) National Land and Water Resources Audit

$163 million (5 yrs) Murray Darling 2001 Projects

$80 million (4 yrs) to the National Reserve system (Australia's biodiversity)

$57.7 million Perricoota Koondrook Forest – Torrumbarry Cutting

$80 million River Red Gum and Woodland Forest – Riverina (National Park conversion)
(note: $80 million =structural adjustment. Economic loss =$72 million industry per annum)

To these examples it is necessary to add the costs of:

National Water Initiative (NWI):

- Implementation of policies through Federal and State planning (eg water sharing plans)
- The establishment and continued operations of the National Water Commission
- The procedural costs to Governments and regional communities of community consultation

The Water Act 2007

- The establish and operations of the **Murray Darling Basin Authority** (300 staff and board of directors)

- The development of **Water Trade Rules** developed by the ACCC
    - The removal of barriers to trading water rights
    - The terms and process for trading water rights
    - The manner in which trades of water are conducted
    - The provision of information to enable trading to take place
    - (Note: substantive costs imposed on infrastructure operators/trusts to comply with rules) NOTE: a key criticism of the ACCC has been a top down approach to the rule development that has not appropriately factored in regional knowledge on the implications

- **The implementation of the Basin Plan** including**:**
    - New State Environmental Water Plans (post 2014) (this will replace National Water Initiative Plans in NSW just completed from 2004 on)
    - Water quality and salinity management Plans
    - Monitoring and evaluation
    - Audit of the Basin Plan's implementation

- Additional costs to New South Wales over and above National Water Initiative Plans implemented in 2004 and which continue to date:
    - This expenditure may be made obsolete by the proposed Basin Plan
    - The cost of new planning implementation and community consultation costs

As outlined in the main body of this submission (executive summary Pages 5-21), the basis of policy reform should be built on strong foundations.

There are strong and consistent concerns in relation to the supporting reports that underpin the decisions of the Murray Darling Basin Plan. (pages 57-62)

A clear theme in the relevant documents relating to the Guide to the Proposed Basin Plan are, the terms: 'best available science', 'modelled scenarios', in the absence of science – the use of 'expert panels'.

The House of Representatives Standing Committee on Regional Australia should evaluate the long term social and economic consequences of the proposed basin plan to Australia as a whole. The impacts are not confined to regional communities.

As identified in the executive summary of this submission – substantial planning for the environment has already occurred and been implemented.

Planning for consumptive water delivery has **inbuilt environmental benefits** as identified by the National Water Commission in the *Environmental Management Report (2010.* In addition to this, other environmental benefits have been made in form of specific adaptive environmental components in a range of water sharing plans. Further investments for the environment have occurred with direct water entitlements purchases, through a range of programs.

Terms of Reference: (1)
The direct and indirect impact of the Proposed Basin Plan on regional communities, including agricultural industries, local business activity and community wellbeing;

Overview:

The Southern Riverina region consist primarily of mixed farming enterprises that have developed over time due to the climatic conditions, availability of water, soil types and proximity to markets.

The diversity of the region and of farming businesses, has been the basis of its long term resilience.

Significant and substantial investments have occurred in developing agricultural businesses on the basis of a regional farming system that **have proven to work.**

This inquiry **should not accept**, that it is easy or possible for agricultural businesses to **re-invent** their current production systems, to meet new challenges posed by Government policy.

Extract: Southern Riverina Irrigators submission to Productivity Commission (L Burge)

> "Riverina and Murray Regional Organization of Councils (RAMROC) have identified that food production in the Murray, Murrumbidgee, Lachlan Valley and Lower Murray Darling Basin, directly employs around 30,000 people. These levels of employment are estimated to be six times the national average for agriculture. An additional 17,000 people are employed in agricultural productions and service delivery, linked to agriculture.[2]

[2] RAMROC

Recovering water for the environment in the Murray Darling Basin, without appropriate planning, will have profound economic and social impacts on regional communities in the RAMROC region.

A recent RAMROC report identifies that for every 10 percent reduction in water availability, the value of agricultural production declines by $220 million and direct employment declines by 4700.[2]

NSW Irrigators Council refers to NSW Government research (WSPs), that shows for every 270 megalitres of water removed from irrigation production, one direct job loss would result. [3]

RAMROC includes the Southern Irrigation region of NSW, encompassing the Shires of Murray, Conargo, Jerilderie, Berrigan, Moulamein and Wakool. A key supply of water in the region is via a private irrigation company, Murray Irrigation Limited (MIL).

MIL supplies irrigation and stock and domestic water to over 2389 properties and covers an area of 748,000 ha of land extending North of the Murray River, to Mulwala in the East, to Moulamein in the West. Water is delivered by the main Mulwala Canal from an offtake from the Murray river below Yarrawonga. [4]

This region was developed by the NSW Government as Australia's largest irrigation network between 1933 and 1964. The NSW Water Conservation and Irrigation Commission was responsible for the construction and operation of the irrigation district.[4]

The Southern Riverina Region of NSW is influenced by the main body of the Murray River, with water sourced from the Hume and Dartmouth Dam. It is the largest irrigated food production area in Australia with the irrigated development off river. It's location enables maximum water delivery efficiency, due to close proximity to Australia's major storage dams. Private water diversions from floodplain flows or floodplain harvesting, does not occur on Southern River systems and therefore is not applicable to Southern Riverina Water Supply issues.

Agricultural production is diverse and is not confined to the water supply systems provided by Murray Irrigation Limited (MIL). Although MIL is the largest provider of water, private diversion schemes operate and these provide valuable input into the region. Sources of water in private diversions may be through direct pumping rivers or creeks, groundwater or through schemes smaller in size than MIL".

Business Investment/Environmental Sustainability Plans:

Extract: Southern Riverina Irrigators submission to Productivity Commission (L Burge)

"The MIL region is the largest gravity fed irrigation system in Australia. Irrigated agriculture in the Southern Riverina region has a long history dating back to initial developments in 1933. The highly regulated system has enabled strong business

[3] NSWIC
[4] MIL

development, directly on farm and in regional towns. Irrigated agriculture producing food for Australia and overseas, was underpinned by Government policies that saw major investment in securing water for the future. The major dams, including the Snowy Mountains Scheme provide water primarily for irrigation purposes, with smaller amounts delegated to supply industries and towns. The city of Adelaide is also a designated supply.[4]

Underpinning that investment, the Federal, NSW and Local Governments collaborated with industry and communities, to develop major sustainability programs. First initiated by irrigators in the 1980s, the resulting Murray Land & Water Management Plans (LWMP) established in 1995 were a 30 year natural resource strategy, developed in collaboration at all levels. The initial 'Heads of Agreement' was signed in 1995. Federal, State and Local Government funding was designed over 15 year. Landholders funded a major component of the plans through levies on their water and through on farm investments. Direct Government investment to date is approximately $68 million with landholder contributions of approximately $347 million.[4]

On ground investments accounted for 96% of funding and this reflects the LWMP success as one of the best value-for-money programs in Australia in the last 14 years.[4]

Land & Water Management Plans include:

- Whole farm plans
- Wastewater storage
- Vegetation Management
- Education, Administration & Governance
- Stormwater management
- Research & Development
- Sub surface drainage
- Monitoring

Major investments have also occurred in the form of an 'Asset Renewal Program'. MIL supply and drainage assets totaling $804 million have been managed for long term food production in the Southern Riverina. To date the asset renewal program is 97% complete with expenditure in excess of $100M over 15 years.[4]

Asset renewal Program includes:

- Civil asset renewal projects (roads bridges etc)
- Mechanizing regulator gates
- Stormwater construction
- Supervisory control and data acquisition (SCADA)
- Infrastructure maintenance

Outside the MIL irrigation supply area, private diverters have not had access to large scale Government programs such as the Murray Land & Water Management Plans.

In this scenario, sustainability programs have generally been entirely self-funded or associated with Government programs on a much smaller scale.

[4] MIL

Farmers would fund the full cost of re-cycle systems, laser grading, farm planning, drainage and other on farm projects to achieve water efficiency and sustainability.

It is important that there is recognition by this committee and by Governments that it is inappropriate to cherry pick regions that should stay or go.

During the recent severe drought, the key to maintaining rice production at Sunrice, in the towns of Griffith and Leeton **was groundwater outside MIL areas**.

It was unfortunate that during the drought, the Deniliquin Rice Mill was forced to temporarily shut, but the value of rice production outside the larger water delivery systems (such as MIL) were strongly felt by regional businesses. Groundwater helped retain jobs.

Jobs generated by continued production, albeit at a reduced scale, was achieved in the capacity of aerial contractors, cartage contractors, fuel, tyre, fertilizer and a range of other farm product suppliers.

Business Planning & Investment:

The loss of economic and social confidence due to the Basin Plan is difficult to quantity but nevertheless is real and widespread. Anecdotal evidence indicates that not only are significant numbers of farmers leaving the industry, partly due to age and economic circumstances, but a key driver is the lack of confidence for a '**life after drought'**.

A key component of **loss of confidence is – 'Government policy'**.

An example of this is significant investments farmers have made in the Land and Water Management Plans. Part way through the planning and investment stage, Government policy changes, meant that the fifteen year sustainability program, was to close.

Many farmers have invested up to $500,000 to achieve efficiency and sustainability. This has not been re-couped due to the onset of the drought and is now at further risk, through the proposed basin plan.

Rural Australia, has suffered immense financial setback as a result of the drought. Farmers typically though, while finding such extended drought period as experienced 2001-2010 financially difficult, generally could look to a bright future, in a post drought period.

The uncertainty that the Basin Plan proposes, has a genuine impact on the business plans of farmers and support businesses. These businesses, in the process of re-planning their business and financial arrangements, now find plans are made more difficult, as normal post drought recovery investments and plans, are jeopardised.

The financial impacts of such a severe drought cannot be recovered in one year. It will take considerable time to recoup past losses and to rebuild, business equity.

The ability to even plan for this scenario is impossible, as the 'goal posts' of Government policy are set to change business parameters, yet again.

Investments that are made in good faith, can be made obsolete within a business year, election term or other determined period, by Government decisions.

It is important that this inquiry understands the magnitude of change that has been imposed on rural communities. In particular, the cumulative impacts of a range of Government policy changes.

Cumulative impacts are not confined to specific businesses, but extend to the social and economic capital of a town or region. An example of this is the $72 million River Red Gum Industry closure in 2010 which impacted on supporting businesses, outside direct forestry operations. To remove a section of industry from a local town has long term impacts.

For Governments to impose cumulative impacts on a range of industries, reduces overall economic activity to unacceptable thresholds.

This then extends into future employment opportunities for regional areas and impacts on future skills, such as apprentice based training.

Agriculture itself, does not operate on regular or fixed income scenarios. Income is highly irregular with substantial risks from climatic conditions, markets and other agricultural risk factors.

The cost of machinery or investments in water use efficiencies, are expensive. A header used on traditional crops in local district can cost in excess of $600,000 and tractors $200,000 plus. One header tyre can cost $6000. These are several examples of input costs.

The profit margin on cropping enterprises varies in relation to world markets, but the margin of profit is limited in a range of years. In wet years, farmers often capitalise on good seasons and it is these years, that make a substantial difference to long term business equity.

A flood event caused by environmental flows, can take away opportunities for equity improvement, in the vital, limited number of good years, that are experienced in the wide variances, of the Australian climate.

Costs Base of water:

It is anticipated that the cost of water per megalitre in the MIL region could rise to near $50. This may make existing enterprises uneconomic. The uncertainty of world markets, mean that agricultural profits are finely tuned. Add to this the extremes of climate and that fact that, farmers are unable to impose price rises on their commodities to recoup costs, mean that there is little room to move in narrow profit margins.

It is simply not possible to keep absorbing increasing costs while not being able to increase your sale price.

Local economies are built around the agricultural industries. If the farm sector ‘sneezes, local economies, catch a cold’.

Every localised business in small regional centres are indirectly or directly related.

The Basin Plan will impose increased costs over and above normal price rises imposed by Government. This is due to the reduced number of entitlements, with a fixed cost based still being recovered by Governments and/or infrastructure operators.

Succession Planning:

Farm businesses were encouraged by Government to move into succession plans as part of good business practise. Many have done so.

The drought has had major impacts on the development and implementation of succession plans. Despite the best laid plans, the severity of this long term drought has negatively impacted on business plans.

Post drought, there is some ability (not all), to re plan and try to incorporate new strategies as businesses try to re-stablish reasonable levels of equity.

The Basin Plan however, further damages that equity, particularly in the case of the 'unknown' impacts of the basin plan. An example of this is the potential risks to the 'reliability of water entitlements'. **Reliability impacts** are identified as a heading by the MDBA in the Guide, but with no information, it is not even possible to guess.

The guide does state however, that impacts on **reliability** will be felt once the basin plan is in the **State's, implementation phase**. This is very unsatisfactory when trying to understand and determine the impacts of the basin plan.

Reliability impacts, may mean the ability to access water at a particular time, or alternatively, an impact on an entitlements yield value, or both. Planning for a seasonal crop is made impossible when the 'reliability of an entitlement' is jeopardised.

This also makes a **mockery of supposed 'increased certainty** delivered to irrigators as a result of the Basin Plan'.

Mental Health and Well Being

It is impossible for an external person on fixed and reliable income sources, to understand the mental health issues, that have impacted on agriculture and its supporting industries, over recent years.

The drought has proven immensely difficult for individuals and their families. Many have sought professional assistance, but others have not.

Farmers often operate and work in unassisted environments and it is **critical** in this scenario that severe stress or **depression, is not constant companion**.

The anger that has mounted in response to this basin plan should not be under estimated. Such feelings are felt by all family members. The long term ramifications of this on children are yet to be realised, as they grow older. Studies into adolescent depression have shown links to early traumatic events. These events and the attitude of individuals can stay will an individual throughout their lives.

The social and economic costs of mental health are completely forgotten by Governments and bureaucrats, in the pursuit of policy decisions, that can be based on weak foundations.

If individual farmers can rationalise and understand why a Government decision or policy is taken, the stress factor is reduced. An example of this could be a policy that is practical and realistic, in regard to workplace safety.

The opposite can be true when an environmental policy is imposed, where those living in the localised regions, know that the foundations of that policy are weak, or that detrimental affects will result from that policy, on either the environment or individuals.

An example of this is where localised communities have years of experience with flood risks, only to be told by remote politicians or bureaucrats in major urban centres – **'it won't happen'.**

Flood Risks

The MDBA has made minimal effort to recognise the full impacts of social and economic impacts of the proposed basin plan.

The consultants engaged by the authority to determine social and economic impacts, are limited in their scope and are constrained by the timeframes imposed.

Already there has been strong community anger at the suggested 800 job losses. On top of this, the scope of the studies, have been confined to entitlement loss. **This is a major gap in the social and economic analysis of the MDBA.**

A key impact of the basin plan is the **proposed risks to private property and public infrastructure by flooding.**

The Plans proposes to recover a minimum **3000 GL of water for the environment**. Of this **2000 GL** is proposed to **flow out the Murray Mouth to sea**.

The authority has identified it desires to reinstate small to medium size floods, create overbank flows. It then goes on to say that it won't cause adverse flooding to third parties.

Clearly there is an error in their argument.

The Authority have rejected infrastructure options as a key mean for the utilisation of environmental flows and yet has stated a wish to reinstate small to medium floods. How this can be done remains a mystery.

This submission previously has outlined the risks associated with releasing volumes of water as environmental flows. The Murray River physical capacity constraints increase the potential third party flood risks or alternatively, reliability impacts on water entitlements

A further aspect of potential impact, is the raising or lowering of river heights in relation to the proposed delivery of environmental flows. This can prevent agricultural businesses accessing their pump sites at periods, when they wish to water crops. In particular this issue will affects private diverters.

Many style of pumps used in irrigation supplies, by private diverters, require removal prior to high water levels, submerging pumps. This can be an extensive operation and a sustained period of higher than normal flow can involve considerable delay, in water management activities associated with a crop.

Proposed environmental flows may also impact on natural creek systems where unnatural water levels rises may occur, cutting off or dividing properties. Under this scenario, stock management, harvesting of crops, spraying or other management activities are impacted, as landholders are unable to access parts of their properties.

(photo: L Burge 2010, head of wheat sprouting on the stalk after five days of rain)

In 2010 a combination of higher than normal creek flows (not in flood) as a result of a natural higher river and creek events, including environmental flows, have left wheat crops unable to be accessed.

The timing for harvesting cereal crops is critical. The inability to access crops, prior to a summer rain event, can reduce grain quality and in the extreme, make a crop unsaleable or downgraded to the extent, that the future sale value is unknown. This scenario has occurred in 2010, in the Southern Riverina.

The MDBA has not developed or made available to the community, any details, of environmental water delivery plans. As such, there is no scope for the Authority to identify the true social and economic costs of their proposed plan.

In delivering environmental water, what may appear as relatively small heights differences in river or creek flows, can make substantial difference to the flooding impacts. **Often these height differences can be as small as 50 cm w**here flood levels can go from **minor, to moderate, to major.** Anticipated **flood behaviour** from a set volume of water will **vary** on **each release,** depending on the heights of the river, downstream creeks or billabongs. Local knowledge is critical in this situation.

The duration of a flood event is also a key factor in determining impacts. The movement of the Hume Dam wall in 1996, saw a prolonged flood event in hot weather create visible scaring of paddocks, which remained for approximately four years.

While this particular event did trigger compensation payments, in general the impacts of floods in most cases, are not covered by insurance. The damage of floods in rural areas can extend to physical assets such as a house, fencing, sheds or stock. The flood damage however, goes far beyond physical fixed assets.

An analysis of stock and crop production figures in 2002 for one agricultural area south of Tocumwal, which may be subject to increased flood risks from environmental flows, has the following example of crop production figures.

TONNES PRODUCTED	**VALUE**	**PRICE/TONNE**
Wheat	$6,869,118	$250
Canola	$3,098,235	$500
Other cereals	$668,298	$220
Rice	$2,064,878	$220
Other	$74,746	$200
Fodder	$470,820	$200
Total	**$13,246,095**	

In the same district animal production figures include:

ANIMAL PRODUCTION	**NUMBERS**	**PRICE/HD**
Lambs	$766,080	80
Ewes & Wethers	$878,917	60
Wool (kg)	$622,541	7
Cattle Breeders	$2,384,424	600
Cattle trading	$389,025	$500
Total	**$5,040,987**	

(source: Peppin Business and Financial Planners: figures @ 2002)

The areas inundated from floods would be a percentage of these total production figures listed above depending on various flood heights, but the impact are not confined to the actual paddocks subjected to flooding.

Flood events can impact on road access, which has an influence on a range of stock/crop management or marketing situations.

Flood impacts also can cause serious impact, on the physical land assets of a property owner.

In the stretch of the Murray River between Hume and Howlong, high river flows necessary to deliver irrigation and environmental water to NSW, Victoria and South Australia have created bank scouring and erosion, on the river flat sections of individual properties.

Compensation negotiations, between landholders and Governments, have led to a flood easement being agreed to on both the NSW and Victorian side of the Murray River. The agreement specifies compensation arrangements, where prescribed flows occur above 25,000 ML/day.

Natural flood events are outside this arrangement, but flows events that are managed for specific purposes, will have to consider these arrangements.

In the photo below, a natural creek or flood runner, exiting from the Murray River has grown to almost, resemble the size of the Murray River itself, in certain places.

(photo: Howlong – L Burge 2010)

(photos: Howlong 2010 L Burge)

Flow heights can clearly be seen on the edge of the stream bank. Increased scouring caused by enhanced flood events, will create further erosion, causing bank collapse and a further carving up of the natural assets of properties in this locality.

(photo: Howlong L Burge 2010)

Trees alongside such waterways can end up falling, pulling large amounts of the creek bank into the water. This enables further erosion to occur on the disturbed creek bank. Once a number of tree obstacles fall into the water, the free pathway of the water is blocked and inevitably water will be forced to find a new diversion point, further expanding the original size of the creek or flood runner.

Although the landholders between the Hume Dam and Yarrawonga, are now in agreement regarding flow height compensation arrangements, the prospect of increased environmental flows to environmental indicator sites and to the Murray Mouth, will create further unintended scouring events, on private property.

Government Agencies and private landholders have attempted to address the scouring action in this section of the regulated Murray River on normal regulated conditions, by the use of stop logs. However, the effectiveness of these 'stop logs' and the ongoing maintenance remains of concern.

The photos provided identify, the increasing size of this previously small water body that leaves and then returns, to the Murray River. This is not the river itself. The size of this flood runner has increased dramatically through regulated flow changes, in the Murray River.

(photo: Howlong, L Burge 2010)

The Murray Darling Basin Authority's plan to recreate flood events will cause a force of water, in this section of the river, that will cause increased erosion and **scouring in the adjoining streams, banks**. This is a perverse environmental outcome of the basin plan.

Given the absence of an environmental water delivery plan, the Murray Darling Basin Authority has had no formal planning discussions, with any affected landholders, at risk of increased flooding in the Basin.

There is limited capacity of the Murray River to deliver environmental flows in excess of normal river demands without causing adverse flood risk. If environmental flows are to be delivered, within prescribed easement arrangements, then the system capacity may mean there is likely to be an impact on the 'reliability' of other water entitlement holders. **This is a key gap in the MDBA Planning and has not been factored in social/economic impacts.**

Terms of Reference (2)
Options for water-saving measures or water return on a region-by-region basis with consideration given to the analysis of actual usage versus license entitlements over the preceding fifteen years

A major gap is this Inquiry is the **limitations imposed in the terms of reference -** to address 'water-savings measures or water return, on a region-by-region basis'.

This inquiry should enable options for **water savings measures for environmental flows** as a major component of this inquiry.

Environmental flows should be assessed on needs and only after evaluation of the range of environmental benefits included in water planning under the National Water Initiative.

This is has not been done. Nor has an evaluation of the environmental benefits derives with National Water Initiative planning been assessed.

Subsequent to this evaluation, a priority should be, the assessment of environmental water efficiencies determined, as part of an environmental delivery plan. This would allow the complex set of issues to be evaluated and reduce the social and economic risks to the broader local and Australian communities. This also has not been done.

It is clear that substantive savings can be made in the delivery of environmental water. This submission has outlined previously, an example of the Barmah Millewa Consultative Reference Group's recommendations, for watering the forests. (refer pages 49-52)

There are many examples of where the efficient use of environmental water can be achieved.

The Barmah Millewa Water Management Plan (1994), despite strong community endorsement and unified community support, was not implemented, due to a policy decision of Governments, not to invest in the watering infrastructure. (refer Pages 49-52)

Instead policies led to the Government decisions to acquire 'more water' instead. This is despite significant recommendations in the final report that identified that '**more water was not the solution'**

The Barmah Millewa Water Management Plan identified the **equal importance of issues such as, 'over watering, under watering and the ability to water efficiently, with a small proportion of flows .**

Using less water, but delivering the same objective through the use of **engineering solutions, would limit or eliminate adverse third party flood risks.**

This submission encourages this inquiry, to re-visit the Barmah Millewa Water Management Plan produced in 1994 as a key mechanism to prevent flood risks and to minimise the social and economic impacts of the Murray Darling Basin Plan.

An example of environmental watering events that can be achieved with less water is the proposed works at Lindsay Island. Without the use of engineering works, it is estimated that approximately 1,200,000 ML of water would be required.

With engineering works, a significant proportion of the floodplain can be wet without causing upstream flood impacts, through the application of 90,000 ML of environmental water.

The NSW Murray Wetland Working Group has developed a partnership approach to utilising existing irrigation channels to water sites off the main bed of the Murray or Edward River system. This unique approach allows minimum environmental water to be used, with a maximum efficiency to provide significant environmental benefits to a nominated site.

Environmental entitlements can be passed through Murray Irrigation channels and with a small investment in engineering works, reach a desired site, off the channel system. A successful water event can be established using a minimum amount of water.

Significant environmental benefits have been achieved under these arrangements.

In respect to 'consumptive' water delivery efficiencies, the Murray Irrigation Limited area, currently operates at 83% efficiency. It is still possible to make some further efficiency savings, but the guidelines of proposed funding programs to achieve further system efficiencies, make appropriate planning difficult.

An example of this is the lack of support for 'sub system' retirements. This approach is far more sustainable than the 'swiss cheese' buyback policy, that currently occurs.

This is not to say that purchase of water entitlements in an open market situation by Government should not occur. It is important that the 'property rights' of water are recognised and that individuals have a right to sell or trade their entitlements, in line with the National Water Initiative objectives.

However, parallel to trading rights, a substantive program should exist, designed by local communities, that enable more strategic local planning. This ensures that all issues are considered and the best outcome for expenditure, is achieved.

It is fair to say that Government agencies will be extremely concerned about the implementation of policy funding programs, given the recent issues of programs such as the Home Insulation Scheme etc.

The risk is that micro management of new programs from centralised locations (eg Canberra) will make decisions difficult and costly. Already there are proven systems in place, that can effectively administer Government packages. The skills sets and expertise for Government partnership programs, already exist in the regions.

A consideration for planning is the difference in previous funding programs, whereby some irrigation regions or systems, have not had access to prior funding opportunities. In this scenario, efficiency gains made by private diverters (outside MIL) will have been totally self funded.

The MDBA Guide however places difficulties **on all** entitlement holders who have **invested in water efficiencies on farm.** Many businesses have not had time to re-coup their investments. Typical investments range from $100,000 to $500,000. The combination of the drought and now the MDBA cuts proposed, place a number of these businesses at considerable risk.

This inquiry should investigate the reasons **why** a key area of water savings, is **outside the investigation parameters for water savings.**

The Lower Lakes in South Australia are to be the beneficiaries of 2000 out of the 3000 GL minium volumes of water to be recovered for the environment as proposed by the MDBA.

The scale of investment by Governments in this exercise, should make it paramount that prior to re-configuring the social and economic value of Australia's food bowl, a full investigation for water efficiencies and savings are made, in this site.

Evaporation rates of the Lower Lakes are approximately 750,000 to 950,000 ML per annum.

Significant water savings can be achieved through operational and infrastructure changes. This may not mean the complete removal of the barrages, but there are substantial improvements and modifications that can occur in relation to the location and operations, of particular barrages. This is particularly needed in periods of low flows.

Provision of a weir at Wellington could allow flexible lake operations in times of low flows. Alternatively, modification to the barrages to increase the estuarine area would provide substantial benefits to the sedimentation issue, at the Murray Mouth. Reports in relation to this were identified on *pages 66- 67.*

It is vital that expectations for the continuation of current operations and evaporation rates of this magnitude, in low flow years (note: outside drought periods) are modified.

The beneficiaries of such changes could pass to South Australian water entitlement holders but would also ensure, that irrigated agricultural production across the entire basin, is not permanently impacted.

In relation to the Coorong, changes to flow release rules from the Upper South East Drainage Scheme to enable more fresh water flows in to the Southern Lagoon should be an urgent decision. (*pages 64-79)*

This would help to overcome the problem caused by substantial historical changes to the freshwater flows from the main South East of South Australia, where historical drainage

schemes have redirected fresh water flows into the South Ocean. Previously significant volumes of water flowed into the Coorong and through to the Murray Mouth from this region.

In 2000, it is estimated that **450 GL of water was passed through the three main drains in the South East of South Australia, directly out to sea.**

While the **re-establishment** of flows from the main South East of South Australia's drainage scheme, into the Coorong is complex, this should not be an argument for increased Murray River flows into the Coorong. **The Coorong, particularly the Southern Lagoon, historically has not been influenced by Murray River** flows.

Terms of Reference (3)
Role of Government, the agricultural industry and the research sector in developing and delivering the infrastructure and technologies aimed at supporting water efficiency within the Murray Darling Basin

Agricultural districts and the diversity of produce and products in a region, generally have been derived from long standing investments in farming systems and techniques that are suited to the climatic zone, soil types, distance to markets and supporting businesses.

Government 'reforms' processes are often put in place due to political imperatives rather than due to a genuine 'reform need'. Often, Governments feel confident that 'new enterprises' can take up ones that are either wound back or forced to close, as a result of Government policy. This is simply not the case.

There are many examples where Government decisions are accompanied by a view that a 'replacement' industry will or can be established, to provide alternate employment or business opportunity.

Rural and regional communities know that establishing new industries is lengthy, is impacted by issues such as the availability of natural gas, airports, relationship to markets, skilled workforce and other social infrastructure necessary, to attract new families to a region.

The Riverina region is extremely suited to gravity fed irrigation methods. There are no or limited, pumping costs and therefore no impact on Australia's other policy proposals, for greenhouse gas reductions.

Gravity fed irrigation systems, suit the climatic temperature and rainfall conditions.

The Southern Riverina soils vary from loamy soils to soils of high clay content. The low rainfall often means that flood irrigation on a less frequent basis, enables water to penetrate to the root zone.

Alternatively, over head fixed irrigation infrastructure such as a centre pivot can produce some disappointing crop results.

This is because the higher temperature zone, means that the overhead travelling irrigators, cannot ensure that enough water is deposited evenly across the crop. In general overhead travelling irrigation systems are more in tune with more medium rainfall zones.

This is not to say that such systems don't work. They can and do, but crop results will vary depending on location and soil types.

Agricultural regions tend to grow the crop best suited to their region. An example of this is the rice industry where heavy clay soils and clear Riverina days, maximise rice growth.

Decisions to grow rice are based annually, depending on water availability. Rice is not the sole crop grown on any farm. Rice is usually part of a 'rice based farming system' or alternatively, as a one off opportunity crop, if water is available.

A typical rice, gravity fed irrigation farm, would produce other cereal crops in rotation with their rice plantings. This provides maximum efficiency of water and use of paddocks. For example, following a rice harvest event, winter wheat may be directly sown into the stubbles upon completion of harvest.

This means that water used on rice, can benefit the next winter cereal crop. Water use in rice production in the Deniliquin region, typically ranges from 10 to 12 megalitres per hectare. In wetter summers, this might reduce to 8 or 9 megalitres, as is likely to occur in the 2010/2011 summer period.

During the 1990's, there was a new push for water to move to '**high value crops'**. Most people involved in agriculture at the time **expressed severe reservations about this concept**.

Governments and bureaucracies argued that the water use should move to '**high value crops' such as grapes**. This ignored the realities of Australian market conditions and was based on a belief system, rather than agricultural reality.

Water use in the Murray Darling Basin best reflects a mix of enterprises and crop types. Annual crop systems work exceptionally well in the Australian climate, whereby water use is reflective of climatic and rainfall events.

It is worth noting that in the discussion on 'high value crops', rice figures were generally expressed as 'farm gate' value and even in this scenario, were invariably wrong. There was no inclusion of the locally valued added industry that was owned and operated by local producers. The Rice Industry has been one of Australia's most successful agricultural industry, yet it attracted a significant proportion of criticism, often based on misinformation and opinion, that was derived from looking at 'ponded water' in a rice bay.

Rice was automatically assumed to 'water wasting' because you could see the water.

An opposite view of this was Government and public reaction to crop types such as Almonds. A fully established almond enterprise in South Australia for example would typically use 14 to 16 megalitres per hectare but because the water could not be **'seen',** it was assumed to use less than other crops such as rice.

Commodities such as rice have NEVER been 'over supplied' and required dumping.

Rice water use is efficient and the crop can only be grown on suitable soil types (clay content). The megalitres of water used on rice, enables dual use where moisture retained in the paddock post harvest allows the establishment of a new winter cereal crop. Sheep are often also run in the same paddock as the growing rice crop, grazing rice banks, reducing weeds and are part of, opportunistic grazing, on the grass growth on the edges of crops.

This inquiry should recognise that the reason most successful Agricultural Businesses survive the extremes of the Australian climate, is due to a genuine understanding of the farming system suitable to a region. This is often learnt and passed through the generations.

A remote view from Canberra, Melbourne or Sydney, can provide some policy directions, that may not valid for a region.

Conclusion:

This inquiry has been instigated as result of the widespread community and business concerns arising from the MDBA Guide to the Proposed Basin Plan.

A major concern in relation to the plan, is that the MDBA have failed to adequately identify, why current major investments by Government and the community, in the recent National Water Initiative plans, need to be scrapped and a new planning regime imposed.

Many of these plans are still in the implementation phase, have been costly to produce and the Governments and the community have invested heavily in the consultation process, to ensure robust decisions.

With major basin plans in place since 2004 (in NSW) and many others such as Macro plans (unregulated rivers) still being implemented, the drought has not enabled these plans to assessed or monitored for the effectiveness, in delivering the range of environmental benefits, that were set during the planning phase.

The MDBA have now identified that new plans are required to improve the ecological health and ecosystem function of many basin environmental Assets. **Yet these same assets, have already derived new planning benefits achieved from the National Water Initiative Plans.**

In examining issues defined by the terms of reference, this inquiry is to look at issues and opportunities for economic growth and diversification within region communities.

The opportunities for **economic diversification do not exist as claimed by Governments**. Regional communities have been built around agriculture. While other industries such as tourism have a place, they cannot replace the economic values derived from the Agricultural industry.

When the Pilliga Forest in North Western NSW was converted to National Parks status in 2004, under State and Federal Regional Forest Agreements, many areas were affected. In particular, the towns of Gwabegar and Baradine.

The historical basis for the **Crown forest industry** closure, was linked to international agreements on the environment in 1992. The final decision on the extent of the timber industry impact for the Pilliga, was made for political outcomes in relation to the

environment. The Pilliga Cypress Pine Forest, was previously an open woodland. The thick stands of timber today does not reflect the historical records of the forest.

The promises of 50,000 tourists to replace forestry, never eventuated and vibrant industries and supporting businesses, were forced to close. Only two forest mills remain. The limited time frame remaining before the expiry of their current wood agreement poses further risk. It may be likely that the wood agreements will not be renewed in a manner to sustain continued operations, as the areas available for harvesting, are considered too small, or the quality of remaining timber stands are unviable, for the grades of timber required.

Industry adjustment packages failed. Structural adjustments funding did not meet expectations and was subject to significant time delays. Government policies did not result in new industries. For many people who remained in the small towns, social welfare payments were required.

Another example of structural adjustment programs that have resulted from Government policy on natural resource management, include the NSW Native Vegetation Laws.

Political promises at the time of the revisions of the Native Vegetation laws, the NSW Government set up a Structural Adjustment Fund.

The Structural Adjustment Fund consisted of:
$12 million – Farmer Exit Assistance
$12 million – Sustainable Farming Grants
$10 million - Offset Pool

This fund was set up specifically to address the impacts of Native Vegetation Laws.

As part of the Native Vegetation laws, private native forestry came under the banner of 'broadscale clearing'. **The definition of 'broadscale clearing' is one tree, that had grown prior to 1990.**

Private Native forestry which forms part of an agricultural enterprise in some regions, is largely operated on the basis of single tree selection. Trees harvested would then be replaced by another tree naturally growing. Despite the single tree selection, **private native forestry** is still **determined as broad scale clearing** in NSW.

Impacts of new laws on private native forestry operators, meant that applicants impacted by the decisions were required to access the same structural adjustment package of the original native vegetation fund.

> ***Extract: Senate Enquiry Native Vegetation Laws, Greenhouse Gas Abatement and Climate Change Measures (L Burge) (March 2010)***
>
> "At time of the introduction of the Private Native Forestry Codes, the NSW Government re announced the same funding package and advised that the structural adjustment assistance package would also be used to address impacts from the Private Native Forestry Codes.
>
> In other words, despite the inadequacy of the original structural adjustment funding in addressing the needs of private landholders subject to Native Vegetation Laws, the limited funding was then to cover Private Native Forestry as well.

This was regarded by farmers as ‘double dipping’ and a reflection that the NSW Government did not adequately regard the true financial implications of various State Based laws.

A further concern was that there was limited time opportunity for landholders to apply for funding. Added to this was the publicly recognised state position, that components of the original Native Vegetation Structural Adjustment fund were already over subscribed.

For Private Native Forestry (PNF) , the code was introduced on 1st August 2007 and progressively sections of the code for different forest species were rolled out.

Private Forestry is conducted on a rotational basis and these rotations may be in excess of 20 years. There are many landholders who have not got a PVP as they are in between harvest cycles, yet the structural adjustment money stipulated that landholders could only apply for assistance within defined timeframes. This could mean that a landholder may not be eligible or be aware of the application process for structural adjustment as the code may not have been practically tested in the field by which to determine ultimate impacts.”

The development of new groundwater sharing plans in the Southern Riverina 016 water management area was accompanied by a structural adjustment package of $100 million dollars which was designed to assist with impacts right across NSW

Ground Water entitlement holders faced significant cuts impacting on their business plans and equity. Many businesses had invested in their ground water bores, invested in irrigation layouts and the associated machinery that accompanied the growing of crops.

The structural adjustment package offered to the Southern Riverina 016 area was totally inadequate. Of the $100 million provided to NSW, $60 million of it went to the Namoi region in northern NSW.

A subsequent announcement saw an additional $10 million added to the $100 million, which was specifically to implement ‘community projects’. Again, 60% of this additional funding went to the Namoi.

There is strong localised anger at how this structural adjustment package was allocated, where regions outside the Namoi, were forced to develop models for adjustment, that were underpinned by inadquate amounts of structural adjustment funding.

In irrigation regions of Deniliquin, Barmah, Mathoura, the closure of the $72 million River Red Gum Industry is a significant economic loss. Add to this the economic fallout from the proposed Basin Plan and the impacts are clearly widespread.

The answer to natural resource management planning is NOT structural adjustment packages. The key issues of such planning, is to get sound science underpinning decisions and to remove the political or advocacy policy decisions that create the social and economic hardship in the first place.

The proposed Murray Darling Basin Plan, will impose further large scale social and economic impacts on rural and regional communities.

The Murray Darling Basin Authority’s studies of the social and economic impacts are confined to ‘entitlement cuts’. The short term timeframe of the economic studies, cannot be considered appropriate, to ensure that full appreciation of the risks are understood.

The impacts of this will go to all accompanying rural business and the social services provided, either those, funded privately or through Government.

The number of health professionals required in a region, the number of educational staff and/or educational services provided are also impacted. With shrinking economic activity, future Skills Training services (eg apprentices) and related employment opportunities, will have long term impacts.

As the population declines as the economic activity of a town shrinks, an increasingly aging population that remains, will be unable to perform the range of social tasks now covered by voluntary services. Governments often ignore the value of such services and these services if not provided on a voluntary basis, would have substantial budget implications.

This submission has not commented specifically in detail on all aspects of the terms of reference.

It is more appropriate for this inquiry to determine whether the foundation basis, for the magnitude of change proposed by the Basin plan, is warranted.

The political speed of the development of the Guide to the Murray Darling Basin Plan is comprehensively inappropriate, in every sense.

List of Abbreviations or Explanations

River Regulation – Storage Dams, Locks, Weirs, Lower Lakes Barrages

MDBC	Murray Darling Basin Commission
MDBA	Murray Darling Basin Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEH	Department of Environment, Water, Heritage and the Arts (Australian Government)
GL	Gigalitre (1 thousand megalitres)
ML	Megalitre (1 million litres)
Ha	Hectares
EC	(Salinity) Electrical Conductivity (EC) South Australia Saltwatch – to convert EC to p.p.m x by 0.56
P.P.M.	(salinity) Parts per million – Total dissolved Solids (TDS) South Australia Saltwatch – to convert p.p.m to EC * by 0.56
AHD	Australian Height Datum
M	Metres
CLLMM	Coorong, Lower Lakes, Murray Mouth
RAMSAR	International Convention for Wetlands of Significance (1971)???
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
KM	Kilometres
NRM	Natural Resource Management
COAG	Council of Australian Governments
IGA	Intergovernmental Agreement
NWI	National Water Initiative
SA	South Australia
NSW	New South Wales
VIC	Victoria

REFERENCES:

Doody, J.S. (2002) '*Sustainable Management of On-Farm Biodiversity in the Rice Growing Industry: Vertebrate Wildlife Resources'* Applied Ecology Research Group, University of Canberra

Pyke, G (2002) '*Rice Growing and Frog Conservation in NSW* – Frog Ecology and Behaviour Group, Australian Museum

South Eastern Water Conservation and Drainage Board

Murray Darling Basin Commission – Ministerial Council report: (SRA) *A report on the ecological health of rivers in the Murray-Darling Basin*, 2004–2007
Prepared by the Independent Sustainable Rivers Audit Group for the Murray–Darling Basin Ministerial Council: Peter Davies, John Harris, Terry Hillman and Keith Walker (June 2008)

Murray Darling Basin Commission – website – Cap on Diversions

Harvey N. *The Significance of Coastal Processes for Management of the River Murray Estuary* – Australian Geographical studies – April 1996.34(1):45-57

Sea Water Exclusion from Australia's Murray River: 117 de l'Association Internationale des Sciences Hydrologiques Symposium de Tokyo (December 1975) -Radox; Rainer, Professor, Horace Lamb Institute of Oceanography, Adelaide, Australia & Stefanson; Robert C, Senior Environmental Officer, South Australia Department of Environment and Conservation, Adelaide, Australia

ABC Science: www.abc.net.au/science/articles/2005/12/-6/1524177.htm

National Action Plan for Salinity & Water Quality (www.napswq.gov.au)

Pannell D. J.: *Politics and dryland salinity: history, tensions and prospects* – CRC for Plant Based Management of Dryland Salinity and School of Agricultural and Resource Economics, University of Western Australia, c/-WA Department of Agriculture, Albany WA

Murray Darling Basin Commission 2003: *Modelling the effectiveness of recharge reduction for salinity management:* Sensitivity to catchment characteristics; Smitt C; Gilfedder M; Dawes W; Petheram C; Walker G.

Gell P; Haynes D; November 2005 – *A Palaeoecological Assessment of Water Quality Change in the Coorong,* South Australia – a report for the Department of Water, Land and Biodiversity Conservation, S.A.

Bodinnar Russell (Rusty) – *Balranald Heritage Pictorial*

Walker D.J; *The Behaviour and Future of the River Murray Mouth*, Centre for Applied Modelling in Water Engineering, Department of Civil and Environmental Engineering, Adelaide University, February 2002 (Revised)

D. J. Walker, Centre for Applied Modelling in Water Engineering, Department of Civil & Environmental Engineering, Adelaide University (Feb 2002), models predicted flows influencing the Murray Mouth

Bourman B; Harvey N; *The Murray Mouth Flood Tidal Delta*; Vol. 15/1983

Fagherazzi Sergio; Department of Earth Sciences and Centre for Computational Science, Boston University, Boston, MA 02122 (December 2, 2008) vol 105/48; *Self-organisation of tidal deltas*

James, Kristine; *The bio-geomorphological evolution of a former flood tidal delta (Bird Island) in the Murray Mouth estuary of South Australia, School of Natural and Built Environments*, University of South Australia 2004

Harvey N; *Coastal Management Issues for the Mouth of the River Murray, South Australia*

Barnett Elizabeth; Distinguishing Natural and Anthropogenic Influences: *A case study of Lake Alexandrina* – South Australian Geographical Journal Vol 94 (1995)

Department of Water, Land & Biodiversity Conservation, Resource Allocation Division, August 2006, report DWLBC 2006/25; *Land-use impact on water quality and quantity in the Lower south East, South Australia*; Saad Mustafa, Jeff Lawson, Fred Leaney, Kwadwo Osei-Bonsu;

Bourman R & Barnett E; *Impacts of River Regulation on the Terminal Lakes and Mouth of the River Murray, South Australia*; Australian Geographical Studies. April 1995-33(1);101-115

Bourman R P; Murray-Wallace C. V; Belperio A. P; Harvey N; *Rapid coastal geomorphic change in the River Murray Estuary of Australia*

Murray Darling Basin Commission: *The Living Murray – Foundation Report on the significant ecological assets targeted in the First Step Decision*

Webster I T; *An Overview of the Hydrodynamics of the Coorong and Murray Mouth*

Murray Darling Basin Commission; *Modelling the effectiveness of recharge reduction for salinity management: Sensitivity to catchment characteristics*; Smitt C; Gilfedder M; Dawes W; Petheram C; Walker G (2003) MDBC & CSIRO

Murray Darling Basin Commission; River Murray Barrages Environmental Flows – An evaluation of environmental flow needs in the Lower Lakes and Coorong – *A report for the Murray Darling Basin Commission* (June 2000) – Department of Environment, Heritage and Aboriginal Affairs – Government of South Australia

Marohasy J; Myth and the Murray – *Measuring the real State of the River Environment*; December 2003, Vol. 15/5, IPA background

Australian Federal Government, The Murray Darling Basin – Water for the Future (www.environment.gov.au/water/publications/action/case-studies/murray.html 3/12/2010

National Water Commission – (website)

Murray Darling Basin Commission – the River Murray System (www2.mdbc.gov.au/rmw/river_murray_system.html

Murray Darling Basin Commission: *Options for Water Savings from the Lower Lakes for improved flows in the Coorong and through the Murray Mouth* – A report prepared by the Environmental Flows and Water Quality Objectives for the River Murray Project Board, (November 2001) – MDBC Technical Report 2001/11 (FinalLowerLakes-28-11-01.doc 10.7.02 11:51)

NSW Office of Water – *Water Sharing and Account Management in the NSW Murray Valley*

Government of South Australia – *Securing the future – A long term plan for the Coorong, Lower Lakes and Murray Mouth* – June 2010

National Research Flagships – *Water for a Healthy Country – An Ecosystem Assessment Framework to Guide Management of the Coorong* – Final Report for the CLLMM ecology Research Cluster, July 2009, The University of Adelaide, SA Research & Development Institute, Government of South Australia, Flinders University, CSIRO

Discover Murray River website; www.murrayriver.com.au, Murray River Tourism Pty Ltd

CSIRO Land & Water; *Snapshot of the Murray-Darling Basin River Condition*; Norris RH; Liston P; Davies N; Coysh J; Dyer F; Linke S; Prosser I; Young B

CSIRO National Research Flagships: *Water for a Healthy Country – An overview of hydrodynamics of the Coorong and Murray Mouth, Water levels and Salinity – key ecological drivers;* Webster Ian T.

Riverina and Murray Regional Organisations of Council (RAMROC)

NSW Office of Water – *Water Sharing and Account Management in the Murrumbidgee Valley* (November 15 , 2010)

NSW Irrigators Council – Briefing Report – Water Act 2007

NSW Department of Water & Energy – Progress Report on NWI Water Sharing Plans

Murray Darling Basin Commission in 2003 – *Modelling the Effectiveness of Recharge Reduction for Salinity Management - Sensitivity to Catchment Characteristics,*

Murray Darling Basin Commission - *MDBC water audit monitoring repot 2006/07 June 2008*

Melbourne MDBA Consultation meeting, October 28th 2010

Cooperative Research Centre for Catchment Hydrology; *The Development of Water Reform in Australia* – Technical Report 02/5 (May 2002) John Tisdell/John Ward/Tony Gudzinski

The Murray Darling Freshwater Research Centre – *Understanding Blackwater events and Managed Flows in the Edward – Wakool River system.* M/BUS/319, Version 1, Oct 09

The Wentworth Group of Concerned Scientists; *Blueprint for a National Water Plan* (31st July 2003). The Wentworth Group is convened by WWF Australia – Saving Life on Earth

Wentworth Group of Concerned Scientists in Association with, Prof R. Quentin Grafton, Ian Kowalick, Prof Chris Miller, Tim Stubbs, A/Prof Fiona Verity, A/Prof Keith Walker; *Sustainable Diversions in the Murray-Darling Basin*

The Australian Newspaper; weekend edition 18-19th December 2010 – *Flood risk to rise under Basin Plan*

The Australian Newspaper; weekend edition 13-14 November 2010 – *the Drought Breaks; Inquirer Special*

Living Murray – *Foundation Report on the significant ecological assets targeted in the First Step Decision*

Ecology Management Pty Ltd: *The Science behind the Living Murray Initiative* (2003); Dr Lee Benson, Dr Andrew Markham, Dr Ross Smith

Australian Geographic; *The Murray River* – Burton A

House of Representatives Standing Committee on Agriculture, Fisheries and Forestry – *Inquiry into future water supplies for Australia's rural industries and communities* – Interim Report (March 2004)

Australian Farm Institute (AFI) (Vol 7 No. 3 July 2010)

National Land and Water Resources Audit – *Extent and Impact of Dryland Salinity in South Australia*

Mathoura Visitor and Business Centre: *Mathoura Historical Information Sheet*

National Land and Water Resources Audit: *Extent and impact of dryland salinity in South Australia*: compiled by S.R. Barnett

Government of South Australia, Department of Water, Land and Biodiversity Conservation; *River Murray Water Resources Report* (Issue 45: 4 September 2009)

Government of South Australia, Department of Water, Land and Biodiversity Conservation – SA Mapland – Photos of the Murray Mouth (permission to publish)

NSW Government: State Forest of NSW *Koondrook-Perricoota Forest Flood Enhancement works – Preliminary Environmental Assessment* (Part 3A Application) April 2009

NSW Government: Department of Natural Resources (May 2006)

Natural Resource Commission: *Riverina bioregion regional forest assessement: River Red Gums and Woodland Forests* (December 09)

Science AAAS – *Trading Water for Carbon with Biological Carbon Sequestration*; Jackson R B et al; science 310, 1944 (2005); DOI: 10.1126/science.1119282

Australian Government; the Wetlands Policy of the Commonwealth Government of Australia

MDBC www.2.mdbc.gov.au/salinity/sal....)

Condon D; Out of the West – *A historical perspective of the Western Division of New South Wales (2002)*

Forest Fire Victoria; The Facts Behind the Fire – *A scientific and technical review of the circumstances surrounding the 2003 Victorian Bushfire crisis*; compiled by Barrie Dexter and Athol Hodgson

Ecology Management Pty Ltd; *The Science behind the Living Murray Initiative* (October 2003)

Murray Darling Basin Commission – *Water Audit Monitoring Report (*2006/07) published June 2008,

Australian Government – Dept Sustainability, Environment, Water, Population and Communities (website)

Australian Government – Ramsar Convention (website)

NSW Government (www.environent.nsw.gov.au nsw water quality & river flow objective).

National Water Commission – *Environmental Water Management Report* (2010)

NSW Department of Environment, Climate Change & Water (DECCW) – (website) Environmental water management planning 31.8.10)

Barmah Millewa Community Reference Group (CRG); Barmah Millewa Forest Final Report, *Water Management Plan* (11th February 1994) Version 4.2

Murray Darling Basin Commission; Ministerial Council, *Sustainable Rivers Audit* (2008)

Murray Darling Basin Commission*: River Murray Barrages, Environmental Flows 'An evaluation of environmental flow needs in the Lower Lakes and Coorong'* – a report for the Murray Darling Basin Commision – June 200

Government of South Australia; Dept Environment and Heritage – *Coorong, and Lake Alexendrina and Albert Ramsar Management Plan (September 2000)*

NSW Livestock Health and Pest Authority – Drought maps, January 2010

South Australia Waterwatch – Saltwatch (parts per million conversion to Electrical conductivity)

Wakool Shire – Socio-economic Impacts: *Closure of Wakool Irrigation District (or parts thereof*) (May 2009) (RMCG Consultants)

Southern Riverina Irrigators; Productivity Commission submission - Issues Paper – *Market Mechanisms for Recovering water in the Murray Darling Basin* (Burge L)

Southern Riverina Irrigators; submission to *Murray Darling Basin Authority – Sustainable Diversions Limits* (Burge L)

Stubbs J; *Social and Economic Impacts of Reduced Irrigation Water* (July 2010)

Burge L; Federal Government Senate Finance and Public Administration Committee submission – *Senate Enquiry Native Vegetation Laws, Greenhouse Gas Abatement and Climate Change Measures (*March 2010)

SOUTHERN RIVERINA IRRIGATORS

Peak body for five landholder associations and 1600 irrigators in the NSW Murray Valley

PO Box 1254
Deniliquin NSW 2710
sri.deni@bigpond.com

15th January 2013

Dr Chris Currans
Principal Research Officer
Senate Rural and Regional Affairs and Transport Committee
Department of the Senate
SG.62 Parliament House Canberra, ACT 2600, PO Box 6100
T: 02 6277 3511 **I F:** 02 6277 5811 **I E:** lauren.carnevale@aph.gov.au

RE: INQUIRY INTO MURRAY DARLING BASIN

Dear Dr Currans

Southern Riverina Irrigators appreciates the opportunity to further correspond with the Senate Rural and Regional Affairs and Transport Committee inquiry into the Murray Darling Basin.

The following attachment is included as 'questions on notice'. During our participation in the inquiry via telephone hook-up, discussions involved the opportunity for the committee to see a presentation that Mrs Louise Burge has compiled on the Murray Darling Basin.

The Chairman of the Murray Group of Concerned Communities Mr Bruce Simpson, suggested that the committee may be interested in receiving a formal presentation of the power point presentation. This was declined as it was advised that the committee would be unlikely to meet again before its report was due.

It was then recommended that additional documentation be submitted to cover key points raised in the power point presentation. However, due to the difficulties in recreating a power point which allowed verbal discussions and also the scale of the photos included, we have prepared an additional paper that we trust may provide some useful information. It was not practical due to the size of the file and the lack of narration to send it in its original form.

Please note for full referencing of material contained and more detailed information, please also refer to the additional attachment – *Water Planning and the Environment January 2011,* lodged previously with the Murray Darling Basin Authority.

I hope that the following attachment can adequately convey aspects of concerns surrounding the Murray Darling Basin Plan.

Yours faithfully

Denis Tinkler
Chairman (2013)

ATTACHMENT A - <u>ADDITIONAL INFORMATION</u>

SENATE INQUIRY – RURAL AND REGIONAL AFFAIRS AND TRANSPORT

(NOTE: FOR FULL REFERENCING AND DETAILS REFER TO '*WATER PLANNING AND THE ENVIRONMENT' JANUARY 2011* – SOUTHERN RIVERINA IRRIGATORS SUBMISSION – MURRAY DARLING BASIN AUTHORITY

MURRAY DARLING BASIN PLAN Issues:

- The Murray Darling Basin Authority (MDBA) has established water recovery target for the Murray Darling Basin. The development of the Basin Plan has not effectively engaged State Governments or regional communities

Water recovered to 2009 prior to Basin Plan	Water recovered to 2019 – Basin Plan	Water recovered post 2019	Total water converted for environment use
823 GL	2750GL	450GL	4023GL (capacity Hume Dam = 3038GL)

- The Murray Darling Basin Plan only applies to regions in the Basin above Lock 1 in South Australia.
- Despite the Basin Plan applying to regions above Lock 1, environmental flow conditions apply below Lock 1 - the Coorong, Lower Lakes and Murray Mouth
- In developing the Basin Plan, the MDBA has significant data gaps which prevent the development of a comprehensive basin plan
- The majority of the water recovery for environmental flows will occur in the Southern Basin food producing regions
- The MDBA flow targets for environmental indicator sites are unrealistic and will have significant third party impacts.
- The MDBA have not developed an environmental water delivery plan to determine what quantities of water can be physically and safely delivered in the Murray, Murrumbidgee or Goulburn river systems.
- The MDBA is to develop a system constraints strategy in conjunction with the States over the next 12 months (note: water recovery targets occurring prior to system analysis for safe delivery of proposed flows)
- The MDBA have not developed watering plans for individual wetland indicators sites.
- The MDBA and the South Australian Government policy positions primarily have focussed on increased Murray River flows to address long term environmental problems at the Coorong Lower Lakes and Murray Mouth.
- The MDBA have ignored relevant reports and data necessary to address long term environmental problems in the highly modified environments of the Coorong, Lower Lakes and Murray Mouth
- The MDBA have not factored adverse social, economic and environmental impacts upstream and including regions of the Barmah Choke that could arise from levels of environmental flows proposed

GENERAL COMMENTS

The Murray Darling Basin Authority (MDBA) note in the Murray Darling Basin Plan, 58% of flows remain in the environment. As a long term average, 42% is extracted for human, industrial or environmental purposes.

In determining further needs of the environment it is important to adequately assess recent achievements in terms of enhancing protections for the environment in Basin water plans. In particular, in the Southern Basin through the Living Murray (2002), the National Water Initiative (2004) and other regional water recovery projects. The Living Murray infrastructure works have not been completed and new environmental provisions under the National Water Initiative Water Sharing Plans, have not been tested for any failings.

The development of the Murray Darling Basin Plan is consistent with long term planning in South Australia to increase 'end of system' flows. In many years merged Darling and Murray River flows to South Australia are in excess of 4500 GL. However in drier periods or drought events when flows to are reduced to South Australia's minimum entitlement flow of 1850GL under the River Murray Agreement, the current archaic infrastructure and operating protocols to maintain Lower Lake levels at 0.75AHD, have adverse impacts on the remaining Murray estuary and lead to increased sedimentation of the Murray Mouth.

The MDBA has adopted the South Australian strategy to utilise increase flows down the Murray River as the primary solution to address long term operating issues and environmental problems of the Coorong, Lower Lakes and Murray Mouth (CLLMM). In developing the Basin Plan, the Murray Darling Basin Authority (MDBA) have ignored the complexities and contributing factors to the decline in environmental health of the CLLMM region.

The Guide to the Proposed Basin Plan (October 2010) had specific end of system flow targets, of the 3000 GL to be recovered for the environment, 2000GL was to flow out the Murray Mouth. After considerable community concern, subsequent versions of the basin plan released by the MDBA have been less explicit in identifying end of system flow objectives, preferring instead descriptions for flows to on route 'environmental indicators' sites. It is argued that flows to indicator sites on the Murray River will be sufficient to address additional flows to the Murray Mouth.

However, the final version of the Murray Darling Basin Plan has again reverted to explicit flow targets for the CLLMM in addition to flow objectives for on route environmental indicator sites. As the MDBA now recognise original flow targets to indicator sites are not achievable without third party impacts and/or creation of flood events, it is essential that public investment warrants greater opportunities to look at a range of solutions for the CLLMM Ramsar site.

Australia is spending over $12 billion dollars on the Murray Darling Basin, it is important therefore that public expenditure maximises sustainable environmental outcomes. Current planning does not address this.

Equally it is important to acknowledge that information used by the Murray Darling Basin Authority (MDBA) to conclude on the additional provisions for environmental flows, may have significant data gaps.

WATER ACT 2007

In 2006 a political response to drought, particularly in the lower sections of the Murray River, resulted in the development the Water Act 2007. In conjunction with conflict and publicised issues between floodplain graziers and irrigation interests associated with the Darling River in the Northern Basin, the Act gave rise to implement South Australia's long term planning to increase flows to Coorong Lower Lakes and Murray Mouth (CLLMM) site.

At the time, concerns about State versus Federal rights on water meant the Federal Government was unable to secure Federal powers over water from the States. A solution was the utilisation of the External Affairs powers provisions in the Australia's Constitution. To trigger use of External Affairs power, the Water Act 2007 priorities international environmental agreements. The Act therefore is contrary to Australia's adoption of international principles for sustainable development, which recognise the balance between social, economic and environmental issues.

The Water Act 2007 is the overarching legislation for the subsequent development of the Murray Darling Basin Plan. The wording of the Act gives priority for environmental protection for voluntary international environmental agreements such as the Ramsar Convention. Voluntary international agreements now attract higher values than the economic and social values of Australia in the development of the Murray Darling Basin Plan.

WATER PLANNING

The Murray Darling Basin comprises the Northern Basin system including the Darling River and its tributaries, while in the Southern Basin, key rivers include the Murray, Murrumbidgee and the Goulburn Rivers. NSW and Victoria have the largest land mass in the Basin, with South Australia making up 6.7% of the Murray Darling Basin.

Water management in the Northern basin is distinctly different from the Southern Basin. The Darling River system water sharing plans in general operate on flow based rules for extractions. Metering in the Northern basin is not extensive.

The Southern section of the Murray Darling Basin has been subject to more stringent policies for water management and environmental protection over a large number of years . The Southern basin is highly regulated, extractions are metered and the allocation of water for extraction purposes is strictly controlled by a complex set of rules associated with available water in the major Southern storages.

Water is only allocated to an irrigation entitlement annually based on conditions determined by rules and water sharing arrangements. As such, allocations against entitlements can vary dramatically from zero % to 100% depending on water availability.

The term 'over allocation' is not appropriate in the Southern basin, as 'allocations' vary each month and per water season depending on dam inflows.

In most years of general rainfall in the Basin, flows to South Australia from both the Murray and Darling River systems average 4000GL. However in dryer periods when flows down the Darling are lower and inflows to the major storage dams at the headwaters of the Murrumbidgee and Murray Rivers are reduced, South Australia becomes entirely reliant on the River Murray Agreement and its minimum entitlement flows of 1850GL.

The 1915 River Murray Waters Agreement was signed by the States and ratified by the Commonwealth in 1917. This agreement was overseen by the River Murray Commission and was amended in 1987, with a new Murray Darling Basin Agreement signed in 1992.

The River Murray Agreement provided:

- Flow at Albury shared equally between New South Wales and Victoria
- Victoria and New South Wales retain control of their tributaries below Albury
- Victoria and New South Wales supply South Australia with a guaranteed minimum quantity of water or 'entitlement'.

Original State sharing arrangements were further amended with the completion of Dartmouth Dam in 1979, when during negotiations, South Australia's entitlement under the River Murray Agreement was raised from 1500GL to 1850GL. These negotiations involved a proposed dam on the Chowilla Floodplain (SA) or the current site of Dartmouth Dam (Vic). Chowilla was not considered suitable due to salinity issues and high evaporation rates.

The River Murray Waters Agreement which governs Murray River flows, has been subject to a range of policies and amendments since the original agreement in 1915. The most recent being:

- 1997 Murray CAP on extractions (implemented in the Southern Basin in 1997)
- 2002 Living Murray project
- 2004 National Water Initiative (NSW Water Sharing Plans)

In 2002 the Murray Darling Basin Ministerial Council commissioned The Living Murray Project. The Scientific Reference Panel (SRP) concluded that:

> "1500GL combined with structural, operational and water quality management could deliver a healthy working river".
>
> "Following this assessment, Governments agreed to recover the 500GL LTCE as a 'first step', towards securing the long term ecological health of six icon sites and, that they should concurrently invest in infrastructure to make the best of the water available for the environment and achieve other ecological outcomes"

The Living Murray infrastructure projects are incomplete and therefore there has been no analysis of the effectiveness of the Living Murray Project, benefits of water acquisition or its application to improve environmental outcomes.

The National Water Initiative (2004) and the resulting NSW Water Sharing Plans, set further significant new provisions for environmental protection. Environmental objectives are based on river flow objectives which set out 12 aspects of flow to be considered for the protection or restoration of river health, ecology and biodiversity.

MURRAY DARLING BASIN PLAN

The Water Act 2007 amends the State and Federal cooperative model of water management under the Murray Darling Basin Commission and established the Murray Darling Basin Authority (MDBA) a Federal Authority, run by a Federally appointed board.

The development of the Water Act in 2007 at the height of the Millennium Drought, establishment of a new MDBA, the appointment of the MDBA Board that had limited operational experience in managing Basin Resources and the required timing for development of a new Basin Plan, has not been conducive to the development of a robust Murray Darling Basin Plan.

The Water Act 2007 and the Basin Plan, only applies above Lock 1 in South Australia. In the Guide to the Proposed Basin Plan , the authority specifically noted that the benefits of the basin plan would be felt below Lock 1. This has created strong community concerns over the practicality and equity in relation to policies under the Basin Plan.

The MDBA has set priorities for the Lower reaches of the Murray , in particular end of system flow targets and environmental outcomes for the Lower Lakes, Coorong and Murray Mouth (CLLMM). The Water Act 2007 specifically notes the protection of wetland sites recognised under the Ramsar Convention, however the development of the Basin Plan appears to place particular emphasis on the CLLMM site.

The Basin Plan will have the largest impact in the Southern Basin. This is because water recovery to benefit end of system flows in South Australia will be largely sourced from the Southern Basin, in particular Southern NSW and Northern Victoria, as Australia's largest water storage dams are located in the Southern Basin.

The Millennium drought has also fostered significant blame on 'over allocation' and raised expectations that the Southern Basin storages can maintain enough water to meet normal seasonal usage plus store enough water to cover a ten year drought event. This is both unrealistic and ignores the capacities of the Hume and Dartmouth Dams and the purposes of dam construction by previous Governments and generations. There appears little understanding of the highly regulated southern basin extraction rules which allocate water based on inflows, storage capacity and sharing rules. Under these rules, monthly seasonal allocation decisions against individual water entitlements are strictly controlled, to ensure the system is not 'over allocated'.

In assessing new additional needs for the environment, it is also important to recognise that environmental benefits are not limited to a defined 'environmental entitlement'. The environment continues to receive benefits from the provision of regulated or consumptive water supplies and other prescribed water entitlements. So in terms of actual water extracted (42%), this volume also provides environmental benefits. Therefore it is important to clearly define what actual environmental benefits are to be delivered over and above those outlined in the new NWI water plans in the Basin, prior environmental water recovery strategies and environmental benefits delivered for consumptive purposes.

The National Water Commission (NWC) in its Australian Environmental Water Management Report (2010) states:

> "water can be used for multiple benefits temporally and spatially, and is normally 'used' more than once".

The report further notes:

> "Jurisdictions commonly make their **environmental water commitments through the establishment of annual allocation** limits **and access rules**, in both surface water and groundwater systems. **These are significant forms of environmental water commitment**, constraining the use of the resource, so as to '**leave behind' enough water to meet the environmental water objectives adopted in water plans."**

The Murray Darling Basin Authority (MDBA) in the development of the Murray Darling Basin Plan relied upon existing scientific literature or incomplete data, to determine the health of the basin and to formulate the basin plan.

Some reports such as the Sustainable Rivers Audit were not specifically developed for the purposes of formulating a basin plan.

The Murray Darling Basin Ministerial Council – Sustainable Rivers Audit (SRA) involved the collection of data during a period of extreme drought (2004-2007). This period was part of the more extensive drought (2001-2010).

The reference benchmark for comparison, describes the patterns and processes, that would be expected to prevail now, had there been NO significant human intervention in the landscape. The report refers to:

> "*It is open to some uncertainty, because it is estimated that than measured'. 'the health of an ecosystem cannot be readily judged by comparison with a database indicating 'normal' ranges for different variables, as ecologists do not have access to the kinds of reference data that a medical practitioner* does'.

The SRA reports were to be scheduled at 3 year intervals to the MDB Ministerial Council. The report, which has underpinned the opinions of the MDBA on the health of the Basin Rivers , was **only an 'analysis of trends' (*note; determined in a drought period*)** and was to be the 1st in a series, of 3 reports.

The SRA report, assessed 23 River Valley catchments. Only 1 was considered in good health, 2 in moderate health, 7 in poor health, 13 in very poor health. Assessed on hydrology, macroinvertebrates and fish, a river could score well on hydrology, but the presence of alien fish eg carp, together with poor scores on macro invertebrates, could produce an overall score of poor. On the basis of this and other supporting documents, the MDBA has identified that a minimum of 3000 GL is now required to restore the health of the Basin.

The SRA report was released in 2008 and has been strongly referenced by the MDBA in the Basin Plan. A second SRA report (2008-2010) was conducted in the latter period of the Millennium drought and continued to rate most river systems in the basin as in poor health. No report has been conducted outside the Millennium drought years and therefore there has been no analysis of ecological health outside this severe drought period.

The MDBA's additional environmental flow targets and new SDLs will amend current diversions limits from 13,623GL (BDL) down to 10,873GL (SDL). This is aimed to increase end of 'system flows' to the Murray Mouth and to provide additional environmental flows to wetland 'indicator' sites particularly those in the Murray River system.

MDBA End of System Flows objectives:

- Barrage flows: greater than 2000GL per year on a three year rolling average with a minimum of 650GL in any year to be achieved for 95% of the time
- Barrage flows: greater than 600GL over any two year period, to be achieved 100% of the time
- Mouth openness: Mouth open to an average annual depth of 1 metre (-1.0M AHD) or more for at least 90% of years and 0.7 metres (-0.7M AHD) for 95% of years;
- Lake Alexandrina salinity: less than 1500EC for 100% of the time and less than 1000EC for 95% of days
- Coorong salinity: Southern Lagoon average daily salinity less than 100grams per litre for 96% of days

The Murray Darling Basin Authority in its deliberations on the Basin Plan released the following:

- The Guide (2010) – which set a minimum of 3000 GL to be recovered for the environment – 2000 GL of which was to flow out the Murray Mouth
- The draft plan (2011) – established 2750 GL as the required new environmental flows & emphasised the use of indicators sites as the determinant of River health. This plan was less explicit in regard to end of system flows

- The revised draft plan (2012)- 2750 GL & new salinity target of 1000 EC Lake Alexandrina did not substantially amend previous actions, but did reaffirm environmental objectives for end of system flows, in particular for the Lower Lakes, Murray Mouth and Coorong.
- The final Basin Plan (2012) incorporates continued emphasis on flow objectives for the Lower Reaches of the Murray, specifically the Coorong, Lower Lakes and Murray Mouth

In developing the Basin Plan, the MDBA has relied on numerous reports for the Lower reaches of the Murray in particular the Coorong, Lower Lakes and Murray Mouth. Many of these reports were generated within South Australia and/or specifically commissioned by the South Australian Government.

In South Australia, the Coorong, Lower & Murray Mouth was first listed for recognition as an international wetland site of importance in 1985. Under the requirements for Ramsar recognition, a nominating country must develop a plan of management for the site in order to assess environmental condition. However a plan of management for the CLLMM was not developed until 2000. A new revised plan was developed during the drought and released in June 2010 by the SA Government and the Federal Environment Minister Penny Wong. This plan Securing the Future, A Long Term Plan of Management for the Coorong, Lower Lakes and Murray Mouth, relied on increased environmental flows down the Murray as the primary objective for addressing long term environmental decline in these sites.

There are strong correlations between the South Australian plan Securing the Future and the Murray Darling Authority's Basin Plan. The development of the South Australian plan, Securing the Future was funded by the Federal Government (DEWHA now SEWPaC).

The South Australian plan *Securing the Future* places strong preference on the following:

- the plan recognizes that large flows down the River Murray will maintain an open mouth and transport salt and other pollutants to the ocean via natural processes"
- when flows are adequate to maintain the Lower Lakes at or near optimal operating range, minimal intervention is required
- the return of adequate freshwater end-of-system flows (flows through the mouth) is essential for any improvements in the health of the site, as any other solution than freshwater would not preserve the current values

The Murray Darling Basin Authority has not incorporated recommendations for major structural changes as recommended in numerous reports and submissions. A comprehensive report prepared for the Murray Darling Basin Commission in 2000, titled *River Murray Barrages –An Evaluation of Environmental Flows* (Anne Jensen, Michael Good, Prudence Tucker, Martine Long), included a number of specific recommendations. These recommendations included:

- articulate detailed barrage operating guidelines to meet ecological needs
- automate barrage gates for more flexible operation and sensitivity to ecological needs
- modify the Mundoo Barrage to increase flow capacity and operate preferentially to limit sedimentation in the Murray Mouth
- evaluate options for relocation and revised management of the barrages to increase estuarine area to increase range of habitats
- integrate flow management actions with other regional planning and management activities for maximum effectiveness

The MDBA have set new SDLs and flow targets to environmental indicators sites in the absence of critical operational plans to ascertain whether the desired flow regimes are achievable, or what will be the third party property impacts and associated financial costs, to achieve the MDBA's flow objectives.

The Basin Plan and its role in guiding water recovery targets particularly for end of system flows, will mean that the majority of flows are expected to come down the major river systems of the Murray, Goulburn and Murrumbidgee Rivers.

Natural flood/inundation events of the magnitude proposed, would more likely occur when high flows down the Darling and Murray Rivers systems merged in coinciding events. Yet, the MDBA targets for indicators sites aim to maximise and utilise increased environmental flows primarily down the Murray River system.

To date, the MDBA have not developed either:

- Environmental water delivery plan or;
- Environmental watering plans for individual sites

The MDBA itself admit that flow targets at many sites including Chowilla (SA) cannot be physically met, yet despite this the flow targets remain in relevant literature and have guided water recovery and acquisitions by the Commonwealth environmental water holder. Public expenditure on the Murray Darling Basin has been identified to date to be $12 billion, but as the basin plan implementation occurs, this figure may have to be substantially increased. Resolving system constraints for example have not been assessed yet and therefore the total costs in infrastructure works to permanently amend the height and system of Murray, Murrumbidgee and Goulburn River regulation and river heights affecting communities/towns/roads/bridges remains unknown.

Parliament of Australia: Senate Standing Committee on Rural and Regional Affairs and Transport Hansard – Management of the Murray Darling Basin Inquiry quotes:

> **Ms Jody Swirepik, Executive Director, Environmental Management, Murray-Darling Basin Authority "***As Dr Dickson said, <u>there are environmental outcomes we were trying to achieve and desirable flow regimes that we thought were linked to achieving those outcomes</u>. We have made an assessment across the whole of the basin with that in mind. We set the environmental outcomes and desirable flow regimes from a purely environmental point of view—what we would like to actually achieve. We knew right at the very beginning that some of the flow regimes we were identifying, which we know are good for the environment, <u>are actually quite large floods</u>. Within our full suite of indicators, for instance, 125,000 on the Riverland-Chowilla floodplain is a big flood in that part of the world. The floods in 2010-11, I think, got up to 93,000 and they flooded some towns on the way down. We knew that there were a suite of those indicators which were affected by the current constraints in the system. <u>Even where some of the constraints could be addressed, we still would not achieve those large flow regimes</u>—and we did not actively target them when we did the modelling process because we knew they were unachievable."*
> *However, for transparency's sake we have reported on the full suite of those indicators and that has led to some of that view about not meeting enough of that suite of indicators.*

The Murray Darling Basin Authority has also attracted criticism for its analysis of the social and economic impacts of the basin plan. MDBA commissioned social and economic studies were limited by the terms of reference. This had meant that many social and economic factors of the basin plan have not been included in the MDBA assessment of full impacts.

<u>RIVER HEALTH :</u>

THE MURRAY RIVER

The Murray Darling Basin Commission website states:

> "In its natural state the River Murray was quite different from the regulated river we have today. During severe droughts it was sometimes reduced to a chain of waterholes. In SA, sea water infiltrated upstream for a considerable distance from the mouth."

"The drought conditions experienced in last few years have shown even with storages & regulation, extended dry climatic conditions could stop the Murray flowing

"Since the completion of Hume Dam in 1936, a continuous flow has been maintained throughout the length of the Murray. Without storages and regulation, the Murray would almost certainly have ceased to run during the droughts of 1938-39, 1944-45, 1967-68, 1982-83 and 1997-98. The drought conditions experienced in the last few years have shown that even with storages and regulation, extended dry climatic conditions could stop the Murray from flowing" 15

Murray River 1914 – Swan Hill

4

Murray River 2002 - Swan Hill

5

Unlike previous historic droughts, the Murray River throughout the Millennium drought continued to flow. This is in stark contrast to natural conditions of many of the Basin's river systems including the Murray which typically in major drought cease to flow.

Murrumbidgee River (R Bodinnar collection)
Balranald Power & pump station 1938

6

Darling River 1941

7

(photo - R Bodinnar collection) (photo - Burke Shire council)

The Federation Drought (1895-1903), historic drought periods of 1914, 1930-1940s all had significant impacts on the Murray River and Darling River systems. Historic records and photographs identify that during such events the Murray and Darling Rivers would periodically go dry or revert to series of pools. In contrast during the Millennium drought, river regulation and water planning in the Southern Basin enabled the Murray River to maintain flows to Lock 1 in South Australia.

Under natural conditions (pre river regulation), the Murray River during the Millennium drought would have dried up below Albury. Southern ocean marine flows may have extended throughout the

Lower Lakes in South Australia and for a considerable distance upstream in the Murray River. The Living Murray Foundation report notes that during historic droughts, sea water extended up to 250km upstream in the Murray.

Many Australians today, have had little association with the Murray River or have only experienced the benefits of the Murray River being a regulated water supply. History shows that Murray Darling Basin Rivers are highly variable and throughout history have experienced periods of low or no flow.

Salinity levels in the Murray River since the spike of 1982, have progressively fallen and remain well within the World Health Organisation's raw drinking water standard of 800 EC.

The Millennium drought saw the benefits of a regulated river system when the Murray River continued to flow to Lock 1. Salinity levels in the Murray River were low throughout the drought and water quality remained suitable for town water supplies and or unfiltered extractions for domestic use on farm.

Despite low salinity levels and a continuous flow in the Murray River to lock 1, the river was described as a dead and dying and a river in major crisis, requiring major changes to its management. Public misconception did not separate the low levels of salinity occurring in the Murray River with higher salinity conditions experienced in the Lower Lakes. During the Millennium drought, reduced inflows and high evaporation rates in the Lower Lakes led to a significant increase in salinity readings but these levels were unrelated to the Murray River itself.

In September 2009 the South Australian Government, Department of Water, Land and Biodiversity Conservation – River Murray Water Resources Report (issue 45:4 September 2009) noted that despite lower than minimum entitlement flow (1850GL)"***salinity levels above Lock 1 remain fairly low"***. *However downstream of Lock 1 salinity levels remain high due to low water levels. Average salinity in Lake Alexandrina is currently 5,400 EC. Average salinity in Lake Albert is currently 8,875 EC."*

The Millennium Drought also saw Lake Alexandrina and Lake Albert experienced adverse environmental impacts arising from the exposure of acid sulphate soils. In previous historical droughts, as the Murray River flows dried up, sea water incursions would ensure the lake beds were covered preventing the exposure of acid sulphate soils. However the construction of the barrages in 1935-1940's which converted the estuary into freshwater lakes, prevented the ingress of Southern Ocean inflows. With Murray River flows dramatically reduced due to the severity of the drought, lake beds dried leading to the exposure of acid sulphate soils.

The development of the Murray Darling Basin Plan has placed particular emphasis on the health of wetland indicators sites and environmental concerns for the Coorong Lower Lakes and Murray Mouth. However, there has been no investigation or identification of adverse environmental issues that may result from increased environmental flows in sections of the Murray River upstream of the Barmah choke or the health of the Ramsar listed Barmah Millewa Forest, through over inundation of specific low lying areas.

Erosion of river banks below the Hume Dam to the Barmah Choke associated with river regulation is an ongoing concern for regional landholders and presents sedimentation risks for the Murray River. Significant resources has been invested by the previous Murray Darling Basin Commission in programs to stabilise river banks and reduce erosion. In developing the basin plan, the MDBA has made no provisions for how to address increased bank erosion arising from proposed plans to deliver the volumes of environmental flows proposed.

Further, there has been no assessment of adverse environmental impacts on the Barmah Millewa Forest arising from repeat inundation of low lying areas.

THE COORONG, LOWER LAKES & MURRAY MOUTH (CLLMM) - RAMSAR

The Coorong Lower Lakes and Murray Mouth (CLLMM) is a highly modified ecosystem with substantial changes to its natural environment from a variety of causes. Major land reclamation schemes in South Australia, had significant impacts on natural inflows to the Coorong. The South Australian South East Drainage Scheme (1863-1975), diverted fresh water surface and subsurface flows away from the Coorong, directly out to the Southern Ocean. In the Northern Coorong, River regulation which included the construction of 7.6km of concrete barrages, has also impacted on freshwater flows to the Coorong.

Despite substantial deviation from its natural state, the highly modified site was listed for international recognition under the voluntary Ramsar Convention on Wetlands in 1985. A country nominating a site for international recognition develops a plan of management, ecological character description and provides regular reports on the status of a site. The Ramsar treaty promotes wise use of resources and therefore is not exclusive of human interaction or use of resources.

When the CLLMM site was first listed under Ramsar in 1985, the region was highly modified, this included the Southern Lagoon of the Coorong which was noted at the time as being hyper saline. (Coorong Ramsar site number 321)

The Australian Government in its report (December 2006) to the Secretary General, Ramsar Convention on Wetlands (Switzerland) noted that the "*site had been declining for at least 20-30 years prior to listing, with the rate of decline exacerbated by Australia' recent drought conditions"*

Despite being Ramsar listed in 1985, a plan of management for the CLLMM site was not developed until 2000. A new plan of management 'Securing the Future – A Long Term Plan of Management for the Coorong, Lower Lakes and Murray Mouth developed by the South Australian Government in 2010 (in the Millennium drought)

Although the entire Lower Lakes are not included in the Ramsar listing, the broader Coorong, Lower Lakes and Murray Mouth region have received full recognition for priority protection through the wording of the 2007 Water Act and its interpretation in the development of the Basin Plan. The Murray Darling Basin Plan particularly prioritises flow objectives for the Coorong Lower Lakes and Murray Mouth site over other wetlands system also recognised by Ramsar.

LOWER LAKES

South Australian Government decisions to convert the Lower Lakes (Alexandrina & Albert) to freshwater lakes as part of river regulation in the 1930s, has led to substantial ecosystem changes.

In 1935-1940 five concrete barrages (in total 7.6kms) were constructed across the estuary channels which separated the Southern ocean inflows from Lake Alexandrina to create freshwater lakes. This left the Lower Lakes entirely reliant on the Murray River system and local tributaries inflows.

Barrage construction removed 90% of the historical tidal prism and only 11% of the estuary now remains. The construction of the barrages reduced the tidal influence on the Murray Mouth by 89% and only 11% of the original estuary remains. (**remnant *estuary****: water on the sea side of the barrages adjacent to the Murray Mouth and the Northern and Southern Lagoon of the Coorong*)

Early studies in 1914 identify that, prior to the construction of the barrages, the tidal prism influencing the estuary and the Murray Mouth was estimated to be 16,900 ML. At this time, the area of the Lower Lakes affected by the tidal prism was 97.3 km2 (Johnston, 1917). A further calculation

of the pre barrage 'spring' prism was done by Walker (1990) who estimated that the Spring tidal prism was approximately 20,000ML.

A more recent estimate of the current tidal prism show that the marine influence on Murray Mouth today is in the range of 643ML and 2,200ML (Murray Mouth Advisory Committee 1987).

This means that Murray Mouth is now largely reliant on Murray River flows as opposed to a combination of river flows and tidal influences, in order to maintain the openness of the Murray Mouth.

Flows to the Murray Mouth are also influenced by operating protocols for the Lower Lakes.

During dryer periods when broader Basin inflows are reduced affecting both the Darling and Murray River systems, South Australia may then be limited to its entitlement flows of 1850GL under the River Murray Agreement. This raises challenges in maintaining the Lower Lakes at static water levels (0.75AHD) for amenity values and having sufficient water to release into the remaining 11% of the Murray estuary.

In dry sequence years, the concrete barrages which exclude the Southern Ocean are often closed for extended periods in order to maintain lake operating levels at 0.75AHD. This operating policy then prevents outflows to the remaining 11% of the estuary for extended periods.

Under these circumstances closing the barrage gates enables the lake levels to be surcharged to 0.85AHD in late Spring. The Lower Lakes are relatively shallow and evaporate approximately 730GL – 950GL per annum (730,000 Megalitre – 950,000 megalitres). Closing the barrage gates, allows sufficient water to be stored in the Lakes to cover evaporation losses over the summer period, with the lakes falling back to approximately 0.75 AHD in the autumn.

With barrage gates shut to maintain operating height of 0.75AHD, flows are not released into the estuary, leading to increased sedimentation in the Murray Mouth.

The major issue for South Australia in dry sequence years, is the ability to maintain the Lower Lakes at 0.75AHD (Height above sea level).

South Australia's preferred solution developed before the Millennium drought and the Water Act 2007, has been to increase flows down the Murray River to cover annual evaporative losses on Lake Alexandrina and Lake Albert (730,000 – 950,000 ML/yr), have additional flows to enable the Lower

Lakes operating height of 0.75AHD to be maintained in most years and have sufficient additional flows over the barrages in theory to create a net outward flow against the incoming tide. The preference is to use fresh water outflows over the barrages to combat sand deposits brought in by the incoming tides.

Managing the Lower Lakes in dry inflow periods has been problematic for South Australia over many years resulting in a concerted effort by the South Australia Government in the late 1990s to lobby for increased state water flows. Key arguments centre around the need to increase flows out the Murray Mouth, salinity risks to the Coorong, Lower Lakes and Murray Mouth.

It is these particular environmental issues that require further investigation, in order to make appropriate investments to deliver long term sustainable environmental outcomes.

The Lower Lakes and Murray Mouth is a typical tidal inlet system influenced by river flows and coastal conditions such as wind, tides and storms.

Early historic maps of the Lower Lakes identify sections of Lake Alexandrina and Lake Albert as being brackish or saline. The Living Murray Foundation report (MDBC 2002) noted that in times of drought, sea water inflows into the Lower Reaches of the Murray extended up to 250 km upstream.

Following the Federation drought (1895-1903), plans were developed to convert the Lower Lakes into permanent freshwater storages. During this period, a report by Government experts (NSW/SA) noted in 1903 that:

> "*construction of a weir or dam in the tidal compartment of a river has been invariably found to result in shoaling ……*
> *"when supply is insufficient to overcome tidal action…..supply of fresh water falls off, the sea water takes it place…*
> *"In the recent drought.. if barrages had been erected 5 yrs ago, (*note 5 years before 1903*) it would have required nearly the whole available flow of the river to keep the lakes sweet*"
> Source: *Adelaide Advertiser 20.3.1903*

Original plans to convert the estuary into permanent freshwater reserve in 1903 noted that sedimentation (shoaling) could occur if barriers were constructed in the tidal section of a river.

Following the construction of the permanent modern barrages in 1935-1940, historic photos show the progressive build up off sand deposits in the remaining estuary on the sea side of the barrages.

WISE OLD GENTLEMEN

THEIR PREDICTIONS WERE RIGHT!!!

18

Barrages early 1940s before sedimentation

Murray Mouth 1949

Note: red circle is the early formation of permanent sand island, commencement of vegetation colonisation

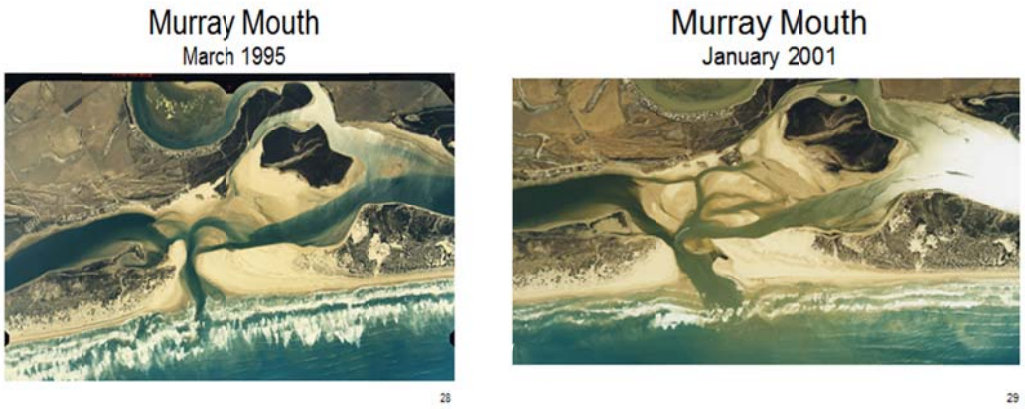
Murray Mouth
January 1956

Murray Mouth
1966

Murray Mouth
Nov 1973 Floods

Murray Mouth
February 1988

(photos purchased SA Mapland L Burge)



(Photos: purchased SA MAPLAND: L Burge),

The growth and stabilisation of sand deposits adjacent to the Mundoo channel has been a progressive feature since construction of the permanent Mundoo Barrages built in 1935-1940. This permanent sand deposit is now referred to as Bird Island and is impeding flows to the Murray Mouth and Coorong. The location and archaic operating features of the Mundoo barrage also prevents timely manipulation of water releases from Lake Alexandrina that could assist with scouring action at the Murray Mouth.

Despite the problems of the Mundoo Barrage being well documented in a variety of reports, the MDBA have not included long term plans to address the continued growth and stabilisation of Bird Island.

A report prepared for the Murray Darling Basin Commission in 2000. This 117 page report titled River Murray Barrages – Environmental Flows (Anne Jensen, Michael Good, Prudence Tucker, Martine Long), included a number of specific recommendations. These recommendations included:

- articulate detailed barrage operating guidelines to meet ecological needs
- automate barrage gates for more flexible operation and sensitivity to ecological needs
- modify the Mundoo Barrage to increase flow capacity and operate preferentially to limit sedimentation in the Murray Mouth
- evaluate options for relocation and revised management of the barrages to increase estuarine area to increase range of habitats
- integrate flow management actions with other regional planning and management activities for maximum effectiveness

The report states:

> "ecologically, the most important geomorphic impact of flow restriction and regulation has been the development of Bird Island by the growth and consolidation of the former flood tidal delta immediately inland from the Murray Mouth". "this is particularly related to the lack of discharge through the Mundoo Barrage."
>
> "During the drought of 1967-1968 the barrages were closed for 529 days, but the mouth did not close completely as it did in 1981 when the barrages were closed for only 196 days, suggesting that conditions other than lack of river discharge (high tides, storm surges) are important in maintaining the opening to the sea"

<u>The April 1981 photograph of the Murray Mouth closure has ever since been portrayed as a symptom of 'over allocation' of water in the Murray River system, primarily used for irrigation.</u>

(photo: April 1981. c SA Mapland purchased L Burge)

During the Australian Parliament Senate Standing Committee 1981, Culver was quoted:

> *'that in addition to low flows, calm seas and reduced tides appear necessary for a complete closure (mouth)'. (Walker D. J.)*[49]

As the Lower Lakes is a key beneficiary of the Basin Plan, it is important to note that there varied views recently about its history and the causes of environmental change and decline.

A document prepared for the River Murray Catchment Water Management Board 2004 (SA) – A Fresh History of the Lower Lakes – Wellington to the Murray Mouth 1800s to 1935 by Terry Sims and Kerri Muller has helped shape current views that the Lower Lakes were historically freshwater and were rarely subject to seawater invasions. The document notes that sea water intrusions have occurred since 1900s as a result of extractions.

In contrast a range of other scientists and reports acknowledge the Lower Lakes did have an estuarine history but that river regulation , locks, weirs and construction of the barrages in the former estuary have all influenced environmental conditions. The Living Murray Foundation Report notes the impact of river regulation which included the construction and operation of the barrages. This report also notes in periods of drought, sea water intrusions extended up to 250 km upstream in the lower Murray River.

In addressing future planning, it is important to look at historical and current influences and develop a range of modern management options, to enhance environmental outcomes in conjunction with achieving social and economic values in the basin.

A key criticism of the Murray Darling Basin Plan is that it ignores a range of solutions that could be incorporated into management and infrastructure decisions to improve ecological outcomes in the Lower Lakes. Instead the Basin Plan prioritises freshwater flows to the Lower Lakes and Murray Mouth as the primary solution.

The Murray Darling Basin Plan does not include the Lower Lakes and Murray Mouth, however the plan's objectives aim to increase flows to the Coorong, Lower Lakes and Murray Mouth. Under this scenario, the MDBA's have specifically set water recovery objectives to meet environmental needs of the CLLMM site, but have excluded any infrastructure or operational improvements to the CLLMM that can maximise environmental outcomes.

The MDBA have ignored the historical role that sea water incursions had on the tidal inlet system and any substantial infrastructure or operational changes that are critical to achieve sustainable long term ecological improvements.

Climate change predictions indicate a drier Murray Darling Basin in the future but the Murray Darling Basin Plan has not recommended infrastructure improvements or modern management options for the Lower Lakes to counter future lower inflows. Instead the Lower Lakes, are to be maintained in their current form

A key failing of the Murray Darling Basin Authority is that it also sets new salinity targets for Lake Alexandrina of 1000 EC in Lake Alexandrina 95% of the time and 1500EC all of the time. Under current barrages infrastructure, it remains impossible to exclude Southern Ocean marine waters re entering Lake Alexandrina. When the barrages gates are open to release freshwater into the remnant estuary, during periods of Southerly swells and high winds, ocean water can push back against freshwater outflows with sea water reaching far into the lake system. Under this scenario salinity levels in the lakes can substantially rise (eg 40,000 EC Goolwa Wharf)

This may make new salinity targets for the Lower Lakes outlined in the final version of the basin plan unachievable. Additional salinity measuring beacons constructed in the drought, report that despite large post drought inflows into Lake Alexandrina, salinity readings rose dramatically as incoming marine waters push back into the lakes through the open barrages. The ability to maintain such low salinity levels when marine waters now move back into the lakes, is further heightened under a climate change scenario and predicted sea level rises. Climate change predictions and sea level rise could see marine water regularly overtopping the barrages and sand bars.

It is not clear at this stage how much additional environmental flows will be needed into Lake Alexandrina to maintain 1000 EC 95% of the time or 1500 EC all of the time, against the regular sea water incursions that occur during Southerly swells and future climate change predictions.

THE COORONG

The Coorong and Murray Mouth are on the sea side of the concrete barrages constructed in 1935-1940 built to exclude marine inflows, which converted the Lower Lakes (Alexandrina & Albert) to freshwater systems.

Water volumes to the Coorong are now largely determined by localised seasonal events (eg local rainfall), marine waters from the Southern Ocean and barrages operations, which determine the release fresh water flows, from the Murray River and localised tributaries.

The Coorong consists of the Northern and Southern lagoon, separated by a narrow land formation near Parnka Point. Here the two lagoons are linked by a relatively shallow narrow channel approximately 200 meters wide. Historical water inflows to the Northern Lagoon of the Coorong was largely influenced by tidal events through the Murray Mouth and Murray River and local tributary flows. The Southern Lagoon was historically influenced by sub surface and surface inflows from the South East of South Australia.

Prior to human settlement and modification, the South East of South Australia climatic conditions, landscape and geological formation, resulted in natural drainage patterns ending in wetlands, swamps and marshland. This complex series of drainage lines and wetlands would eventually travel north westerly, with much of the overland and sub surface flows ending in terminal wetlands or flowing into the southern lagoon of the Coorong. Southern Lagoon inflows would eventually move into the Northern Lagoon and comprise part of the natural flows out the Murray Mouth.

The South East region of South Australia has no natural drainage that would discharge large volumes of floodwaters to an ocean outfall. Some waters did gravitate to the Southern Ocean, primarily through the Glenelg River and localised springs.[45]

The South East Drainage Scheme (1863-1975) was developed by the South Australian Government. The South East Drainage scheme comprises an extensive network of drains that divert freshwater away from the Coorong directly out to sea. The flow rates diverting water away from Coorong vary depending on seasonal conditions. <u>In 2000, approximately 450GL (450,000 Megalitres) was diverted away from the Coorong directly out to the Southern Ocean.</u>

As a result of draining landscape to increase areas suitable for agriculture, approximately 90% of the wetlands in South East of South Australia have been lost. This reference to wetland loss is often misquoted to represent 90% loss of wetlands across the entire Murray Darling Basin.

In contrast drainage activities in the Upper South East occurred through a mix of private uncoordinated drainage activity and Government funded drainage schemes. The Upper South East Drainage and Flood Mitigation Scheme was initiated in 1993 and approved in 1996. This Upper South East Drainage and Flood Mitigation Scheme was developed in response to growing concerns about modelled prediction on salinity risks to the region and for flood mitigation. Federal Funding was made available to address predicted salinity risks associated with rising water tables and to manage flooding events in the region. This project further amended the natural water flows of the Upper South East area altering the natural drainage flows of localised swamps and marshes. This stage drainage scheme together with the main South East Drainage Scheme, added to the changed drainage patterns, for the whole South East region.

As part of the funding approval process, the Federal Government imposed a condition on funding that no more than 40,000 Megalitre (yearly average) flows from the Upper South East Drainage and Flood Mitigation Scheme could enter the Southern Lagoon of the Coorong. While the rule's intention may have been designed to limit the modelled risks for salinity, the rule has also impacted on the ability for naturally occurring rainfall events or flood waters to be released into the Coorong.

<u>This rule (condition) is still in place today and thereby limits the amount of local inflows that can flow into the Southern Coorong</u>. Managing hyper saline conditions of the Coorong face two major policy issues. The first concerns that status of the Coorong which included hyper salinity in the Southern Lagoon, when Australia listed the Coorong for recognition under the Ramsar Convention in 1985. The second is also linked to the Ramsar listing where the Federal Government imposed a condition on funding in 1997 for the Upper South East Drainage and Flood Mitigation Scheme to preserve the hyper saline conditions of the Southern Lagoon consistent with its conditions at the time of listing under Ramsar in 1985. To add amend hyper saline conditions (either raising or lowering) would substantially amend the ecological character conditions associated with the original Ramsar listing.

The Murray Darling Basin Authority and the South Australian Government have not sought to amend this rule and therefore local inflows remain restricted. In reviewing the impact of the drainage schemes on the Coorong, the South Australian Government has enabled some infrastructure works to be amended which enables limited inflows back to the Southern Coorong but only from the Upper South East Drainage and Flood Mitigation Scheme.

The South Australian Department of Water, Land and Biodiversity Conservation (DWL&BC) commissioned a historical water quality assessment as part of the Upper South East Program. The report, *A Palaeoecological Assessment of Water Quality Change in the Coorong South Australia (November 2005) Peter Gell and Deborah Haynes, Diatoma, The University of Adelaide, 5005, A report for the Department of Water, Land and Biodiversity Conservation S.A.*

The executive summary states:

> Its executive summary states "*DWL&BC commissioned the Coorong historical water quality assessment project under the Upper South East (USE) Program to determine a timeline of changing water quality conditions for the Coorong Lagoons using diatom analysis and dating techniques. The USE Program has conducted controlled releases into the Coorong Southern Lagoon via Salt Creek since August 2000. This research will contribute to a greater understanding of pre- and post-European water quality conditions and will help guide the USE program releases*".
>
> "*Before European settlement the Northern Lagoon of the Coorong was dominated by tidal input of marine water. Marine flushing also strongly influenced the Southern Lagoon but less frequently or to a lesser extent. At no time in the 300 years before European settlement has the Coorong been noticeably influenced by flows from the River Murray"*

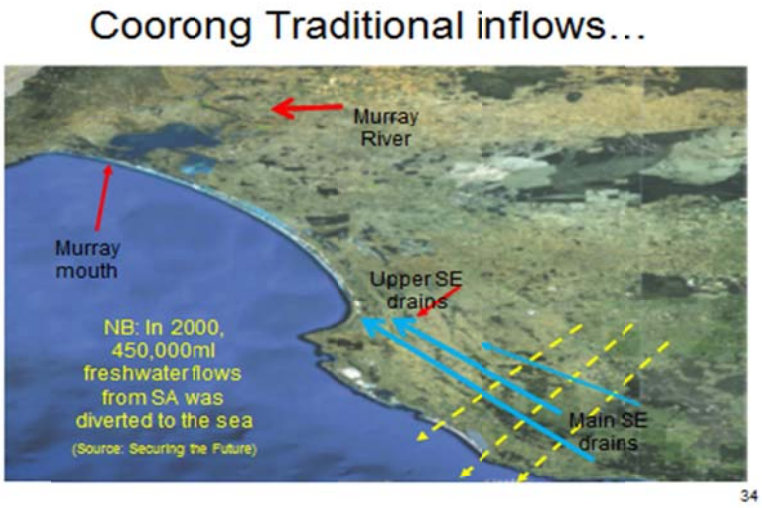
Hyper saline conditions of the Southern Lagoon of the Coorong have attracted widespread publicity and the salinity conditions of the Southern Coorong have been a key argument to increase flows down the Murray River.

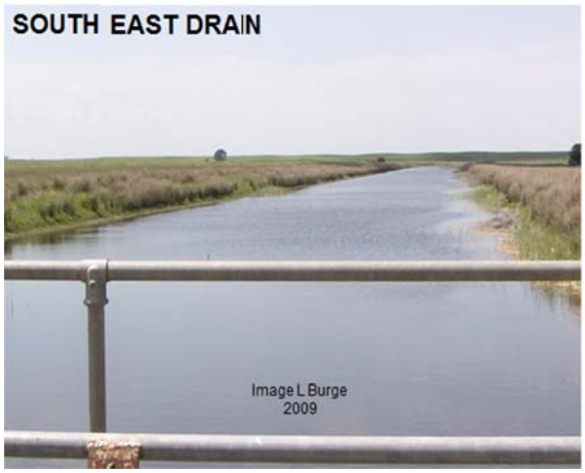
There appears no concerted effort in South Australia to recognise historical flow patterns to the Coorong, or re-establish some level of natural flows from the larger drainage scheme in South East of South Australia. In 2012 a recent public meeting of approximately 200 people in the South East of South Australia, opposed modifications to the regions drainage schemes and the return of freshwater flows to the Coorong.

The South Australian Government has considered a feasibility study, however there are no indications of returning flows from this major drainage network in the current development of the Murray Darling Basin Plan

Further, in relation to the Upper South East Flood Salinity Flood Mitigation Scheme, It seems ironic that while the MDBA and the SA Government seek additional fresh flows from the Murray River to address hyper saline conditions in the Southern Lagoon of the Coorong, management rules still apply today which prevent the use of local inflows above an average of 40,000 ML/y.

Further, the South Australian Government appears to have ignored a recent report (2005) commissioned by their own Department of Water Land & Biodiversity and Conservation in regard to the historical influences of water inflows to the Coorong.





The construction and operations of the barrages also have a major impact on environmental conditions in the Coorong. This is due to the operating protocol which guides water releases from the Lake Alexandrina to the remnant Murray estuary and Mouth. In drier periods, objectives to maintain the Lower Lakes at 0.75AHD can lead to extended periods where the barrage gates are closed. Consequently there may be extended periods where no fresh water flows from the Murray River are released into 11% remnant Murray estuary leading to a build of sand deposits brought in by incoming tides.

A South Australian National Park sign located at the Coorong identify:

> *" barrages built in 1930s to stop salt water from entering the lower Murray via Lakes Alexandrina and Albert have halved the flow of water from the River to the Coorong. As a result the Northern Lagoon has become more saline"*

The MDBA and the South Australian Government have included policies to improve the infrastructure or operational arrangements for the barrage. There has been limited recognition of the need for fluctuating water levels in the Lower Lakes but there remains a strong position to retain the Lower Lakes operating protocols near the current format.

The preferred option for the South Australian Government and the MDBA, is for increased flows to maintain relatively static lake levels, have sufficient additional flows to cover evaporative losses and to have sufficient water to release over the barrages into the remnant estuary and use fresh water flows to scour out the Murray Mouth.

LAKE ALBERT

Lake Albert is a landlocked closed lake with a narrow opening to Lake Alexandrina. Exchange of water between the lakes is predominantly influenced by wind.

Low water levels and increased salinity levels in the Lake Albert during the Millennium drought brought a strong response from local landholders for increased environmental flows.

Lake Albert is naturally more saline as the main inflows to the Lake are through wind assisted water exchange from Lake Alexandrina. The construction design and location of the Narrung Ferry causeway in 1966 has altered the natural restriction of the Narrung narrows leading to water exchange impacts between the two lakes. The reduced opening and increased sedimentation in the Narrung Narrows has increased salinity issues in Lake Albert.

In the post Millennium drought period, when flows down the Murray were at extremely high levels, salinity readings in Lake Albert did not correspondingly reduce.

Local landholders began to lobby for major infrastructure improvements to the Narrung Narrows Ferry causeway built in 1966. Without substantial modifications to area, increased Murray Darling Basin Flows will not resolve Lake Albert long term salinity issues.

SALINITY

Salinity levels in the Murray River since the spike of 1982, have progressively fallen and remain well within the World Health Organisation's raw drinking water standard of 800 EC. The Murray River readings at Morgan fluctuate from approximately around 400 to 600 EC and are therefore well below the upper level of WHO raw drinking water standards.

The Salinity Crisis during the 1980s led to the National Salinity Audit 2000 which presented dire scenarios for the risk of dryland salinity in agricultural landscapes based on 'best available science'. Modelled predictions for salinization of Australia's landscapes since the National Salinity Audit 2000 have now been revised. This report however, significantly influenced predictions on future salinity risks for the Murray River. Despite a revision on the risks of dryland salinity, outdated salinity data remains a constant in public perceptions and Government processes.

In developing the Basin Plan, the MDBA has set daily salinity targets for the Southern Lagoon of the Coorong less than 100 grams per litre for 96% of days. This ignores the reasons for hyper saline conditions developing in the Coorong over a long term historical period. The South East of South Australia drainage schemes (1863-1975) which diverted flows away from the Coorong directly out to sea has led to increased salinity levels in the Southern Lagoon of the Coorong. Further drainage schemes in the late 1990s -The Upper South East Drainage and Flood Mitigation scheme, also has had significant impacts on salinity levels in the Coorong as drainage impacted the natural functioning wetland ecology of the region.

Salinity levels in the Northern Lagoon are influenced by tidal inflows and the operating protocols of the lower lakes. When barrages gates are closed for extended periods to maintain the Lower Lakes at 0.75AHD limited freshwater flows are released into the Northern Coorong.

Historically the mostly land locked water body of Lake Albert has experienced fluctuating levels of salinity. The only freshwater inflows to Lake Albert occur through localised inflows or through water exchange with Lake Alexandrina through the Narrung Narrows. The building of the Narrung Ferry causeway in 1966 further reduced the narrow opening of the Narrung Narrows increasing sedimentation and restriction water exchange between the two lakes. During the Millennium

drought salinity levels rose to very high levels, but in a post drought periods (post 2010) it was observed that corresponding salinity levels did not reduce in conjunction with the high Murray River flows into Lake Alexandrina.

In developing the Basin Plan, the MDBA has set new salinity targets for Lake Alexandrina. Ecological outcomes for Lake Alexandrina are for less than 1500 EC for 100% of the time and less than 1000EC for 95% of days.

Under the Basin Plan proposal, Murray River flows will have to be of sufficient quantity to meet new salinity outcomes for Lake Alexandrina. The MDBA have ignored all other contributing factors to salinity readings in the Lake Alexandrina and have concentrated on dilution flows from the Murray River.

Lake Alexandrina and surrounding landscapes have naturally occurring salts in the landscape arising from the regions geological history. Adding to salinity levels in the lake is the ability for marine water to infiltrate through the sand dunes separating the lake from the Southern Ocean. The concrete barrages erected in 1930-1940 are also not water tight so sea water from the Southern Ocean can move underneath the barrages on the lake floor.

When the barrages are open, local climatic conditions can lead to reverse flows. 'Reverse flows' can occur during Southerly swells when southerly winds blow sea water back into Lake Alexandrina through the open barrages. Such conditions can elevate salinity readings in Lake Alexandrina with readings as high as 40,000 EC at the Goolwa Wharf.

Reverse sea flows also affect the Tauwitcherie and other smaller barrages where flows move can move into the lake up to Pomanda Point.

The combination of reverse sea flows through the open barrages, infiltration through sand dunes, wind borne salts and naturally occurring salt levels in the local landscapes, may not make the MDBA's 1000 EC are realistic or achievable target. This may require a large quantity of environmental water to dilute the Lower Lakes at the expense of water use in other environmental sites. This target may also impact on other river users in years of low inflow where the 1000 EC or 1500 EC target is difficult to achieve.

CLLMM: MODIFICATIONS TO THE NATURAL ENVIRONMENT

The Lower Lakes, the Coorong and lower reaches of the Murray River have undergone substantial changes since European settlement. River regulation in the Southern Basin has provide a more secure supply of fresh water to South Australia, however a common misconception is that river

extractions is the primary source of environmental decline in the Coorong Lower Lakes and Murray Mouth (CLLMM).

As part of river regulation, the Lower reaches of the Murray have been substantially changed. As part of South Australian decisions to convert the Murray estuary to a fresh water lake system, natural wetlands and swamps in the final stages of the Murray River were drained and reclaimed for agriculture. Artificial levee banks around Mannum to Wellington were created on either side of the Murray River raising the final section of the Murray River above the river flats below. From Lock 1 to the barrages in the Murray estuary, water levels are maintained at a static water operating level of 0.75AHD (height above sea level).

Draining wetlands and swamps and elevating the height of the Murray River banks, enabled irrigation activities to occur via opening and closing small irrigation outlets on the sides of the constructed river banks allowing gravity irrigation flows to water the land below. Up until very recent years, excess water flows from this type of irrigation system in South Australia, was then repumped directly back into the Murray River, significantly raising nutrient levels in the final reaches of the Murray.

Human habitation and development on these reclaimed areas along the SA stretch of the Murray (Mannum to Wellington) experienced major implications in the Millennium drought. When the Murray River fell below usual operating levels of 0.75AHD for extended periods, the artificial levee banks dried out and bank slumping in certain regions occurred.

South Australia has utilised river bank collapse as an effective argument to increase flows to South Australia. However this ignores that artificial levee banks require constant maintenance and a reliance on static water levels to maintain levee banks would not be an accepted practise outside South Australia. Most natural river banks experience widely fluctuating river heights. In times of severe drought, a more sustainable solution such as levee strengthening may be prove to be a more viable option in the long term.

The Lower Lakes region has also experienced significant pressure from urban development. Development on Hindmarsh Island has involved the creation of network of canals and associated housing development complimented with an extensive marina development.

Entrances to the marina are immediately upstream of the Goolwa barrage.

This submission notes that in balancing the needs for increased end of system flows, there will be substantial social and economic impacts in the Southern Basin. These impacts on not confined to the loss of productive water, currently used for food production in the Southern Basin.

There has been a substantial lack of planning in relation to how the large volumes of environmental water proposed under the Murray Darling Basin Plan can be physically delivered. In addressing how the Basin Plan will actually be implemented, further consideration should be given to future private land inundation, potential increased flooding risks and/or impacts on the ability of the regulated river system to meet the needs of extractive industries.

The CSIRO Environmental and Ecological Benefits Report identify environmental and ecological benefits from increased flows in the Murray Darling Basin but significant data gaps remain.

The CSIRO report notes:

- Floodplain & bird breeding value will be $3 billion, if including Coorong Lower Lakes and Murray Mouth then the value rises to $8 billion
- There may be a $542M loss in irrigated agriculture

- There will be a $1 dollar per megalitre increase to land values in the Barmah Millewa(Southern NSW)
- With a corresponding decrease of $1.66 per megalitre decrease to land values on the Victoria side of the Barmah Millewa
- A 1 x metre rise in lake levels would equate to $58,000 increase to house values at Lake Alexandrina

There is significant community concern about the accuracy of the CSIRO's figures in relation to economic benefits arising from increased environmental flows and the economic impacts to irrigated agriculture and dependent communities.

It may be easier to understand house value rises in Lake Alexandrina (SA) from elevated lake levels, it is harder to find corresponding data to support the CSIRO's claims in relation to land values in the Barmah Millewa region of Southern NSW or Northern Victoria. Contrary to the CSIRO report, residents adjacent to the Barmah Millewa Forest are concerned about future land devaluations that may arise if the Murray Darling Basin proposed environmental flows, lead to increased local or regional flooding risks.

In developing the Basin Plan, the MDBA should consider a balance between social and economic expectations right along the river system. While residents in the housing developments in the Lower Lakes may argue strongly for a stable water supply at 0.75AHD above sea level to maximise amenity values in marinas and housing developments, risks for other residents may occur upstream with proposed environmental flows causing increased flooding risks, property access issues or frequent low level land inundation.

Photos Hindmarsh Island development: L Burge 2009

CONCLUSION

The Water Act 2007 set new parameters for water management in the Murray Darling Basin.

The Environment currently receives 58% of inflows. Between 2004 – 2009, the MDBA report that 823 GL (excluding Snowy) of water has been recovered for the environment. The Basin Plan will add a further 2750GL giving a total of 3600 GL. *(note: Versions of the Basin Plan identified recovery targets of 2289GL sourced from the Southern Basin and 390GL sourced from the Northern Basin)*

Post 2019, an additional 450GL is to be procured for the environment giving a total of water diverted from productive use to environmental share of 4050GL. By way of annual comparison, this equates to more than the entire contents of Australia's larger storage dams – (eg Hume Dam) being converted to entirely environmental use (Hume Dam capacity = 3038GL)

To date there are no plans for how this water will be delivered. The majority of this water is to be delivered via the major river systems in the Southern Basin. This brings significant potential impacts to other river users and flooding risks to upstream landholdings.

The Murray Darling Basin Plan has also failed to incorporate environmental risks to upstream environments, particularly areas below the Hume Dam and including risks of over inundation of the Barmah Millewa Forest.

The timeframes imposed under the Water Act 2007 meant that the newly established Murray Darling Basin Authority has relied on a range of existing literature, scientific documents or incomplete reports. There are few reports specifically commissioned for the purposes of the development of a basin plan.

Under the Basin Plan, the MDBA has prioritised the Coorong Lower Lakes and Murray Mouth site but has failed to identify or develop a comprehensive range of solutions that would deliver long term sustainable solutions. Instead the MDBA has relied on increased flows down the Murray River.

The MDBA to date has not developed a water delivery plan to adequately assess what quantities of water can be physically and safely delivered in the Murray River. In conjunction individual site environmental watering plans have also not been completed.

This is a major failing of water planning currently in the Murray Darling Basin. Major water policy changes are being implemented prior to adequate planning on what is actually required to maximise environmental health in the basin.

HARVARD UNIVERSITY

SCHOOL OF ENGINEERING AND APPLIED SCIENCES

SCHOOL OF PUBLIC HEALTH

KENNEDY SCHOOL OF GOVERNMENT

John Briscoe

Gordon McKay Professor of the Practice of Environmental Engineering

February 24, 2011

The Secretary
The Standing Committee on Legal and Constitutional Affairs of the Senate
Canberra
Australia

Dear Sir/Madam:

Thank you for your invitation (email from the Secretary of, dated 14 February 2011) to make a submission to the Inquiry into provisions of the Water Act 2007

Why I make this submission:

For many years I was the Senior Water Advisor at the World Bank. In that capacity I visited Australia in 1996 and became interested in the emerging Australian experience with water management, especially in the Murray Darling Basin. Over the intervening period I have followed developments closely, have visited Australia several times, and interacted with many Australian water professionals, in Australia and overseas.

Two years ago I left the World Bank to assume a position as Gordon McKay Professor of Environmental Engineering at Harvard University, where I direct the Harvard Water Program. In 2010 I visited Australia three times – one as a member of the High-Level External Review Panel convened by the MDBA to review the draft Guide to the Basin Plan; one to work with the National Water Commission, and once as part of the Harvard/University of Melbourne/Monash/Committee for the Economic Development of Australia water collaboration. I have followed developments relating to the Water Act 2007 very closely.

So I am a very interested outsider, who surely has many of the details wrong. If there is a value to my observations it comes from the fact that I have been privileged to see many reform processes in many countries, and have developed a nose for sniffing out the story.

Why do I care?

Harvard University · Pierce Hall 107B · 29 Oxford Street · Cambridge, MA 02138

I care for two reasons. First, because I have many Australian friends and want what is good for them and your wonderful country. Second, because what happens in Australia matters hugely to the rest of the world.

Perceptions and Facts

The Harvard historian David Blackbourn writes in his great book "The Conquest of Nature" of the dialectic of water challenges and responses. He describes how all water solutions are provisional, how each succeeding generation takes for granted the achievements of their fathers and forefathers, and how contemporaries always wonder how those who went before could have been so short-sighted and stupid.

There is no better illustration of this difference of perception than the situation of water management in Australia. Over the last 10 years Australia did something which no other country could conceivably have managed – in a large irrigated agricultural economy (the Murray Darling Basin) a 70% reduction in water availability had very little aggregate economic impact. Before the buts and the buts and the buts, this extraordinary achievement is, in my view, the single most important water fact of the 21st century, because it shows that it is possible (with ingenuity and investment) to adapt to rapid climate change and associated water scarcity.

What has been very striking to me on my visits to Australia, is how dramatically this perspective is different from the political and public perception, which is largely that "we have done a terrible job". Again and again I had to confront this "truism" in discussions in Australia. After all these discussions I concluded that there was a fatal misdiagnosis of "the problem". If one can conceive of a simple (and simplistic) equation in which:

Outcome = f(Exogenous Change, Institutional Response);

90% of the political and public blame was placed on "institutional response". To cite just two (important) examples: The Honorable Malcolm Turnbull, author of the Water Act 2007 claims that "our water management has been extraordinarily ill informed in years past" (*http://www.malcolmturnbull.com.au/blogs/the-water-act-and-the-basin-plan*) and the MDBA's ill-fated Guide to the Basin Plan asserts that "over the past few decades….the focus has swung to looking at economics …and the role of the environment has been overlooked."

I found (and find) this diagnosis (a) extraordinarily widespread and (b) extraordinarily erroneous. What is obvious to me is that the overwhelming factor behind the dismal situation in the MD Basin was the dramatic reduction in rainfall and even larger reduction in river flows. It is equally clear to me that the Institutional Response (of the Murray Darling Basin Commission, the basin states, and farmers) was extraordinarily innovative and – within the bounds set by nature – effective. Not only for the economy but, as shown by the National Water Commission, for ameliorating the environmental damage of the terrible drought.

The Politics of the Water Act 2007

In the course of my visits and in my reading, I have come to see opportunistic politics as a major factor in the development of the Water Act of 2007 and the current impasse. Of course I know much less about this than any of the esteemed members of your committee, but because this perception underlies my analysis, let me summarize this understanding briefly.

The environmental vote was important in the election of 2007. After seven years of drought environmental conditions were poor, not least in the Murray Darling Basin. The electoral arithmetic of Australia is such that most of the electorate live in the coastal cities. Most city dwellers have both little knowledge of the land and water environment of the world's driest continent, and a paternalistic and dim view of farmers and agriculture. He who could capture the environmental vote would strongly improve his chances in the election. Most environmental-minded voters were Labour. If the Liberal Party were to woo some away it had to do something dramatic. The Water Act of 2007 was one of the dramatic efforts.

The Act was hatched in a very short time, with very little consultation with any of Australia's great water professionals or its innovative farmers. (By the way, in the eyes of this observer at least, the smart city dwellers had been far less innovative vis-a-vis water than their dim-witted country cousins.)

In the eyes of the architects of the Water Act, it was necessary to take power away from those who had made a mess of things (the States and farmers) and put it in the hands of the enlightened in Canberra. A major challenge was how to deal with the matter of the Constitution, which had given the states powers over water management, and which underpinned the inter-state consensual processes which had been the institutional bedrock of the MDB Commission. The primary author of the 2007 Act, the Honorable Malcolm Turnbull, is quite explicit about this. *"In the 1890s our founding fathers missed a big opportunity when they drafted our Constitution in not putting the management of interstate waters under federal jurisdiction. In 2007 we rectified that mistake with the Water Act" (*Malcolm Turnbull "The Water Act and the Basin Plan, December 9, 2*010, http://www.malcolmturnbull.com.au/blogs/the-water-act-and-the-basin-plan/).*

Because constitutional amendments are, not simple, and definitely cannot be done over a weekend before an election, the authors of the Water Act 2007 had to find legal cover for usurping state powers. An alert and enterprising environmental lawyer found the fig-leaf, which was the Ramsar Convention, which the Commonwealth Government had signed, committing itself to protecting wetlands which are critical for migratory birds.

To avoid a constitutional crisis, the Commonwealth had to build the Water Act around this fig-leaf. So the Act became an environmental act, which was all it really could be, since it was in the name of the commonwealth's obligations to an obscure international environmental convention that it was taking powers from the states.

And so the fundamentals of the Act were born – an environmental act in which Canberra would tell states and communities and farmers what to do.

<u>The substance of the Act: 1 Federal and State responsibilities</u>

The framers of the Water Act 2007 had not read their Churchill. Democracy is, indeed, the worst form of government, except for all those other forms that have been tried from time to time. Yes, the consultative, participatory model of the MDB Commission did have its flaws, because consensus was difficult and often slow. But it is now obvious that the commonwealth-bureaucrats-and-scientists-know-better-then-states-and-communities-and-farmers-do model has, once again, proved to be much worse and even much slower.

The highly secretive "we will run the numbers and the science behind closed doors and then tell you the result" MDB Basin Plan process was not, in my view, an aberration which can be pinned entirely on the leadership of the MDBA Board and management, but intrinsic to the institutional power concentration that is fundamental to the Water Act 2007.

The substance of the Act 2: Balance between the environment and human uses

There are claims that the Water Act of 2007 was not an environmental act but one that mandated balance between the environment and human uses. Digging deep into the turgid 236 pages of the Water Act for confirmatory phrases, the Honorable Malcolm Turnbull claims, now, that the Act was all about balance.

To a disinterested reader this is poppycock. The National Productivity Commission's interpretation of the Water Act (2007) is that "*it requires the Murray-Darling basin Authority to determine environmental water needs based on scientific information, but precludes consideration of economic and social costs in deciding the extent to which these needs should be met*". Similarly, the High-Level Review Panel for the Murray Darling Basin Plan (of which I was a member) stated that "*The driving value of the Act is that a triple-bottom-line approach (environment, economic, social) is replaced by one in which environment becomes the overriding objective, with the social and economic spheres required to "do the best they can" with whatever is left once environmental needs are addressed*. "

This interpretation was also very clearly (and reasonably, in my view) the interpretation taken by the Board and Management of the MDBA in developing the Guide to the Basin Plan. This was transmitted unambiguously to the members of the High-Level Review Panel for the Murray Darling Basin Plan.

(As an aside, I have wondered whether this logic is derived from (a) a belief that this is the right thing to do or (b) an understanding that this was the only constitutionally-defensible approach given that state powers were being abrogated in the name of meeting the Commonwealth's Ramsar obligations.)

The substance of the Act 3: The roles of science and politics

The Act is based on an extraordinary logic, namely that science will determine what the environment needs and that the task for government (including the MDBA) is then just to "do what science tells it to do".

In the deliberations of the High Level Review Panel, we pointed out that, taken literally, this would mean that 100% of the flows of the Basin would have to go to the environment, because the native environment had arisen before man started developing the basin. The absurdity of this point was to drive home the reality – that the Murray is one of the most heavily plumbed river basins in the world, and that the real choice was to decide which set of managed (not natural) environmental (and other) outcomes were most desirable.

The job of science in such an instance is to map out options, indicating clearly the enormous uncertainties that underlie any scenario linking water and environmental outcomes. In its final report, the High-Level Review Panel stated:

Far from being "value neutral", a set of value judgements are fundamental to the aspirations of all Acts, including the Water Act. …. It is a fundamental tenet of good governance that the scientists produce facts and the government decides on values and makes choices. We are concerned that scientists in the MDBA, who are working to develop "the facts", may feel that they are expected to trim those so that "the sustainable diversion limit" will be one that is politically acceptable. We strongly believe that this is not only inconsistent with the basic tenets of good governance, but that it is not consistent with the letter of the Act. We equally strongly believe that government needs to make the necessary tradeoffs and value judgements, and needs to be explicit about these, assume responsibility and make the rationale behind these judgements transparent to the public.

<u>The process of formulating the Basin Plan</u>

In all of my years of public service, often in very sensitive environments, I had never been subject to such an elaborate "confidentiality" process as that embodied in the preparation of the Guide to the Basin Plan. The logical interpretation was that the spirit of the Water Act of 2007 (environment first, science will tell, the Commonwealth government will decide, the people will obey) required such a process. The High-Level Panel told the Chair and CEO of the MDBA that they understood that this was what the Act dictated but that it was the role of senior civil servants to explain that this would not, and could not, work. We were given to believe that there was no appetite for such a message at higher levels in the government in Canberra.

A corollary of this flawed process (and the ideas incorporated into the Act) was that there was very little recourse in the process to the immense, world-leading knowledge of water management that had developed in Australia during the last 20 years. Time and again I heard from professionals, community leaders, farmers and state politicians who had made Australia the widely-acknowledged world leaders in arid zone water management that they were excluded from the process.

<u>Investments in water-saving infrastructure</u>

A major complementary program for implementing the Water Act is the massive water infrastructure program. Indeed, the Honorable Malcolm Turnbull believes that "*the real problem is (not the Water Act) but that the Labor Government has failed to invest in the water-saving*

infrastructure that was the centerpiece of the Howard Government's National Plan for Water Security".

In my visits to Australia I heard a chorus of opposition from economists about what they considered to be program which paid a massive amount for every drop of water saved.

In my perception this program has been badly thought through. The economists are largely right – this is a very expensive way to save water and that many of the investments will be made in areas that will, sooner or later, go out of production.

But they also note that this is a "bribe" to farmers for the implicit breach of contract by the Federal Government. If this is the case, then the question should be approached differently.

For example, it seems highly probable that world food prices will continue to increase sharply in coming decades. Australia has developed great expertise in sophisticated and high-valued agriculture. This national asset is, it would seem to me, to be something that Australia would want to preserve and hone. If there were a clear vision for "the future of Australian agriculture in a changing world", and a clear definition of the areas where Australia has a comparative advantage, then investing in modernization of the Australian agricultural economy might be a high-return use of public funds. This is quite different from a fund for "saving water" – it would be an investment in productivity and an investment in a strategic Australian capability. In my view a plan for water cannot be done in isolation from this complementary bit of strategic analysis.

My conclusion:

Let me first repeat what I said at the beginning of this note. I am an outsider. I am flattered to be asked to share my views with your Commission of Inquiry. I am fully aware that there are likely to be many details that I have not got right. But I have worked on water policy issues in dozens of countries and have developed an instinct for what is central. I may have some notes wrong, but believe strongly that I am playing from the right hymn-book.

My conclusion is stark. I believe that the Water Act of 2007 was founded on a political deception and that that original sin is responsible for most of the detour on which Australian water management now finds itself. I am well aware that unpredictability is an enemy and that there are large environmental, social and economic costs of uncertainty. But I also believe that Australian cannot find its way in water management if this Act is the guide. I would urge the Government to start again, to re-define principles, to engage all who have a stake in this vital issue, and to produce, as rapidly as possible, a new Act which can serve Australia for generations to come. And which can put Australia back in a world leadership position in modern water management.

Yours sincerely