

Senate Rural and Regional Affairs and Transport References Committee

Questions on Notice – Friday, 23 November 2012 CANBERRA, ACT

Inquiry into management of the Murray-Darling Basin

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**SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT
REFERENCES COMMITTEE**

Inquiry into the management of the Murray Darling Basin

Public Hearing Friday 23 November 2012

Questions Taken on Notice – Southern Riverina Irrigators

1. HANSARD, PG 11

ACTING CHAIR: ... Is it possible for us to receive in written form the presentation you referred to earlier?

Mrs Burge: It is possibly better to see it because I think the historic photos explain the issue far better.

Senator NASH: There will probably be a difficulty with getting the committee together at any point in time in the near future for us to do that. While it might not be optimum, with that in mind it might be useful for you to provide it as part of a submission in so far as you can. There might be some very useful information in there but I just do not see our having the capacity to view it as a committee any time soon.

Mrs Burge: I will try to provide it in a format that can be shortened and made understandable in a written and visual form.

ACTING CHAIR: Thank you very much.



Peak body for five landholder associations and 1600 irrigators in the NSW Murray Valley

15th January 2013

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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 - ADDITIONAL INFORMATION

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 prioritises 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, there are environmental outcomes we were trying to achieve and desirable flow regimes that we thought were linked to achieving those outcomes. 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, are actually quite large floods. 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. Even where some of the constraints could be addressed, we still would not achieve those large flow regimes—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.

RIVER HEALTH :

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's 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!!!

Barrages early 1940s before sedimentation



20

Murray Mouth 1949



21

Note: red circle is the early formation of permanent sand island, commencement of vegetation colonisation

Murray Mouth
January 1956



22

Murray Mouth
1966



23

Murray Mouth
Nov 1973 Floods



25

Murray Mouth
February 1988



27

(photos purchased SA Mapland L Burge)

Murray Mouth
March 1995



28

Murray Mouth
January 2001



29

(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”

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.



(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. In 2000, approximately 450GL (450,000 Megalitres) was diverted away from the Coorong directly out to the Southern Ocean.

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.

This rule (condition) is still in place today and thereby limits the amount of local inflows that can flow into the Southern Coorong. 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.

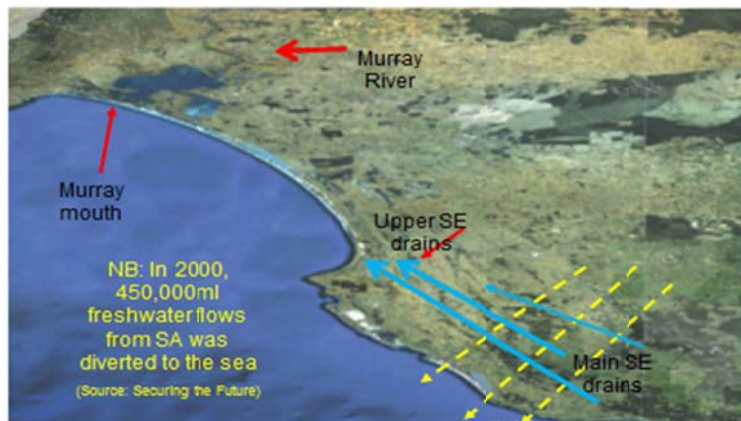
There appears no concerted effort in South Australia to recognise historical flow patterns to the Coorong, or re-establish some level of natural flows from the larger drainage scheme in South East of South Australia. In 2012 a recent public meeting of approximately 200 people in the South East of South 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.

Coorong Traditional inflows...

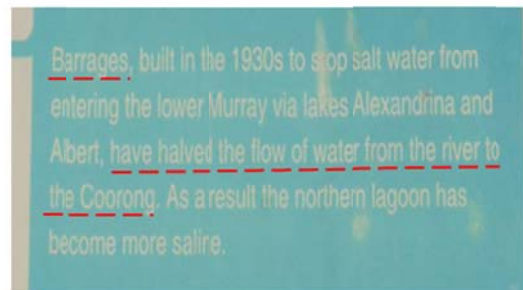


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SOUTH EAST DRAIN



Photo of National Park sign at Coorong includes....



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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.

Murray Mouth January 2011



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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.

**SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT
REFERENCES COMMITTEE**

Inquiry into the management of the Murray Darling Basin

Public Hearing Friday 23 November 2012

Questions Taken on Notice - National Irrigators' Council

1. HANSARD, PG 17

Senator NASH: Finally, could I ask you both: as you get a chance to work more fully through the plan itself, if there is anything further or additional that you can bring to the committee, if you could provide it to us in writing, having had a more thorough look at the plan, that would be really useful.

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Mr Gregson: Of course.

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Mr Gregson: Of course.

Answer:

The NSW Irrigators' Council has advised they 'have nothing further to add'.

**SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT
REFERENCES COMMITTEE**

Inquiry into the management of the Murray Darling Basin

Public Hearing Friday 23 November 2012

Questions Taken on Notice – Wentworth Group of Concerned Scientists

1. HANSARD, PG 32

Senator RUSTON: I have one question, being entirely parochial here: the five-point plan that you briefly alluded to a moment minute ago, the Lower Lakes, Meningie Narrung Lakes Irrigator Association's five-point plan—what is your view on it?

Mr Stubbs: I am not referring to their five-point plan; I am referring to—

Senator RUSTON: I am asking you what your view is on their five-point plan.

Mr Stubbs: I have seen those five points. I cannot recall them in detail, so I would not really want to comment unless I could see them.

Senator RUSTON: Could you take that on notice?

Mr Stubbs: Yes.

**SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT
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Mr Stubbs: I have seen those five points. I cannot recall them in detail, so I would not really want to comment unless I could see them.

Senator RUSTON: Could you take that on notice?

Mr Stubbs: Yes.

ANSWER:

The five point plan deals with specific hydrologic issues related to lake Albert and the Coorong. The 5 point plan proposes a number of engineering actions to be undertaken in the region. The Wentworth Group has not looked in detail at the proposed actions nor seen the technical reports to indicate the outcomes from the proposed actions. A review of these technical reports would be required before a view on the benefits of the proposed actions could be given.

Notwithstanding this the underlying issue still holds true for this part of the system as it does for the whole river system, that is, sufficient water must be returned to the system so that it is able to function effectively as a healthy working river.

**SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT
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Inquiry into the management of the Murray Darling Basin

Public Hearing Friday 23 November 2012

**Questions Taken on Notice – Department of Sustainability, Environment,
Water, Population and Communities**

1. HANSARD, PG 43–44

Senator NASH: ...the federal government does have the capacity to override, if you like, a state's objection to the plan? Is that a fair comment? I will put it differently: the federal government has the appropriate measures to implement the plan if a state decides that it does not want to sign up to it?

Mr Parker: Yes, that is right and I think nobody wants to go there.

Senator NASH: ... As you said at the beginning, you have to plan for contingencies and that is what we do in our job. That makes it really clear, thank you. On notice, could you please explain to the committee what actually makes that happen—what underpins the ability for that through the legislative framework? I am very happy for you not to do that now if you want to provide it on notice, just so we can get a detailed understanding of how that all works.

Mr Parker: It is in the Water Act, so we can provide that.

Senator NASH: That would be terrific.

2. HANSARD, PG 47

Senator XENOPHON: In terms of the criteria, what time frame do you think we are looking at to determine those criteria?

Ms Harwood: That really depends on how the project unfolds. We have not seen the business case or the construct that South Australia is intending to prosecute for that program, so that is something I cannot answer.

Senator XENOPHON: But you are aware of the criticism that the current arrangements and the current fund have been quite problematic for South Australian irrigators, who have already achieved those levels of efficiency in terms of not having open channels, having pressurised pipes and the like?

Ms Harwood: Yes, but I am also aware that there is substantial Commonwealth investment and South Australia has been successful, in open competitive programs across the southern basin, in securing irrigation efficiency investment under the Commonwealth On-Farm Irrigation Efficiency Program.

Senator XENOPHON: Could you provide some details on that, because that is an area of complaint that I get from the Riverland in particular with respect of that particular program? I am not asking you to breach any confidences. In terms of raw figures, how much money and how many projects have been approved in South Australia compared to in the rest of the basin?

Ms Harwood: Yes, I can do that.

3. HANSARD, PG 47

Senator RUSTON: Following on from Senator Xenophon's question, who will actually administer the \$265 million in funding in South Australia once a plan has been agreed between the two organisations, the South Australian government and you?

Mr Parker: I think that will depend on precisely how the business case comes to us and what agreement is reached. The precise issue has not been settled.

Ms Harwood: It comes in two quite distinct components. There is the Murray River Improvement Program, what is colloquially known as the Water Industry Alliance proposal, for \$180 million. That one is in preparation of a business case which is being funded by the Commonwealth. The \$85 million program is more recently conceived and I think that is still very much in the design phase.

Senator RUSTON: Okay. Obviously, where that it is administered is of great concern to the people who are the recipients of the program. I just put that on notice...

4. HANSARD, PG 47

Senator RUSTON: ... Going back to the 650 gigalitres, have any substantive projects been identified so far in relation to that?

Mr Parker: The Commonwealth has funded the states to do a prefeasibility study of 16 projects.

Ms Harwood: Yes, and there are multiple projects inside some of those.

Mr Parker: So there is a large list of those and that information is publicly available. We are happy to provide that to you...

5. HANSARD, PG 48-49

Senator NASH: It is my understanding that there were some taxation issues in the Murrumbidgee that I think the government promised to fix in early 2011 that are impeding the capacity for infrastructure upgrades, potentially leading to more buybacks. Are you aware of this? Can you shed any light on that for me?

Ms Harwood: Yes, there was an issue that arose in terms of taxation matters to do with the Sustainable Rural Water Use and Infrastructure Program, and that had slowed contracting on, in particular, the Private Irrigation Infrastructure Operators Program in New South Wales. The tax office has continued to work on those amendments and it was hoped they would be introduced in this sitting, but it appears now that they will be delayed. This is mostly because of issues that arose in consultation, so the plan is for those to go in early next year. In the meantime, all but one of the delivery partners who we work with in that program, which is in the Murrumbidgee, the Murray and the Macquarie, have signed up, but the Murrumbidgee irrigation have had particular concerns in terms of the tax ramifications for them. We are in discussions with them as to how we might proceed with a contract that works in the absence of yet having certainty on the tax amendments.

Senator NASH: Could you take on notice for me what those issues were within the consultation process that you referred to. Not on notice, why on earth has it taken nearly two years to resolve?

Ms Harwood: I think that question really has to be directed to the tax office and the Assistant Treasurer, but—

...

Ms Harwood: Again, we will take it on notice, but it is a matter for the Taxation Office.

Senator NASH: I understand it is a matter for tax. Do you have any understanding of why it has taken so long? ...

...

ACTING CHAIR (Senator Sterle): You should just take it on notice, Ms Harwood.

**SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT
REFERENCES COMMITTEE**

Inquiry into the management of the Murray Darling Basin

Public Hearing Friday 23 November 2012

**Questions Taken on Notice – Department of Sustainability, Environment,
Water, Population and Communities**

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Mr Parker: Yes, that is right and I think nobody wants to go there.

Senator NASH: ... As you said at the beginning, you have to plan for contingencies and that is what we do in our job. That makes it really clear, thank you. On notice, could you please explain to the committee what actually makes that happen—what underpins the ability for that through the legislative framework? I am very happy for you not to do that now if you want to provide it on notice, just so we can get a detailed understanding of how that all works.

Mr Parker: It is in the Water Act, so we can provide that.

Senator NASH: That would be terrific.

ANSWER: Under Australia's Constitution, Commonwealth legislation will prevail over Basin State legislation to the extent of any inconsistency, provided that legislation has been validly made within the Commonwealth's legislative powers. Section 35 of the *Water Act 2007* (Water Act) requires Basin States to act consistently with the Basin Plan in managing Basin water resources.

The Water Act requires a water resource plan be prepared for each water resource plan area. Where a Basin State fails to prepare a water resource plan that is consistent with the Basin Plan and subject to the procedures set out in section 73 of the Water Act, the Minister may request the Murray-Darling Basin Authority to prepare a water resource plan under section 68 of the Water Act. Such a water resource plan, if adopted by the Minister under section 69 of the Water Act, would prevail over any Basin State water planning arrangements to the extent of any inconsistency.

2. HANSARD, PG 47

Senator XENOPHON: In terms of the criteria, what time frame do you think we are looking at to determine those criteria?

Ms Harwood: That really depends on how the project unfolds. We have not seen the business case or the construct that South Australia is intending to prosecute for that program, so that is something I cannot answer.

Senator XENOPHON: But you are aware of the criticism that the current arrangements and the current fund have been quite problematic for South Australian irrigators, who have already achieved those levels of efficiency in terms of not having open channels, having pressurised pipes and the like?

Ms Harwood: Yes, but I am also aware that there is substantial Commonwealth investment and South Australia has been successful, in open competitive programs across the southern basin, in securing irrigation efficiency investment under the Commonwealth On-Farm Irrigation Efficiency Program.

Senator XENOPHON: Could you provide some details on that, because that is an area of complaint that I get from the Riverland in particular with respect of that particular program? I am not asking you to breach any confidences. In terms of raw figures, how much money and how many projects have been approved in South Australia compared to in the rest of the basin?

Ms Harwood: Yes, I can do that.

ANSWER: For Rounds 1 and 2 of the On-Farm Irrigation Efficiency Program:

Area	Number of sub-projects	Funding GST inclusive as at most recent variation	Funding GST exclusive as at most recent variation
Sub-projects in South Australia	127	15,022,629.93	13,656,936.30
Sub-projects in remainder of Basin	722	214,477,257.17	194,979,324.70
TOTAL	849	229,499,887.10	208,636,261

3. HANSARD, PG 47

Senator RUSTON: Following on from Senator Xenophon's question, who will actually administer the \$265 million in funding in South Australia once a plan has been agreed between the two organisations, the South Australian government and you?

Mr Parker: I think that will depend on precisely how the business case comes to us and what agreement is reached. The precise issue has not been settled.

Ms Harwood: It comes in two quite distinct components. There is the Murray River Improvement Program, what is colloquially known as the Water Industry Alliance proposal, for \$180 million. That one is in preparation of a business case which is being funded by the Commonwealth. The \$85 million program is more recently conceived and I think that is still very much in the design phase.

Senator RUSTON: Okay. Obviously, where that it is administered is of great concern to the people who are the recipients of the program. I just put that on notice...

Answer: Up to \$180 million has been set aside, subject to due diligence, for the River Murray Improvements Program. A business case for the River Murray Improvements Program will include South Australia's proposed administration arrangements. A final business case is due by the end of January 2013. The proposal (including administration arrangements) will then be subject to Commonwealth due diligence assessment.

A further \$85 million has been committed to South Australia for research, regional development and industry redevelopment. The additional funding will be the subject of a separate business case to be prepared by the South Australian Government and a separate Commonwealth due diligence assessment. The funding will be provided to the South Australian Government under National Partnership Agreement arrangements.

The Commonwealth's preference is that all relevant activities be delivered through the South Australian Government.

4. HANSARD, PG 47

Senator RUSTON: ... Going back to the 650 gigalitres, have any substantive projects been identified so far in relation to that?

Mr Parker: The Commonwealth has funded the states to do a prefeasibility study of 16 projects.

Ms Harwood: Yes, and there are multiple projects inside some of those.

Mr Parker: So there is a large list of those and that information is publicly available. We are happy to provide that to you...

Answer: The Commonwealth is funding \$10 million for the 'Environmental Works and Measures Feasibility Program' in four basin states. The program funding commenced in October 2011 and results of these investigations are scheduled for completion between February and July 2013.

Scope;

- a) investigate 17 State identified projects to at least feasibility stage
- b) investigate community identified projects in four states to at least pre-feasibility stage

NSW - \$3.2 million
1. Euston Lake restoration and improved water efficiency
2. Upper Murrumbidgee environmental flow enhancement
3. Nimmie-Caira System Enhanced Environmental Water Delivery
4. Piping Irrigation Demands
5. Burrendong Dam
6. Southern Macquarie Marshes
7. Investigation into efficient delivery of high priority stock and domestic supplies
8. Modify weirs enhance floodplain inundation
9. State led community engagement projects (Nine projects shortlisted for further investigation)
Victoria \$ 3.2 million
10. Watering the Lindsay Island floodplain sub-project
11. Watering the Wallpolla Island floodplain sub-project
12. Watering River Red Gum sites along the Murray sub-project
13. Watering black box wetlands in Gunbower forest sub-project
14. Watering the Hattah Lakes - Chalka Creek North sub-project

15. State led community engagement project (Four projects shortlisted for further investigation)
South Australia \$1.8 million
16. Katfish Reach and Pike Implementation (Stage 3)
17. Eastern Mount Lofty Ranges Low Flow Bypasses
18. Implications for environmental water delivery SDL adjustment investigations
19. State led community engagement project (Six projects shortlisted for further investigation)
Queensland \$1.8 million
20. Queensland Murray Darling Basin Environmental Works and Measures project
21. State led community engagement projects (Two projects shortlisted for further investigation)

5. HANSARD, PG 48-49

Senator NASH: It is my understanding that there were some taxation issues in the Murrumbidgee that I think the government promised to fix in early 2011 that are impeding the capacity for infrastructure upgrades, potentially leading to more buybacks. Are you aware of this? Can you shed any light on that for me?

Ms Harwood: Yes, there was an issue that arose in terms of taxation matters to do with the Sustainable Rural Water Use and Infrastructure Program, and that had slowed contracting on, in particular, the Private Irrigation Infrastructure Operators Program in New South Wales. The tax office has continued to work on those amendments and it was hoped they would be introduced in this sitting, but it appears now that they will be delayed. This is mostly because of issues that arose in consultation, so the plan is for those to go in early next year. In the meantime, all but one of the delivery partners who we work with in that program, which is in the Murrumbidgee, the Murray and the Macquarie, have signed up, but the Murrumbidgee irrigation have had particular concerns in terms of the tax ramifications for them. We are in discussions with them as to how we might proceed with a contract that works in the absence of yet having certainty on the tax amendments.

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Ms Harwood: Again, we will take it on notice, but it is a matter for the Taxation Office.

Senator NASH: I understand it is a matter for tax. Do you have any understanding of why it has taken so long? ...

...

ACTING CHAIR (Senator Sterle): You should just take it on notice, Ms Harwood.

Answer: Waiting on the Assistant Treasurer for response and will be forwarded to the Committee upon receipt.

**SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT
REFERENCES COMMITTEE**

Inquiry into the management of the Murray Darling Basin

Public Hearing Thursday 23 August 2012

Questions Taken on Notice – Murray-Darling Basin Authority

1. HANSARD, PG 45

Senator XENOPHON: I think Ms Dickson is familiar with the critique of the Wentworth Group of Concerned Scientists, and I would be grateful if she could respond to their claims or concerns in relation to the way that groundwater is treated in the context of this plan.

Dr Dickson: I might start with an overview addressing the main concern and then talk about some of the detail following Senator Nash's question of how each of the individual groundwater aquifers are being treated. The Wentworth Group have characterised groundwater as if it were one whole combined pool that was all directly linked to surface water. That is very simplistic and wrong—that is not how the system works and there is no feint of hand in robbing Peter to pay Paul, as you expressed it, Senator Xenophon.

There are 66 different aquifers that have been assessed. I will have to get Dr McLeod to give me the details, but for most of the aquifers that are highly connected to surface water—a lot of the alluvial aquifers—there is no increase in the diversion limit. The baseline diversion limit is determined and then the sustainable diversion limit is the same as that—there are a couple where it is a little bit lower; there is one up in Queensland.

There are a lot of other aquifers that have very little connection, or no connection in the case of some fossil aquifers, with surface water, so there are different issues to consider. The issue of recharge is a key consideration in determining the sustainable limits of those. The simplistic point that is being made is just not correct and does not have any grounding in science. It is just a simplistic expression of how the system works. Dr McLeod can talk about the individual aquifers and the factors determining their sustainable limits.

Senator XENOPHON: I am conscious of the time, so could Dr McLeod provide something on notice in relation to that? That might be useful in the context of the debate coming up next week.

Dr Dickson: Okay.

**Senate Rural AND REGIONAL Affairs and Transport
References Committee
Inquiry into the management of the Murray Darling Basin
Public Hearing Friday 23 November 2012**

**Murray-Darling Basin Authority response to correspondence from
Senator Nick Xenophon to Senator the Hon Bill Heffernan**

Question 1

As a result of this exchange (between Senator Xenophon and Mr Cosier and Mr Stubbs of the Wentworth Group of Concerned Scientists) I requested that Dr McLeod provide a response on notice to the issue of individual aquifers and the factors determining their sustainable limits

Answer

The Murray-Darling Basin Authority developed the groundwater sustainable diversion limits (SDLs) to reflect an environmentally sustainable level of take. To meet the environmentally sustainable level of take requirements for groundwater, the Authority determined that a groundwater SDL must:

- maintain key environmental assets that have any dependence on groundwater;
- maintain base flow groundwater contributions to rivers and streams (connectivity);
- ensure that productive use of the aquifer is sustainable without compromising the hydrogeological integrity of the aquifer; and
- protect against decreasing groundwater quality, in particular salinisation of the groundwater resource

Each of these criteria was considered when the SDLs for the 66 individual groundwater SDL areas were determined. The 66 SDLs can be categorised as:

- 1 area, the Upper Condamine Alluvium in Queensland, where a reduction in diversion limit is required;
- 34 areas where SDL has been set at the baseline diversion limit, ensuring there is no impact on surface water resources above the baseline in these systems; and
- 31 areas where additional groundwater use can occur without impacting on the sustainability criteria.

The Authority used a precautionary approach in the specification of the groundwater SDLs in the Basin Plan and has also published its consideration of the issue of surface groundwater interactions and related factors. Further information can be found in the Authority's July 2012 *Addendum to Groundwater Methods Report*, located at

<http://download.mdba.gov.au/revised-BP/Addendum-to-Groundwater-Methods.pdf>.

The Authority strongly refutes the statements by Mr Cosier at the public hearing on 23 November 2012 that the Basin Plan “proposes an increase in extraction of groundwater by 1,700 gigalitres” and “potentially 1,700 gigalitres being taken from the river”. The Basin Plan sets the Basin wide groundwater baseline diversion limit (BDL) at 2,386 GL/y, which reflects a more accurate determination of the potential extraction under current planning arrangements than the estimate of the BDL as at late 2010 which appears to inform Mr Cosier’s remarks. The Basin wide groundwater SDL of 3,334 GL/y allows for an additional 984 GL/y of overall groundwater use above the groundwater baseline.

In relation to the potential impact on surface water of the increase in groundwater use permitted under the Basin Plan above the BDL, the Authority’s July 2012 *Addendum to Groundwater Methods Report* (p10) relevantly states:

“In regards to the issue of the potential impact of groundwater extraction on surface water resources the MDBA has calculated that the unassigned groundwater assessment for the revised draft Basin Plan (28 May 2012) has a potential reduction in surface water resources from unassigned groundwater extraction in the Lachlan Fold Belt and Highland unassigned systems of between 29 and 58 GL/y. It is essential to note the time span of the potential impacts can vary from a few years to hundreds of years and in some cases may never be realised. Mindful of this context, the MDBA is of the view that this is an acceptable risk”.

The groundwater SDL revisions since May 2012 do not change the scale of the Authority’s assessment undertaken for the revised draft Basin Plan.

Question 2

I would also appreciate if Dr Dickson could explain her statement that “(there) are a lot of other aquifers that have very little connection, or no connection in the case of some fossil aquifers, with surface water...” and quantify what “a lot of other aquifers” are (emphasis added).

Answer

As part of the determination of groundwater SDLs the Authority has categorized the level of connectivity between surface and groundwater resources as high, medium or low. There are 30 of 66 groundwater SDL areas where the connectivity level has been classified as low. Further information on how the Authority considered connectivity in determining the groundwater SDLs can be found in the Authority’s April 2012 *The proposed Groundwater Baseline and Sustainable Diversion Limits: methods report* located at <http://www.mdba.gov.au/files/Proposed-BP-GW-BDL-SDL.pdf>