

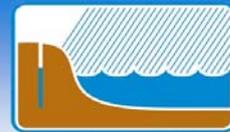


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### THE BASIN PLAN

Paul Dalby, In Fusion Consulting

The [Guide to the Basin Plan](#) is a proposal by the Murray Darling Basin Authority for community discussion on how to restore the health of the [Murray Darling Basin](#). The Plan is a requirement under the Water Act (2007), and is in response to widespread community concern about the state of health of river systems in the Murray Darling Basin in Australia that has been growing for a decade.

There can be no argument that the MDB is in a state of poor ecological health. A [Sustainable Rivers Audit](#) in 2008 demonstrated that the ecological health of the Basin was mostly "Poor" or "Very Poor". The Lower Lakes at the end of the system were at risk of turning to [acid](#) on a large scale. An internationally important wetland for migratory birds – the Coorong – has changed its [ecological character and bird populations are collapsing](#). The total flow at the Murray Mouth has been reduced by 61% which means that the river now ceases to flow through the [mouth 40% of the time compared to 1%](#) of the time in the absence of water resource development. There are high levels of salinity built up along the floodplain at the lower end of the River, and important wetlands along the Murray and Darling Rivers are in a poor state of health. There are a number of [fact sheets](#) prepared by CSIRO on some of the economics and science that has supported the need for the Basin Plan.

Over the same period, irrigation communities have also been doing it tough. During the drought over the last decade, water storages were run down to the point that there was no longer water in the system to support water extractions and allocations began to be cut. It is one of the great triumphs of Australian inventiveness and determination that irrigation industries managed to survive through these times. A mix of clever science, an ability to trade water, on-farm innovation and sheer guts got many irrigators through what could have been a decimation of irrigation across the Basin. This is not to say that communities in the region have not experienced real stress and pain, and that some individuals did not have to make realistic decisions to leave their businesses. I am simply dipping my hat to what I think is an extraordinary achievement.

The environmental, economic and social stress over the last ten years has common causes. The

[drought was long and severe](#), and this compounded a problem of over-allocation of water across the Basin. It is important to recognise that the River stopped flowing at its Mouth in 2002, before the severe drought hit the region. Water had been allowed to be allocated by the government well in excess of the ability of the River system to support them. The powers given to the Murray Darling Basin Commission seemed to be insufficient to stop this behaviour, and as a result, some river catchments in the Basin have become [over-allocated](#). Peter Cullen summarised the problems neatly in [his paper](#) in 2007.

Putting more water back into the River system is paramount if we want greater certainty for irrigators and healthy river systems that we can all enjoy. Tourism is a major employer in the Basin, and a ugly, sick waterways, and saline floodplains covered with dead trees attracts few visitors. However, I can understand the fear and anger of rural communities who live in the Basin as a result of the proposal put forward by the MDBA. This problem is not of their making. It is government who makes decisions on water allocations. It is the Opposition in Parliament that holds Executive Government to account. It is the Media's role to interrogate and investigate government decisions and make sure the community understands what is going on. And it is every citizen's role to hold governments to account and demand good governance or sack the incumbent. In my view, it is our collective failure as Australians that has put us in the position where we need a Basin Plan. It is our collective responsibility to find a way to restore the health of the Murray Darling Basin river systems in a way that does not unduly punish the innocent.

I am not pretending that there are any easy answers here. This is going to be difficult, and will require lots of discussion. The reason it will require lots of discussion, is that we all need to inform ourselves of all sides of the debate. We need to hear and weigh up alternative solutions that are put forward and see if we can find a consensus about how to move forward. Given the tenor of some of the starting positions of they key lobby groups, this may seem a long way off. I am hopeful that these are early starting positions that can mellow over time in the interests of negotiating a win:win outcome.

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## THE BASIN PLAN

Paul Dalby, In Fusion Consulting

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In the late 1980's, farming groups and conservation groups came together to address what was then a crisis in dryland salinity and soil degradation. Landcare was formed as a united front for farmers and conservationists who saw that they had more in common than they had differences. The result was a clear mechanism for government to assist and support farmers to better manage their land and protect our common natural resources, and cooperation between farmers and conservationists (who in many cases ended up being the same people).

The same opportunity exists now. A healthy River system is in the interests of all Australians. Prosperous and happy communities in the Basin creates wealth and opportunities for all Australians. Can we work together to achieve these two outcomes? We have time to think this through. The Basin Plan is not adopted until the end of 2011 and will not be implemented fully until 2019.

I would like to challenge some of the assumptions of the current debate.

1. Less water means less wealth or less jobs? Perhaps, or it could mean different industries requiring different skills. Are there crops that produce higher profit with less water and more labour? Or different industries altogether? With a major research

and investment effort, could we transform agriculture and industry in the region into one that is smarter, more efficient and more profitable?

2. Irrigation is the only driver of the economy in the MDB? It is a major driver, but there is also tourism, services, mining etc. The National Broadband Network will open up massive opportunities for regional communities to attract new businesses and be more entrepreneurial. How can we harness these opportunities to help regional communities thrive?

3. This is about food security? I don't think so. Our export sectors will be surely hit (cotton, rice and dairy) and the prices of some food will go up (dairy in particular). Horticultural crops will not be hit that hard according to the MDBA. We should also be able to work out how to grow more food with less water through research and innovation.

4. This is about the city vs. the country. The city is not against the people in the country. It is for a healthy river system. It is also for a prosperous rural economy and will be willing to pay the price for buying back water to fix past mistakes and to restructure the economy with money for training, research and infrastructure.

5. Putting water back into the River is only good for the greenies. I'm really not an expert here, but my simple

maths says that if there is more water in the River, there is more water available during the tough times. This means more certainty for irrigators not less. It means being able to get through the dry times with less cuts to allocation. I could be wrong. I would be interested in other views.

6. The Lower Lakes are just evaporation basins and should be filled with seawater. I have heard many ideas on how to fill the Lower Lakes with seawater to reduce evaporation and save water. This seems like a sensible idea on the surface, but the environmental and economic costs just make it untenable as far as I can make out. The financial costs are much more expensive than saving water through efficiencies upstream and environmentally, any analysis I have seen suggests it would be a catastrophe.

I would encourage you to read the Executive Summary of the Basin Plan at the very least. Remember, this is a proposal at this stage. Your input could make a difference. Have your say and get more information: Murray Darling Basin Authority [www.mdba.gov.au](http://www.mdba.gov.au), 1800 230 067, or email [engagement@mdba.gov.au](mailto:engagement@mdba.gov.au)

*Paul's summary of the Basin Plan, and links to further information relating to this article feature in his more comprehensive blog post at <http://blog.litfuse.com.au/2010/10/09/the-basin-plan/>.*

## RECENT DEVELOPMENTS AND APPLICATIONS OF HYDROLOGICAL MODELLING TECHNIQUES IN THE MURRAY-DARLING BASIN: HYDSOC SA WORKSHOP

Bob Newman

On 1st September, a modelling workshop was held at the SARDI Plant Research Centre auditorium, jointly sponsored by Hydrological Society of SA and eWater CRC. More than 70 people attended. Nine eminent speakers presented on a broad range of modelling topics. The workshop finished with a panel discussion session.

The following summary of the day

will remind those that attended of the topics presented and provide those that could not attend with a sample. The presentations will be available on our website and contact details for each of the presenters will enable you to follow up individually if you require. As the Guide to the Murray Darling Basin Plan had yet to be released, the workshop focused on the modelling techniques rather than the specific outcomes for the plan.

Two of the presenters were unavailable on the day but were adequately replaced by alternatives. Pradeep Sharma stood in for Dr Tony McLeod from the Murray Darling Basin Authority and Dr Russell Crosbie (CSIRO) stood in for Dr Mark Littleboy.

**Strategic needs in the Murray-Darling Basin**  
Pradeep Sharma (MDBA)

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## RECENT DEVELOPMENTS AND APPLICATIONS OF HYDROLOGICAL MODELLING TECHNIQUES IN THE MURRAY-DARLING BASIN: HYDSOC SA WORKSHOP

Bob Newman

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*Pradeep Sharma is Principal Modeller with Murray Darling Basin Authority and has over 30 years experience in water resources Planning and Management in Australia and India.*

Pradeep set the scene by describing the requirements of hydrological models that the Authority relies upon. These include:

- DSS's which integrate hydrology, ecology and socio-economic attributes,
- analyses in both spatial and temporal scales
- Eco hydrological modelling
- Optimisation and other system analysis tools
- Operationalising existing research
- Short to medium term flow forecasting
- Salinity – Flow and salt mobilisation relationships
- Risk and uncertainty analysis

An increasing emphasis on the broader range of resource management decisions has necessitated a rapid migration towards a complex and integrated suite of models to deliver a diverse range of outcomes over both short and longer term time frames. The following speakers brought out individual components of the modelling suite.

### Overview of modelling requirements in the MDB

Dr Peter Wallbrink (eWater CRC)

*Peter is the Executive Manager, River systems/Catchment and Climate for the eWater CRC. Peter has a wide background in forest hydrology, soil erosion, sediment transport and catchment processes, with over 100 peer-reviewed scientific publications.*

The eWater CRC operates with 45 partners from industry and research sources. The focus of the program is to develop a nationally consistent modelling base to support the 21st-century suite of water resource management issues. It was acknowledged at the outset that some of the

traditional hydrological models were reaching their 'use by date'. A series of modelling tools is under development and some have already been released. The tools cover both rural and urban situations and are capable of delivering outcomes at a range of scales and timeframes.

The eWater modelling platform allows for standardisation of configurations together with customisation to meet specific needs. The modelling suite covers catchments, rivers and urban situations.

Peter provided a summary of the Source Rivers platform, a national river system modelling platform providing suitable for both planning and operations and fit for purpose applications across the jurisdictions. Peter described the trialling of the functional components in four catchments across the Murray Darling Basin. Further details are available on the eWater website.

### River Operation Models Andy Close (MDBA)

*Andy Close manages the Water Resources Group in the Murray-Darling Basin Authority and has a career's experience of modelling the southern Murray Darling Basin system*

The first models were developed more than 100 years ago and have been influential in some very significant decisions for the Basin:

1902	Manual modelling of Cumberbarooa Storage 1891-1902
1965	The River Murray Model – Dartmouth Vs Chow illa dam sites
1975	Salinity models
1982	Water Accounting
1988	Salinity and Drainage Strategy
1995	The Cap on diversions
2000's	Environmental Flows (The Living Murray)
2008	Sustainable Yields Study
2009/10	Basin-wide modelling for Basin Plan

The Authority now has a comprehensive modelling framework that links together the tributary models with a monthly simulation model (MSM) and a daily flow and salinity model (BIGMOD). A range of post processing tools enables an analysis of hydrological environmental indicators. The modelling suite is used for long-running water resource planning over 114 years, short-term planning 1 to 5 years starting with current conditions, flow and salinity forecasts up to 6 months ahead.

The modelling suite is well calibrated for flow and salinity relying upon a vast database. It provides for:

- Water Resource Assessment
- Sharing water between States
- Allocating water to users
- Demand estimation
- Ordering water from storages
- Storage Operation
- Environmental flow rules
- Flow and Salinity Routing
- Water Accounting

Andy provided some case studies of the application of the modelling suite including analysing reliability of supply, matching demand to supply, comparing different 'water products', water accounting, salinity accounting, annual compliance reporting of the implementation of the Cap on diversions and climate change scenarios. The management of the Basin would be impossible without the models. .

### Recharge and runoff prediction – planning for climate change

Dr. Russell Crosbie

*Russell Crosbie is a Research Scientist with CSIRO Land and Water. He has been actively involved in the evaluation of recharge processes under different climate change scenarios for the Murray-Darling Basin Sustainable Yields and related projects.*

Aside from the allocation of water for the environment, planning for climate change is the big current issue. Russell has been undertaking the con-

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## RECENT DEVELOPMENTS AND APPLICATIONS OF HYDROLOGICAL MODELLING TECHNIQUES IN THE MURRAY-DARLING BASIN: HYDSOC SA WORKSHOP

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version of the International Global Climate Models (GCMs) into practical run-off and recharge predictions with particular emphasis on the implications for the Murray Darling Basin. The work involves downscaling from the various global climate models to the basin and ultimately to individual tributary catchment scales. A probabilistic approach is used to weight the selection of the validity of the GCMs to Australia and the Basin. Three approaches are available; simple scaling methods involving adjustments to the historical series, stochastic methods and deterministic methods.

Russell provided an indication of the projections for run-off and recharge for a 2030 global warming scenario for possible wet / median / dry futures. These scenarios were applied to shorter term 15 year blocks of the 112 year record. This provides planners with credible scenarios for the consideration of water availability within the long-run planning regimes.

### Setting Groundwater Extraction Limits

Stuart Richardson (SKM)

*Stuart Richardson is a Principal Hydrogeologist with SKM. He has been involved with a range of projects related to the estimation of sustainable groundwater yield, development of water allocation policy and assessment of the water needs of groundwater dependent ecosystems.*

Stuart described the evolution of groundwater allocation approaches from a 'safe yield' philosophy to 'sustainable yield' and now to 'acceptable yields'. The increasing recognition of the value of stakeholder engagement allows for the incorporation of societal values into a decision-making process. The principles of sustainability can be incorporated with quantifiable parameters. Resource Condition Limits can be addressed through a range of indicators such as rate of drawdown, changes in water quality, impacts

upon neighbours and, more recently, the inclusion of groundwater dependent ecosystems.

The stakeholder engagement process necessarily involves longer timeframes in order to bring all stakeholders to a higher level of understanding. Groundwater modellers need to provide information in a very transparent manner. Stuart used several case studies to illustrate the engagement process enabling a more robust decision-making outcome, albeit it not always as successful as might be desired.

### Groundwater - surface water interactions

Ian Jolly (CSIRO/eWater CRC)

*Ian Jolly is the leader for the groundwater - surface water interactions group for the eWater CRC. He has a wide background in the study of groundwater recharge and discharge processes in semi-arid catchments, and their implications for plant-water use and salinisation processes.*

Ian reminded us that groundwater currently provides for 16% of the total water use in the Murray Darling Basin and that this has grown dramatically since the introduction of the 1995 Cap on surface water diversions and could double by 2030. One quarter of all groundwater use will be directly sourced from the induced streamflow leakage. This has impacts on riverine ecology, downstream surface water supplies and the potential for double allocation of streamflow.

The interaction between surface water and groundwater is now formally incorporated into the water planning arrangements and this has involved a paradigm shift for the hydrologic and hydrogeologic management disciplines.

The eWater modelling suite will explicitly recognise the groundwater surface water interaction processes through the introduction of groundwater/surface water interaction tools. These interaction tools draw upon specific modelling frameworks such

as numerical groundwater models (e.g. MODFLOW) and are not intended to replace them where they are justified.

In the Source Catchments platform the tool incorporates features of PERFECT and GWLag based upon a GIS parameterisation of the sub catchments, soils, land-use and groundwater functions. In the Source Rivers platform, interaction is incorporated through individual reach based (node to node) linked groundwater and surface water attributes, which can handle both gaining and losing connections. The tools can incorporate groundwater pumping, diffuse recharge, irrigation and flood induced recharge, bank storage exchange and evapotranspiration. This increased functionality enables improved catchment scale calibrations and predictions of base flow and how it might be affected by climate change, land use change and groundwater developments. Water accounting can now explicitly incorporate the groundwater surface water exchange fluxes rather than leaving them as unaccounted losses/gains.

### Eco-hydrology

Ian Overton CSIRO

*Ian Overton is the Leader of the Environmental Water Stream within the Water for a Healthy Country National Research Flagship in CSIRO. He has over 15 years experience in ecology, hydrology and spatial information science with particular expertise in spatial modelling of environmental systems and the Murray-Darling Basin. He is currently undertaking a fellowship with NWC which is taking him around the globe.*

The modelling of ecosystem response to hydrological changes is a fast emerging discipline that is increasingly important to the imminent decisions needed across the Basin. Eco-hydrology modelling can inform the determination of ecosystem water requirements and environmental water management decisions. Floodplain systems provide for multiple habitats but are highly complex and

## RECENT DEVELOPMENTS AND APPLICATIONS OF HYDROLOGICAL MODELLING TECHNIQUES IN THE MURRAY-DARLING BASIN: HYDSOC SA WORKSHOP

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variable with hydrology being the main driver.

Ecosystems have adapted to the natural hydrological regimes which have since been greatly altered. Ecologists have provided a wide range of ecology/flow hypotheses which influence the productivity of elements of the food chain including biogeochemistry, plankton, macro invertebrates, fish, birds, and aquatic vegetation.

Within the Murray Darling Basin lowland systems, the ecological responses can be related to inundation levels which correlate to a range of historic flow bands but which can be simulated by future interventions other than flow. Ecological thresholds are related to timing and extent of inundation. This provides a basis for predicting the response of ecological systems to future changes in flow regimes resulting from water allocation and environmental flow decisions. The ability to inform management decisions over both the short term and long term involving real time management of environmental allocations coupled with the natural events is a significant challenge.

The eWater CRC is developing a suite of eco-hydrology decision support tools including Eco-Modeller and Eflow predictor. These build upon some earlier products such as MFAT (CSIRO) and IBIS (ANU).

These tools are being used to inform options for the 18 major icon wetlands sites across the Murray Darling Basin. Over recent years there has been a significant gathering of the basic information that enables these models to function. This includes satellite imagery of past flood events, hydraulic models, LiDAR terrain models, flooding extent, depth and volume, wetland surface areas and depth, structural changes to habitats. The MDB FiM (Flood Inundation Model) couples flood mapping and eco-hydrological classification attributes.

The use of these models provides a clearer picture of the ecosystem objectives; what are we trying to achieve; how much environment can we afford?

### Hydrodynamic exchange models

Dr Ian Webster (CSIRO)

*Ian is a Senior Principal Research Scientist with CSIRO Land and Water. His main activities in recent years include the investigation and modelling of the interactions between the physical, chemical and biological processes in lakes, rivers, and estuaries leading to algal blooms and water quality degradation.*

Ian provided us with a Coorong case study of the response of a coastal lagoon to freshwater inflows. The Coorong can be conceptualised as an inverse estuary; it comprises interconnected North and South lagoons which have been particularly stressed over the past two decades.

A hydrodynamic model has been developed which simulates water levels and salinity in response to river inflows, barrage discharges sea level changes in flows from the South-East Drainage System. The model has been used to simulate dredging of the Murray mouth and the potential change flow regimes at the barrages. Salinity is a critical factor for the ecosystem response together with water level fluctuations, water quality (nutrient and turbidity). The biological attributes include birds, fish, macrophytes, invertebrates. The model derives 8 ecosystem states, four in each lagoon. The model has been used to simulate the current baseline conditions, synthesised historic natural conditions and a range of future conditions based upon climate change scenarios.

### Socio – economic analyses

Dr Jeff Connor (CSIRO)

*Jeff is an ecological economist and environmental policy analyst with CSIRO Ecosystem Sciences. His research activities include the evaluation of the eco-*

*nomics of policy options to market acquisition of water for the environment and the evaluation of adaptation and structural adjustment for an irrigation sector facing reduced water supply.*

The forthcoming Basin Plan is obliged, under the Water Act 2007, to optimise triple bottom line outcomes. It needs to do this using the best available scientific knowledge having regard for the National Water Initiative. The challenge for natural resource management economists is to provide information on:

- The consumptive use values including both irrigation and urban water
- The cost implications of water quality (salinity, blue green algae, thermal pollution)
- amenity and recreational values and other non-consumptive values
- the optimisation, net benefits, accounting for risks and variability

Jeff illustrated his presentation with examples from urban water supply in Adelaide drawing from a range of water sources include the River Murray benchmarked against the cost of supplementing water supply. This included an assessment of the reliability profiles across a range of supply source combinations.

A rural case study, using the Torrumbarry Irrigation Area in Victoria, illustrated an asset based approach to regional adaptation strategy under changes to water use driven by reallocation of water to the environment or potential climate change. This case study also included the issue of salt export on both local and basin scale assets. The study provided information on ecosystem service values including productive agriculture, environmental flows, recreation and amenity and instream river salinity.

Jeff examined opportunities to harness both private and public investment using market forces and recognising the value of multiple benefits. Local government offers opportunities to bring in high-value private investment adapted to local needs.

## RECENT DEVELOPMENTS AND APPLICATIONS OF HYDROLOGICAL MODELLING TECHNIQUES IN THE MURRAY-DARLING BASIN: HYDSOC SA WORKSHOP

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NRM economists can inform communities on the implications of choice for change and reconfiguration which is going to be essential under the likely Basin Plan.

### Where to?

Future opportunities Forum participants / Panel

Following the presentations at panel forum was held with the following key themes being identified:

- Societal values have changed dramatically
- An adaptive management approach is preferred (learning by doing)
- The interactions between hydrology ecology and productivity is a challenge for modellers
- It is important to maintain the

modelling capability within the calibration range rather than ambitiously extrapolate too broadly

- There remains a wide range of models and for local catchment managers/operators this presents a dilemma. Which is the best model to use? - It is understood that eWater might develop a practical guide to the application of different models.
- Models need to be explicitly 'fit for purpose' – a particular purpose; the notion of a 'holy grail' single model for the basin is premature!
- The concept of a series of catchment/rivers/eco-hydrology/groundwater interlinked models such as being developed through eWater and platforms that might be adopted across the jurisdic-

tions is particularly attractive.

- Model development inevitably interacts with the politics/policy agendas. How long might it take for this new series of models to be accepted. There is a tendency to hang on to working models beyond their use by life. No doubt the migration to the new suite of models will take a decade. Accordingly, it will be necessary for eWater or some ongoing multi-agency organisation to maintain a technical service provision throughout the transitional period.
- Beware of the risk of models reflecting the individual bias of modellers (different outcomes can be delivered using the same tools!)
- Being called Ian is not a prerequisite for an eminent hydrologic modeller – but it helps!

## UPCOMING EVENTS

**ozwater'11**  
09 - 11 may 2011 • adelaide

Australia's National Water Conference and Exhibition—<http://www.ozwater11.com.au/>



### 'Water for Health: Towards Sustainable Practices'

On behalf of the Australian Water Association (AWA), we invite you and your organisation to be part of Australia's most important annual event for the water industry to be held at the Adelaide Convention Centre, South Australia from 9 to 11 May, 2011.

Ozwater is an event like no other, organised by the industry for the industry where the issues that drive the industry are discussed and future directions decided. Ozwater '11 will address the wide ranging issues that face the water industry today. These include major national water reforms, climate change and its impacts, techno-

logical advances and the challenges of human resources to name a few.

The Ozwater '11 Conference will feature inspirational international and national keynote speakers, numerous invited speakers, scientific and technical papers, case studies, workshops and electronic poster sessions.

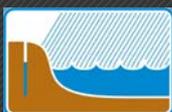
This will be a water industry opportunity like no other to network and engage with industry leaders and experts from all over Australia.

As well as an international standard 3 day conference, a major component of the event will be the extensive Ozwater '11 Trade Exhibition that will showcase the best of what the industry has to

offer. Exhibiting organisations from around the world will display products, services and innovations will participate in this world standard exhibition. In addition to the conference delegates, it is anticipated that thousands of trade visitors will attend the free exhibition. An exciting floor plan layout will ensure the maximum interaction of exhibitors, delegates and trade visitors.

There will be extensive multi-level networking and social activities that will offer the opportunity to engage leaders and industry experts on an individual basis and discuss and share issues important to you. No other water industry event in Australia receives the support or promotion as does Ozwater.

## CONTACT HYDSOC



<http://www.hydsoc.org>

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## MEDIA WATCH

### Murray-Darling Basin Plan Angers Australian Farmers

A government plan to reduce irrigation diversions has farmers up in arms. Residents of Australia's Murray-Darling River Basin reacted angrily this week to the proposed water cuts outlined in a newly released guide management plan for the basin.

<http://www.circleofblue.org/waternews/2010/science-tech/environment/murray-darling-basin-plan-angers-australian-farmers/>

### Guide to the proposed Basin Plan: have your say

MDBA has released the Guide to the proposed Basin Plan for community discussion and feedback. Feedback received before the end of November will be considered during the drafting of the proposed Basin Plan, which will be released in 2011.

<http://www.mdba.gov.au/communities/latest-news/have-your-say>

### Call to raise the bar on Murray-Darling Basin water reform

National Water Commissioner Ms Chloe Munro called for wider ranging and more rigorous reporting on delivering the water reform actions agreed to under the \$3.7 billion Commonwealth-State Water Partnerships Agreements.

<http://www.nwc.gov.au/www/html/2926-call-to-raise-the-bar-on-murray-darling-basin-water-reform.asp?intSiteID=1>

### Study: Overpumping Draws Down the World's Groundwater Reserves

Much of the global groundwater pumped out of aquifers for household use and irrigation ends up in the world's oceans, depleting the aquifers faster than they can be replenished, a new study published in Geophysical Research Letters shows.

<http://www.circleofblue.org/waternews/2010/world/study-overpumping-draws-down-the-worlds-groundwater-reserves/>

### Reduced Dredging Operations at the Murray Mouth

Minister for the River Murray Paul Caica today announced dredging operations in the Murray Mouth have been reduced for the first time in more than eight years.

<http://www.ministers.sa.gov.au/images/stories/mediareleasesNOV10/murray%20mouth%20dredging.pdf>

### Australia must better plan for a variable water future

The delivery of sustainable water supplies in Australia will require water managers and engineers to factor in a range of predicted variations in climate and long-term demand for water resources, according to a CSIRO climate and water expert

<http://www.csiro.au/news/Australia-must-better-plan-for-a-variable-water-future.html>

### Groundwater threat to rivers worse than suspected

Excessive groundwater development represents a greater threat to nearby rivers and streams during dry periods (low flows) than previously thought, according to research released recently by CSIRO.

<http://www.csiro.au/news/Groundwater-threat-to-rivers-worse-than-suspected.html>

### Environmental watering - Spring 2010

The Commonwealth Environmental Water Holder to deliver more than 25GL of environmental water in Spring 2010 to ten sites in the Murray-Darling Basin.

<http://www.environment.gov.au/water/policy-programs/cewh/index.html>

### Prelude LNG project gets federal environmental approval

The Minister for Sustainability, Environment, Water, Population and Communities, has approved, with strict conditions, Shell's Prelude floating LNG facility in the Browse Basin off the coast of Western Australia.

<http://www.environment.gov.au/minister/burke/2010/pubs/mr20101112.pdf>

### Dry year sees Perth aquifers drained by a parched city

The equivalent of an extra 17,600 Olympic-sized swimming pools of water will be taken from Perth's aquifers this year, as a prolonged dry spell bites hard on supplies.

<http://www.smh.com.au/environment/water-issues/dry-year-sees-perth-aquifers-drained-by-a-parched-city-20101110-17nga.html>

### Wetland wonderland breeds birds' paradise

A once-parched flood plain has become a bustling "mini Kakadu" after farmers used irrigation infrastructure to mimic Murrumbidgee flows

<http://www.smh.com.au/environment/conservation/wetland-wonderland-breeds-birds-paradise-20101105-17hl6.html>