MURRAY-
DARLING BASIN
ROYAL COMMISSION

SUBMISSION COVERSHEET

CONTACT DETAILS	
Name of Organisation (where applicable)	
Name of Author	Mr Austin Evans
Phone Number	
Email	
Address	NEW SOUTH WALES
Website (optional)	
CONFIDENTIALITY AND PRIVACY	The Royal Commission will treat all submissions as public documents, unless the author has reached a prior agreement with the Commission that the submission be treated as confidential. Public submissions may be published in full on the Commission's website. Your name, organisation (if applicable), and state or territory will be published with your submission. **Has the Commissioner provided agreement for the submission to be treated as confidential? No**
SUBMISSION DETAILS	My name is Austin Evans. I have previously worked in the irrigation industry as the head engineer at Coleambally Irrigation during which time I was a member of the Murrumbidgee Environmental Watering Advisory Group (amongst other roles). Currently, I am the Member for Murray in the NSW Parliament. The views expressed in this submission are mine only and are not put as being the view of the NSW Government or any of my previous employers. This submission addresses Terms of Reference 3, 6, 12 and 13. The "current form", "impediments", adequacy to "achieve the objects and purposes of the Act and Basin Plan" and "other related matters". My submission highlights a fundamental flaw in the Basin Plan particularly with reference to the environmental condition of the Coorong, Lower Lakes and the Murray Mouth (CLLMM). The solution to ensuring it is looked after in the future requires all the relevant factors to be addressed. There are a large number of these factors, but the main three are: • The amount of water flowing down the Murray River • The ability of the system to function as a tidal estuary (as it was pre barrages)

	• The amount of water flowing down the Coorong from the Upper South East area at the southern end of the Coorong. Addressing one of these without addressing the other two is like trying to sit on a 3 legged stool with only one leg in place. At the moment the basin plan has focused on the amount of water flowing down the Murray River and largely ignored the other two. Water Flowing down the Murray River This is being addressed by the Basin Plan as agreed by the Basin States. It is covered in plenty of MDBA reports and no doubt will be covered by plenty of the submissions. I don't think that I need to add anymore here. Tidal Estuary (as it was pre barrages) A peer reviewed paper written by Peter Gell and recently published in the CSIRO Pacific Conservation Biology (see attached paper: Gell PCB 2018 - Watching the tide roll away – advocacy and the obfuscation of evidence) clearly shows that the science based position is that the Lower Lakes were always a mostly estuarine system that only occasionally became predominantly fresh during large flood events. This only changed to predominantly freshwater once the barrages were put in. As Peter Gell states in his paper, this has been obfuscated by various scientists and the SA Dept of Environment (amongst others). At best this has been as the result of sloppy academic work possibly influenced by confirmation bias; at worst it is a deliberate collusion driven by ideology to achieve a political outcome. We will never achieve good health of the CLLMM by water alone. The barrages either need to be removed or operated in a way that allows the Lower Lakes to function in its natural varying estuarine state. Flows into the Coorong from the South Historically, there were significant flows into the southern end of the Coorong which were interrupted by the Upper South East Drainage (USED) system. This was a system that drained more than 89% of the wetlands in the south east corner of South Australia and diverted the water into the ocean. Note that this fact had previously been misinterpreted to criticise the whole basin (see attached article: 111017 - Dealers in Dodgy Facts) in a similar way to the Lower Lakes estuarine/freshwater debate above. Anyone that has dealt with running water will tell you that a much smaller volume of water put into the end of a dead end channel (like the Coorong) will have the same effect as a much larger volume of water trying to be fed in from the open end by raising and lowering the levels (as is suggested by many as the way the Coorong should operate). Works are being done to put some of this redirected drainage into the southern end of the Coorong. This is a critical component to help restore the health of the Coorong. Achieving the objects and purposes of the Act and Basin Plan and the 'enhanced environmental outcomes'

	Good health of the CLLMM will only be achieved when the scientific evidence is listened to and all the factors are taken into account. Adding more water will not achieve healthy environment while the other legs of the stool are ignored.
DOCUMENTS UPLOADED?	Yes
DECLARATION	I declare that: • the submission is made by me or I am authorised to do so by the organisation making the submission • I understand that my submission may be published in full • I understand the Commission may contact me should further information be required. checked

Dealers in Dodgy Facts
Andrew Gregson, NSWIC

Earlier this year, Austin Evans, the Senior Operations Engineer at Colleambally Irrigation, set out on what became a research odyssey to uncover the truth behind a figure often quoted by big environmental lobbyists, most frequently the Australian Conservation Foundation. The quest started from a simple desire to understand where a figure had come from.

On the ACF website was a claim that "90% of floodplain wetlands in the Murray-Darling Basin" were lost. The same figure was quoted on the website of the Commonwealth Environment Department. If it was true, Austin was as worried as the next person that lived in the Basin. After all, this "environment" was his home.

The first stop was Professor Angela Arthrington at the Australian Rivers Institute within the Faculty of Environmental Science at Griffith University in Queensland. She noted that statement in full was:

> *About 90% of the flood plain wetlands in the Murray-Darling Basin, 75% of the coastal wetlands of New South Wales, as well os 75% of Swan Coastal Plain wetlands in south-western Australia have been lost.*

According to Professor Arthrington, the data was attributable to *Bunn et al* from 1997. It was published by the Land and Water Resources Research and Development Corporation. Professor Stuart Bunn is the Director of the Australian Rivers Institute, based at the same University. He's also a Commissioner of the National Water Commission and was previously a Director of Land and Water Australia.

Austin went to the source of the information in an email to Professor Bunn seeking an understanding of the source of the statistic. The reply that he received makes it very difficult to conceive how anyone could still be using this unrealistic figure in the first place.

Professor Bunn pointed out that he had been the editor of the work in which the figure had appeared. He noted that there were "several reviews undertaken as background papers intended for publication", but that only 2 were completed. Another of the reviews – for central and southern Queensland and northern New South Wales – was received from Lukacs and Pearson in draft form only. These same two authors wrote a chapter on habitat modification in which they referred to a Murray-Darling Basin Commissioner Ministerial Council report that the

> *...south-eastern region of South Australia has lost more than 89% of its wetlands due to drainage.*

South-eastern region of South Australia? That's hardly the entire Murray-Darling Basin!

This same figure later appeared in a scoping review (1997) and was backed up in a conference presentation in 1999 given by Professor Bunn titled "The Challenges of Sustainable Water Use and Wetland Manager" given at a Water and Wetlands Management Conference run by the Nature Conservation Council of NSW in Sydney in November of 1998.

Professor Bunn advised Austin that the 90% figure across the entire Basin

> *...was drafted directly from my oral presentation and is clearly not correct i.e. that it suggests that 'about 90% of the wetlands in the MDB have been lost' when this should have either been 'up to 90% in some regions' or referred specifically to the SE region of SA.*

With the inaccuracy now uncovered, Austin set out on a path to have it corrected wherever quoted. He contacted the Australian Conservation Foundation and laid out for them their citations of the incorrect figures and also pointed to Environment Department citations of the same incorrect information. He then provided them with the details which had been furnished by Professor Bunn.

At the time of writing this article, the incorrect figures are still being quoted on the Australian Conservation Foundation website. To be perfectly clear, the ACF know that these figures are not correct, yet they continue to promulgate them.

In the same correspondence, in February this year, Austin pointed to the "Facts and Figures" page of the ACFs website in which they said

> *We remove around 11,500 gigalitres ... of water from the Murray and Darling Rivers per year, of its average total of about 14,000 gigalitres.*

Proving these numbers incorrect wasn't such a forensic exercise as the "90% of wetlands" furphy. The Guide to the Murray-Darling Basin Plan, published several months earlier, noted that total diversions of 10,940 gigalitres occurred out of a total of 32,780. On anybody's interpretation, the ACF were being less than direct in their figures.

The upshot was that the ACF changed their total diversion and total flow figures on their "Facts and Figures" page, yet continue to publish the 90% of wetlands figure in their "just add water" article that still appears at the time of writing.

Perhaps more distressingly, "State of the Environment" report from 2006 is still available on the Commonwealth Department of Environment website (at the time of writing), still citing "Ninety percent of floodplain wetlands in the Murray-Darling Basin" and still attributing those details to Professor Arthrington.

The policy debate surrounding environmental and productive water use is a tough one even when accurate figures are being used. When lobby groups such as the ACF, backed up by the Commonwealth Department of the Environment, insist on continuing to provide figures that *they know* are not accurate, it seems pretty clear there's an agenda at play.

Austin has put in the yards for all of us. *Productive Water* and all who NSWIC seeks to represent thank him for his hard work.

PRODUCTIVE WATER

The Journal for Irrigators in NSW

ISSUE. 02 | SUMMER 2011

KATRINA HODGKINSON | A $10 BILLION BAND-AID | SURFACE / GROUND WATER CONNECTIVITY MAPPING

Make the move to Rubicon's world-leading irrigation technology on your farm

Ask your irrigation designer about **FarmConnect®**

Now is your chance to take a once-off opportunity to revolutionise your farm's irrigation system, but you need to get it right.

This year's launch of FarmConnect – Rubicon's fully automated on-farm irrigation system – means you can now choose an irrigation system for your farm that lets you be more productive, with less water and less effort.

Rubicon's FarmConnect is made with the same practical innovation, robust manufacture, precision components and long-term flexibility that is transforming irrigation networks around the world.

If you'd like the benefits of the world's smartest irrigation systems on your farm, then ask your irrigation designer about the Rubicon FarmConnect system.

If you would like more information or a quote contact Rubicon FarmConnect on 03 5820 8800

Rubicon's FarmConnect is a complete on-farm water management system that combines automation, control, monitoring and crop management into a single, easy-to-use, web-based software program.

The system integrates many innovative technologies, all improved by Rubicon engineers to meet our customers' specific needs:

- ✓ **new wireless radio nodes**
- ✓ **new actuation systems for bay outlets**
- ✓ **new riser valves that seal under pressure and operate at high flows**
- ✓ **innovative soil moisture monitoring methods.**

Rubicon Water
1A Wheeler Street, Shepparton VIC 3630

FarmConnect® | RUBICON™
www.rubiconwater.com

IRRIGATION EFFICIENCY PARTNERS PTY LTD

- Irrigation Efficiency Partners Pty Ltd aims to help farmers produce more from every megalitre. We work to secure investment opportunities for farmers wanting to modernise their irrigation systems.
- We are proud to be selected as a Delivery Partner in the Australian Government's On-Farm Irrigation Efficiency Program and work in partnership with leading farmers to establish water efficient farming businesses.
- We specialise in overhead spray and drip irrigation technologies and have a team of experienced people that can provide project design and planning advice to farmers wanting to upgrade their irrigation systems.
- Irrigation Efficiency Partners Pty Ltd is putting together a portfolio of farm projects for the next round of Australian Government on farm irrigation efficiency funding.

IRRIGATION EFFICIENCY PARTNERS PTY LTD

ABN 65 149 972 832
PO Box 865 Lavington NSW 2641
724 Union Road Lavington NSW 2641

Tel: 02 6962 2220 **Email: kaye@iepartners.com.au**
Web: www.iepartners.com.au

Current projects are supported by the Australian Government
Water for the Future On-Farm Irrigation Efficiency Program

High-profile lobbyist, Andrew Gregson has headed up the New South Wales Irrigators' Council since 2007. During this time he also served as founding CEO of the National Irrigators' Council.

He is a fierce campaigner for the rights of his members and a daunting foe for anyone suggesting their water allocations should be cut.

Gregson has been a prominent commentator in the debate over the Draft Murray Darling Basin Plan.

A barrister and solicitor with qualifications in economics law, from The University of Tasmania and the University of New Mexico, Gregson has also worked as a the chief of staff and state director of the Tasmanian Liberal Party.

The big issue for irrigators in NSW this quarter is obviously the Basin Plan. This edition of Productive Water has been written prior to it being released (at least formally – there are plenty of leaks about). We did contemplate holding this edition until the release had occurred, but "mid-November" was the best information we could find. We asked "what year?", but didn't get an answer...

We have been delighted with the reception that our first edition received. Mailed directly into the hands of around 8,500 irrigators across the State, the Journal proved a talking point for several weeks. Feel free to tell us your thoughts – do you like the Journal? Which parts? Is there anything that you would like to see in the Journal? Our contact details are below.

Inside this second edition you'll find some more detailed pieces examining critical issues for irrigators. Southern Riverina Irrigators Executive Officer – and subject matter expert – Louise Burge provides an analysis of the vexed question of the lower Lakes. Louise has dedicated many, many hours to understanding this complex question and we're delighted to publicise her work.

The second feature from our Sharing the Knowledge program, written by program co-ordinator and NSWIC Policy Analyst Mark Moore, is also inside. Whilst you're reading this, that program will be touring Queensland examining what irrigators in that State are doing and sharing tips, tricks and local knowledge in a series of free forums.

In the last edition, we featured interviews with key Federal players Minister Burke and Senator Joyce. In this edition, we move to a State focus with an interview with NSW Primary Industries Minister Katrina Hodgkinson.

We're also delighted to be able to bring some coverage to the excellent work undertaken by Austin Evans from Coleambally Irrigation. It has irked NSWIC for some time that environmental lobbyists continue to spruik that "90% of wetlands in the Murray-Darling Basin" have gone. We knew it just didn't ring true – so Austin got to work uncovering where it came from. The fellow to whom it is accredited disowned the figure when Austin was finally able to track it down. Even in the face of the glaring truth, though, environmental lobby groups continue to use it.

Finally, given the Draft Basin Plan, an analysis of its underlying legislation – which we think is the root cause of the problem – is inside.

We hope you find this publication useful – both to your business directly and to keep up with events and activity in your industry. Please don't hesitate to be in touch with us to let us know your views, opinions and insights. You can contact our office on 02 9251 8466 or email us at nswic@nswic.org.au.

PRODUCTIVE WATER
ISSUE 02 SUMMER 2011

PRODUCTIVE WATER EDITOR
Andrew Gregson
andrew@nswic.org.au

EDITORIAL ASSISTANT
Mark Moore
mark@nswic.org.au

ADVERTISING
Matt Elmer
matt@productivewater.com.au
0418 577 357

NSW IRRIGATORS COUNCIL
Level 9
15–17 Young Street
SYDNEY NSW 2000

nswic@nswic.org.au
02 9251 8466

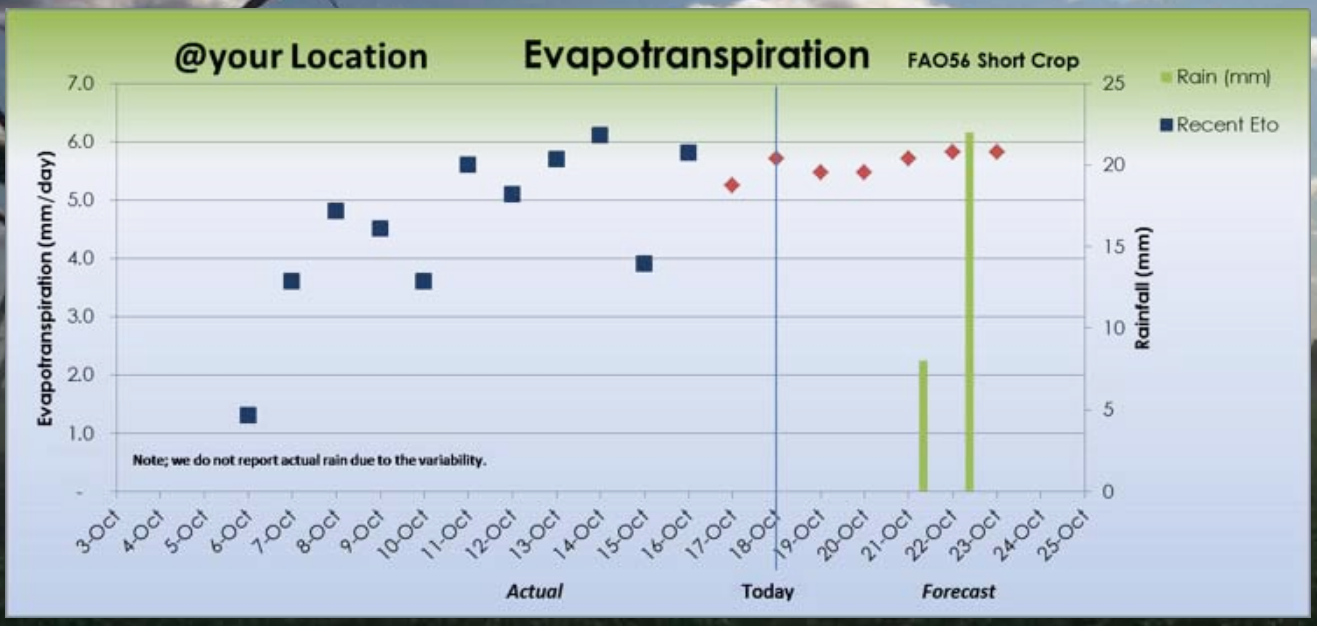
WAS YOUR CROP ONE OF THE THIRSTY ONES?

WATER = PRODUCTION

MAKE SURE YOU ARE PUTTING ENOUGH ON!

iWater is the Australian standard for evapotranspiration data, delivered to you daily and with a forecast for the next 5 days.

Why bother with solar panels, loose wires and broken sensors. Get what you need, daily data delivered when you need it. Get the industry standard data FAO56 from the Australian Bureau of Meteorology which includes real measurements of wind. .



Signup for daily fax, sms & email of ET mm /day:

www.productivewaterservices.com/iwater

PRODUCTIVE WATER SERVICES

We have a first class understanding of how water contributes to production and the gross margin. We provide services that return the investment and lead to profitability.

- Field to field benchmarking of plant water use
- Whole farm water balances
- Drip, furrow, basin performance assessments
- Drip, furrow, basin designs for best practice
- Current knowledge of NSW water legislation and management
- Irrigation management plans for Works Approvals
- Farm requirements from irrigation schemes

Best of all we are based in central NSW and will work with your team to get a professional result which is of genuine use to your irrigation enterprise.

Call Bill Williamson on 0418 452 367
Narromine, NSW
info@productivewaterservices.com

AN INTERVIEW WITH STATE WATER MINISTER

KATRINA HODGKINSON

WORDS: **ANDREW GREGSON**

Katrina Hodgkinson is the Member for Burrinjuck, NSW Minister for Primary Industries and Minister for Small Business.

Water issues are certainly central to her responsibilities as the Member for Burrinjuck but as the Minister for Primary Industries, Minister Hodgkinson looks after regional and rural water including State Water, the Sydney Catchment Authority and the NSW Office of Water.

Growing up on a superfine merino stud at Yass in Southern NSW, Minister Hodgkinson has experienced the farming lifestyle first-hand. She is passionate about tackling the issues that affect the State's farming community and understands both the challenges and rewards of life on the land.

Prior to entering parliament, Minister Hodgkinson was the owner and operator of a wool and fine arts retail enterprise in Yass and Bowral, before becoming an adviser in the Howard Government.

As a fifth generation Yass resident, Minister Hodgkinson is a strong advocate for rural NSW. She has represented the seat of Burrinjuck in the New South Wales Legislative Assembly since 1999. She proudly represents the State's farmers as Minister for Primary Industries and believes in the great potential of rural and regional NSW.

Some of the areas covered by the Primary Industries portfolio include agriculture, fisheries, forestry, Crown Lands, NSW Food Authority, Marine Parks, NSW Office of Water, State Water, SCA, CMAs, aquaculture and biosecurity.

Key priority areas in both of the portfolios include food security, science and research, regional service delivery, strategic land use policy, commercial fisheries reform and water, catchment and land management.

Productive Water had a chance to pose some questions to Minister Hodgkinson.

The Water portfolio isn't a simple one but you also find yourself in a portfolio that encompasses many other issues. How do you go about understanding so many detailed issues?

It is about staying grounded and keeping up with the grassroots issues as well as regularly meeting people and stakeholders and really listening. It is equally important to receive quality advice from a number of sources to ensure that decisions that are made are done with the best and most current levels of information. Obviously, having a broad background in and appreciation of rural issues is a major advantage.

Clearly, both my Electorate and Ministerial Offices and Departments are all very busy - there is a constant two-way flow of information on a vast array of topics. After 16 years of mismanagement under the former Labor Government, it is a challenge but we're focused on

getting on with the job of making NSW number one again.

You were well recognised in the agriculture arena during previous roles. How has the Government scenario changed your profile?

There is a marked difference in the roles and responsibilities between Opposition and being in Government. The community rightly expects to see and hear their Ministers and local Members out and about, attending meetings and events and liaising and providing feedback to communities on a variety of issues that can be either positive or negative.

It is essential to me as the Minister for Primary Industries and Minister for Small Business that despite the frenetic pace of Government, I stay connected with the communities I am here to serve. I regard it as another essential part of the job – and it is a key way to stay connected with people and their issues.

At the release of the Guide to the Basin Plan last year, there was plenty of passion and heated debate. As Shadow Minister, you saw much of that first hand. How do you deal with it?

The release of the Guide to the Basin Plan was understandably a very emotive issue which was clearly apparent during the community meetings held last year and for very good reason.

The Guide was a shocker.

As Minister, I must focus on making decisions based on the facts. In the case of the Basin Plan however I do not believe this is entirely possible because the emotion is really an indicator of the level of concern that people have with the MDBA's Plan.

I maintain that the only way forward on this issue is to take a balanced approach that takes into account all the needs of communities, economies and the environment.

There's an element of "reform fatigue" in rural Australia. You're no doubt noticing it in water. How should we, as a State, manage that fatigue?

Reform fatigue builds up when people are continually fighting to maintain their rights or their lifestyle. There is always a risk of fatigue particularly with an issue such as the Basin Plan which has been ongoing for many, many years and brings about so much uncertainty in people's lives.

However, we cannot let fatigue creep in on the issue of the MDBA Plan. It is way too important to let fatigue shape our destiny.

I encourage the NSW Murray-Darling Basin community to assess the MDBA's proposed Basin Plan when it is released on November 28. This is where industry organisations will play a key role and people should make full use of industry groups, such as the Irrigators Council, to develop a response and participate in the 20-week consultation phase.

Groups from a range of perspectives are trying to influence your position on the Murray-Darling Basin. How do you deal with that pressure?

"THE RELEASE OF THE GUIDE TO THE BASIN PLAN WAS UNDERSTANDABLY A VERY EMOTIVE ISSUE WHICH WAS CLEARLY APPARENT DURING THE COMMUNITY MEETINGS HELD LAST YEAR AND FOR VERY GOOD REASON.

THE GUIDE WAS A SHOCKER."

As Minister for Primary Industries it is important that I listen to the views and facts from all legitimate sources.

I adopt the approach that clear, logical thinking and a rigorous assessment of all the implications is the best way forward to achieving a balanced Basin Plan which will see triple bottom line outcomes for the people of NSW.

Do you think that too much emphasis is placed on the Murray-Darling Basin? Should we be concentrating on water policy in cities more? In regions? In coastal NSW?

Water policy is an important issue no matter where you live. This was clearly evident during the recent drought which saw communities all over NSW live through tough times and prolonged water restrictions.

Since this time, very significant water savings have been made across the State and all communities should continue to work to use water more efficiently.

I think part of the media attention on the Murray-Darling Basin is due to the inherent conflicts in reaching agreement – the conflicts between the Commonwealth and the States, between the States themselves and between the various communities in the catchments. I think we'll just have to live with the attention Basin issues are given. Let's not forget though, it does provide an opportunity for rural and regional residents to air their concerns in mainstream media.

What's the future for irrigation in NSW?

Irrigation will continue to be a major contributor to our agricultural sector and the broader NSW economy, despite the environmental water recovery targets under the Basin Plan.

The NSW Government will continue to work with NSW irrigators to look at delivering water-use efficiency initiatives and provide them with the necessary information and tools they need to ensure the long term sustainability of the industry.

PRECISION SURFACE IRRIGATION

WORDS: **PETER MOLLER**

Pressure on the availability of water, together with a desire to reduce input costs has seen many growers seek to improve their water use efficiency by upgrading their irrigation systems.

Growers which go down this path not only benefit from reduced water use but an efficiently managed irrigation system also has the potential to deliver improved yield and quality, significant labour savings and reduced nutrient leaching.

Aside from changes to field design there are two critical components to strategies for effectively improving water use efficiency. The first component is a crop demand management system which provides accurate crop and environmental monitoring to assist in determining when to water and how much water to apply in order to maximise yield and quality. These systems involve installing field sensors such as soil moisture probes, wireless communications infrastructure and software which enables remote monitoring and analysis of data. In essence crop management systems are about adding science to the art of irrigation decision making.

The second component of efficient irrigation management is implementing a method of applying water to crops that precisely meets but does not exceed crop demand.

Among more efficient application methods, high flow surface irrigation is often the preferred option for growers looking to capitalise on existing investments in laser grading and for those seeking to avoid the capital outlay and ongoing energy costs associated with pressurised systems. The higher flow rates and on-demand ordering provided by modernised supply systems, along with recent research showing that well managed surface irrigation can achieve efficiencies of around 90% (similar to sprinkler and drip systems) are also likely to have been significant factors in driving uptake.

The principle behind high flow surface irrigation is straightforward and well understood: applying water at higher flow rates over shorter periods of time results in reduced infiltration below the root zone, which is water that cannot be used by the plant. It also reduces prolonged saturation periods that limit crop productivity. What is less well understood is that irrigating with high flows is only part of the equation and often does not save water in isolation.

Farmers who have invested in new irrigation systems can be disappointed that they are not able to achieve the level of water use reductions that they were expecting.

While high flow surface irrigation offers the potential for higher efficiency, controlling irrigation run times becomes a critical determinant of whether these efficiency gains are actually achieved. Application needs to be precisely controlled to ensure water is not applied beyond an optimal cut-off point. At high flow rates, any application of water beyond this point will quickly result in significant runoff or saturation, eliminating any efficiency gains and potentially inducing prolonged plant growth shutdown after irrigation.

With optimal run times that can range from one to three hours, the logistics of manually implementing a high flow irrigation sequence become difficult to manage effectively.

Northern Victorian irrigator Russell Pell is currently in the process of automating his high flow surface irrigation. "I knew that high flow irrigation would mean implementing automation," said Pell. "At the moment on our high-flow paddocks, we are manually irrigating five acre bays in 1 1/4 hours. I find controlling high flow irrigation almost impossible to keep up with. By automating I can get more control over the water usage and more control over our lives."

Automation provides the precise control over run times that is critical when irrigating using high flows, while eliminating logistical issues.

In its simplest form, automation enables growers to control run times precisely by remotely opening and closing devices according to a predetermined schedule, which is often centrally managed using computer software. More sophisticated systems dynamically calculate cut-off through the use of in-field sensors. These sensors measure the rate of infiltration as the irrigation progresses and the advance of the wetting front to determine the optimal cut-off time. A signal is sent to a gate or valve to instruct it to automatically close at the calculated time and adjust the start times of all subsequent bays in the scheduled irrigation.

With traditional surface irrigation, rules of thumb are often sufficient for determining appropriate run times. Under a high flow regime, automatic sensors provide the precision needed to accurately calculate cut-off times by factoring in real-time crop cover conditions and soil moisture deficits.

Similarly, under high flow irrigation, the reliability of the automation system is an important factor. A breakdown in hardware such as a gate actuator or wireless communications network failure while an irrigation is in progress can result in over irrigation or runoff wastage. In the first instance automated hardware needs to be of an industrial design and construction to avoid failure. Additionally, an automation solution needs to encompass system monitoring that quickly identifies and alarms issues to the irrigation manager before they become problems.

Ultimately growers upgrading their irrigation systems are looking to achieve improved productive output per megalitre of input. With precision surface irrigation, reducing the number of irrigations per season and reducing the volume of water applied per irrigation is readily achievable.

But it involves more than irrigating with high flows. Accurate crop data is needed to enable growers to confidently meet but not exceed crop water needs, while reliable automation provides the precise control over run times needed for substantial improvements in water use efficiency.

Pell is enthusiastic about improving his water use efficiency and sees it a necessary part of farming in today's environment.

"The main benefits will be more productive use of the water and my time. In the changing environment in which we operate, we have to produce a lot more fodder from a lot less water and this automation project has the potential to meet that challenge. I find that really exciting".

Peter Moller Is a qualified agronomist and General Manager of Rubicon Water's FarmConnect division.

A NEW APPROACH TO SURFACE / GROUND WATER CONNECTIVITY MAPPING

WORDS: **KEN CRAWFORD**

ABSTRACT

The current methodology used in connectivity mapping in the Guide to the Murray-Darling Basin Plan may have introduced inaccuracies in the characterisation of surface/groundwater interaction. Low bore density and information gaps in river elevation, aquifer hydraulic conductivity, river bed hydraulic conductivity and riparian zone evapotranspiration may have caused errors. This creates uncertainty for water managers in formulating water sharing plans.

Recent investigations at Gins Leap Gap in the Namoi Valley, demonstrate that a new approach is needed to correctly characterise surface/groundwater connectivity. The new approach involves field investigation of constrictions in the alluvial aquifer. This work has shown that geological controls such as faulting, fracturing and volcanic events can limit and restrict groundwater flow. Key areas, such as The Gap, provide scientific control over the hydrogeological investigation as bedrock topography can be mapped in relation to the river bed and standing water levels in monitoring bores.

The new methodology relies on accurate topographical survey, including mapping the river bed and a Digital Terrain Model (DTM). Real Time Kinematic (RTK) surveying equipment with GPS technology is used in conjunction with civilcad (TopconR 2010) software for processing. Map Grid of Australia (MGA) and Australian Height Datum in metres (mAHD) allow mapping of relative levels and further extension of survey to any part of the Murray-Darling Basin.

Major constrictions in the alluvial aquifer in the Upper Namoi Valley occur at intervals of approximately 40-50 km. Hydrological

KEN CRAWFORD IS THE PRINCIPAL CONSULTANT OF KLC ENVIRONMENTAL PTY LTD BASED IN BOGGABRI, NSW.

KEN PRESENTED THIS PAPER RECENTLY TO THE NSW INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS SYMPOSIUM HELD IN SYDNEY

HIS PAPER IS PUBLISHED AS PART OF THE PROCEEDINGS OF THE SYMPOSIUM:

PROCEEDINGS OF THE INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS, NEW SOUTH WALES BRANCH

NSW IAH SYMPOSIUM 2011 HYDROGEOLOGY IN NSW – THE CHALLENGE OF UNCERTAINTY, SYDNEY, NSW, AUSTRALIA, 5–6 SEPTEMBER 2011

investigations at major constrictions of alluvial aquifers would greatly improve our understanding of groundwater discharge and recharge. Numerical models could be more accurately calibrated at these points reducing uncertainty in predictions.

The new approach to connectivity mapping is holistic, integrated and multidisciplined with a bias towards geological engineering. Catchment communities within the valleys of the Murray-Darling Basin relate well to this concept because it is easy to understand and implement. Other field methods such as temperature, chemical signatures and isotope studies complement the new physical method of connectivity mapping.

The current methodology used in the connectivity mapping in the CSIRO Murray-Darling Basin Sustainable Yields Project (CSIRO 2007) and the Guide to the Proposed Basin Plan (MDBA 2010), may have introduced inaccuracies in the characterisation of surface/groundwater interaction. The methodology involved assessing the direction and magnitude of the groundwater flux. The assessment of direction of groundwater flux involved collecting surface and groundwater data, for a given point in time, and creating a watertable elevation surface. An assessment of flux direction was based on the gradient between the river and water level in the aquifer. With this methodology, low bore density and knowledge gaps in river elevation, aquifer hydraulic conductivity, river bed hydraulic conductivity and riparian zone evapotranspiration may have contributed to inaccuracies in the characterisation of surface/groundwater interaction (Parsons, Evans & Hoban 2008).

Uncertainty in the connectivity mapping is causing concern for catchment communities. Accurate connectivity mapping would encourage acceptance of the Proposed Murray-Darling Basin Plan. A new approach is needed to assure people that knowledge gaps will be filled and that a Best Management Practice (BMP) standard scientific method of assessment is achieved (Crawford, Allen & Aharon 2009). The new approach proposed in this paper is termed 'geological engineering' and is carried out in key areas of the underground landscape. The methodology has been demonstrated in the Namoi CMA Gins Leap Gap Project (KLC Environmental 2010).

This work has shown that major alluvial aquifer constrictions are suitable for detailed hydrogeological investigations. These key areas have geological controls that determine the bedrock topography. Plate 1 is a photograph of The Gap, which is north of Gins Leap near Boggabri in the north west of NSW. The major tributaries of the Namoi River, including Cox's Creek, the Mooki, Peel, Cockburn, Manilla and McDonald rivers combine to flow through The Gap. The groundwater associated with the unconsolidated sediments of the alluvial aquifer also passes through this key area (Crawford & Aharon 2007). Key areas can be identified where geological controls such as faulting, fracturing and volcanic events have formed the underground landscape causing a narrowing of the paleochannel.

The rationale behind the geological engineering approach is that key areas are the hydrogeological boundaries between storage zones where groundwater flow can be measured and monitored with a higher degree of certainty. In other words, the groundwater flux can be determined without detailed analysis of the whole zone. The hydrogeological zone may be considered as an underground storage pond. The storage ponds have similar groundwater regimes. They are separate, although still connected, to some extent, where boundaries significantly limit groundwater flow.

A recent major finding at The Gap is the damming effect on groundwater and the extent to which bedrock topography limits groundwater flow. Visualise a dam in a hidden valley. This becomes a discharge point for the wider catchment feeding it. The Gap makes an ideal groundwater monitoring station and data gathered becomes invaluable as a benchmark in time. In this manner it is possible to assess aquifer recharge feeding that point. Soil landscape studies are invaluable in resolving the water balance for each zone as they consider the complexities of run-off and deep drainage in the catchment. Catchment communities have confidence in this approach as it considers local and regional water balance. The Proposed Basin Plan needs this input to review the Sustainable Diversion Limit (SDL) derived from calibrated regional models.

The wider catchment of the Upper Namoi Valley and the underground landscape reveal a pattern of constrictions in the bedrock topography at approximately 40–50 km intervals. This is based on 'reading the landscape' and reference to paleochannel maps. Narrowing of the paleochannel is the distinguishing feature and many other valleys within the Murray-Darling Basin show similar patterns, particularly in the Uplands.

The idea of a BMP for connectivity mapping and aquifer recharge assessment is appropriate in this case as project management will involve collaboration with a range of consultants expert in their field. A standard scientific method to accurately map the major constrictions of the hidden valleys of the Murray-Darling system will give a pattern or a blueprint for detailed hydrogeological investigations. The resultant mapping to the mouth of the Murray River, will improve our understanding of Basin groundwater.

Plate 1: Sunlight on Gins Leap Gap, Boggabri NSW (Photo: K Crawford 2008).

METHODS

The geological engineering approach is based on the combination of the following methods. The reliability of the data collected relies on the accuracy of the DTM. This is the foundation of the project. Third party verification by registered surveyors achieves Quality Assurance (QA) in terms of accuracy of the model and the relationship between this and other project sites in the Murray-Darling Basin.

Digital Terrain Model

A Digital Terrain Model (DTM) is set up using civilcad (TopconR 2010) software for processing. A topographical map, including transects is produced including river bed elevation. A DTM may be defined as a mathematical representation of the Earth's surface upon which mapping, design, analysis and compilation is based (Stewart 2009). Real Time Kinematic (RTK) is a ground-based method using satellite technology to capture accurate 3D positions. RTK accuracy tolerances are +- 2 cm for horizontal measurements and +- 3 cm for vertical measurements.

To establish survey control over the project site the survey is based on the Map Grid of Australia (MGA) datum for horizontal measurements and Australian Height Datum in metres (mAHD) for level control. The MGA is a Universal Transverse Mercator (UTM) projection based on the Geocentric Datum of Australia (GDA). Australia is divided into six degree zones of longitude. UTM relates to the position format for the conversion of the earth's spherical shape to a flat map with grid lines (Stewart 2009).

The topographical/DTM surveys allow accurate control over the hydrological investigation. Facilitation of the following steps is achieved: geophysical survey, drilling program, geological survey, pumping test and the final analysis of all data.

Transient Electromagnetic Survey and geo-electric river run

A Transient Electromagnetic (TEM) survey of The Gap was conducted in 2009 following a previous geo-electric survey along the river (Allen 2008). Two forms of survey were adopted. First thirty eight 100m2 loops were placed on the ground and used to measure electrical resistivity to a depth of 150m. Second, a 5 turn 6.5 x 4m transmitter loop followed by a 15 turn 2x3m receiver loop were towed at 5km/hr for 2 days back and forth across the site to provide greater lateral detail to a depth of 50m. TEM equipment was chosen to give both speed of coverage and a full depth profile.

Drilling control to bedrock

Drilling commenced at nominated locations based on TEM imaging, and the need to obtain a geological cross-section and undertake a pumping test. Drilling control to bedrock confirmed the accuracy of the geophysical survey in respect to depth to bedrock. The four monitoring bores and a central extraction bore were then constructed. Casing and slotting was based on geological logs. All drilling and bore construction was to industry standards with Class 5 or 6 drillers.

Water sampling, auto-logging monitoring bores and pumping test

Groundwater field parameters were measured and groundwater samples collected for laboratory analysis from the newly constructed bores prior to the pumping test (McLean 2009). Groundwater field parameters were also measured throughout the duration of the pumping test in the extraction bore and groundwater samples were collected at the end of the test. Water quality parameters were monitored during purging to ensure that water samples were representative and to evaluate groundwater conditions. Water quality parameters electrical conductivity (EC), pH, temperature, dissolved oxygen (DO) and redox potential (redox) were measured in the field using a calibrated Quanta Hydrolab multiparameter probe. Water samples were also taken for isotope studies to age the water. Auto-logging was carried out for 12 months in the monitoring bores. Hydrographs were graphed against rainfall recorded at Boggabri post office.

Geological cross-sections and transect profiles

DTM cross-sections display the collated data accurately. Transects across the project site with emphasis on levels at the river bed in relation to the groundwater levels formed the surface/groundwater connectivity mapping of the Namoi River at this time and place. Interpretation of geophysical images facilitated the understanding and mapping of the geological cross-sections and the extent of the alluvial aquifer. It should be cautioned that drilling to bedrock, with the geological engineering approach was sufficient for hydrogeological purposes. A strictly engineering approach for construction purposes would require further core-drilling to greater depths. This is because the geological cross-sections are based on the interpretation of the geophysics at depths below bedrock where there is no drilling control at this stage.

RESULTS

The surface/groundwater interaction or characterisation of the Namoi River at Gins Leap Gap, during a drought-period in 2010, was that of a disconnected losing stream (Plate 2). The Namoi River at this key area has an unsaturated zone of approximately 1m between the river bed and standing groundwater level. The River is perched above the groundwater with a clogging

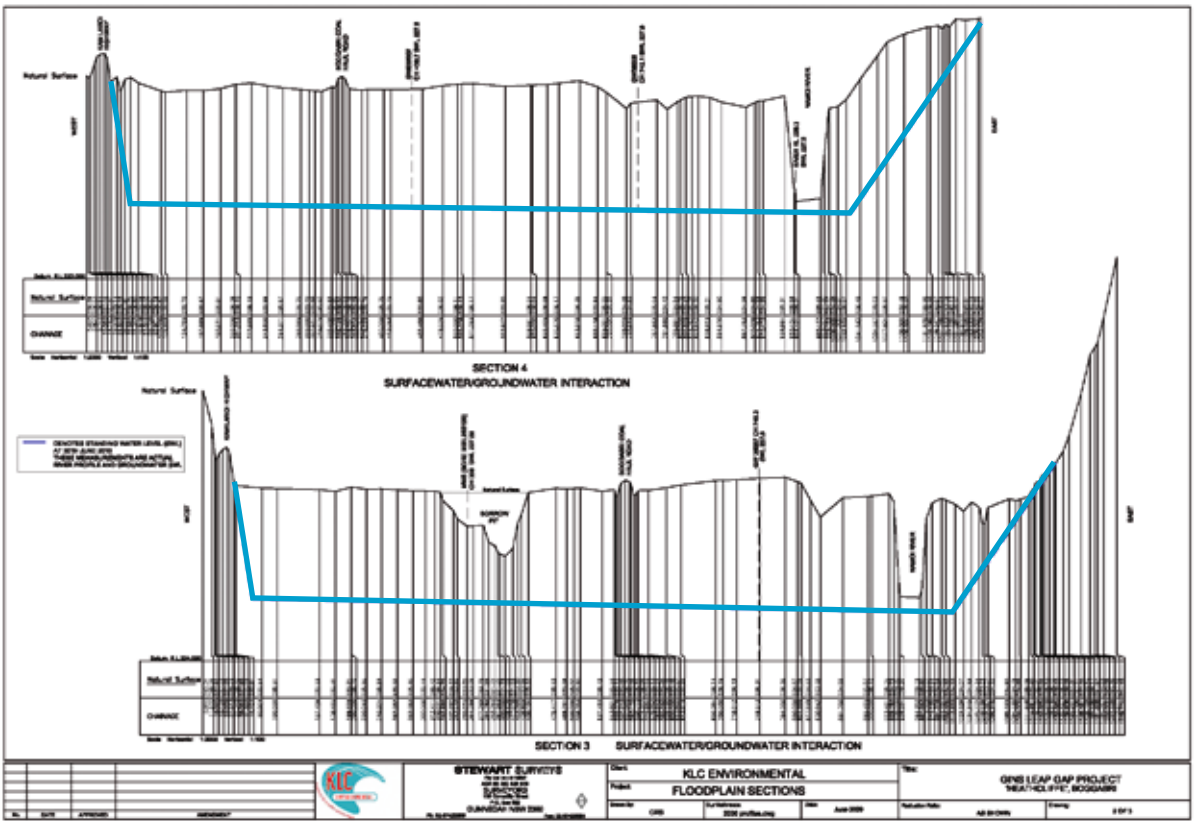


Plate 2: Flood Plain Cross Sections of the Namoi River at The Gap. The blue line is the standing groundwater level at the end of 12 months auto logging and depicts the river bed perched above the groundwater by approximately 1 m of unsaturated zone (30 June 2010).

layer in the base of the river which limits seepage.

Plate 2 is a profile of two transects in the DTM which depicts the characterisation or connectivity mapping at that time and place.

Correlation with the previous geo-electric river run in 2008 confirmed the presence of an unsaturated zone beneath the river bed over a distance of 10.8 km.

Plate 2: Flood Plain Cross Sections of the Namoi River at The Gap. The blue line is the standing groundwater level at the end of 12 months auto logging and depicts the river bed perched above the groundwater by approximately 1 m of unsaturated zone (30 June 2010).

DISCUSSION

A disconnected stream can slowly lose water into an underlying groundwater system, but at a rate insufficient to raise the watertable to the base of the stream (Eamus, Hatton, Cook & Colvin 2006).

During drought times river bed seepage is not a major source of aquifer recharge and it has a low impact on stream flow in this area (KLC Environmental 2010). One of the major sources of aquifer recharge is flooding and more attention should be devoted to this aspect of recharge (Timms 2011). Managed Aquifer Recharge (MAR) is a technique that should be utilised more to enhance flooding recharge.

The other major source of aquifer recharge is from the sideslope of the wider catchment and irrigation returns (Pigram 2006). A case study of Zone 4 West in the Upper Namoi Valley of NSW revealed the complexity in assessing sideslope recharge and the need to undertake soil landscape studies to resolve the water balance (Crawford, Ross & Timms 2004).

It is important to conduct this type of hydrological investigation when the river is just a chain of ponds and drought conditions have drawn down groundwater levels. This is the scenario that groundwater managers have to plan for; that is when the whole environment is under stress.

Groundwater is a precious resource in a semi-arid climate where ephemeral streams prevail. Hydrogeologists need to be engaged in more field investigations at key areas within the Basin and work within a structure and methodology that assures the catchment communities that the science is rigorous. Knowledge gaps exist in understanding groundwater boundaries. Desk audits need the input of new field data and numerical models need calibrating at each key area.

SHARING THE KNOWLEDGE

WORDS: **MARK MOORE**

IRRIGATING IN A CHANGING CLIMATE. WHAT EXACTLY ARE WE TALKING ABOUT?

WHAT'S CHANGING?

Well in reality everything around us constantly changing, nothing ever remains the same. So if we talk about a changing climate or environment, then this is something that could affect everyone as the climate plays an integral role in all aspects of life. The climate changing is nothing new, as with everything else, it's always been changing. Perhaps we're heading into a time with more severe weather conditions (longer droughts, larger rain events, cooler temperatures or warmer temperatures), unfortunately no one can accurately pinpoint what's going to happen, so this is even more reason to look at ways of adapting our practices to minimize the possible effects of changes to our lives and businesses. The Goal - to remain productive and profitable.

STK Presenters (Left to Right): Michael Murray, Krysteen McElroy, Ray Sellwood, Bradley McElroy and Richard Wheaton at Harvey Dam, WA

How is the irrigation industry changing? Someone's always got a bigger, faster, lighter, cheaper, smaller, slower, heavier, more expensive or more efficient way of doing something. Is it even possible to keep up with all the changes? How can you figure out what best for your operation now and into the future. This is partially where the idea for the Sharing the Knowledge program came from.

Let's say I'm farmer "A" located in NSW. I've spent months and hundreds of thousands of dollars changing my farm plan, talking to industry experts, consultants, neighbours (some of whom consider themselves experts) and then implementing these changes using the best products and services available to me, why on earth would I want to see or hear about what someone else is doing or has done?

Honestly, you probably wouldn't after all that! But let's just say there's a farming couple, we'll call them farmers "B&C" from SA who just did a similar upgrade to their operation, granted they have a different soil type and grow different crops, but the layout of the farm and irrigation system is pretty close. In adapting to their new system "B&C" came up with an idea which assists the water getting down the crop rows more easily and saves water.

Farmer "A" hasn't grown a crop in the new system yet and doesn't realize that he's going to be faced with a very similar issue, not as pronounced, but still similar. If only he'd gone to that presentation of Sharing the Knowledge he would already have know about customizing a piece of farm equipment to make a shield sprayer for getting between the rows without affecting the surrounding growth.

It's not always about the latest and greatest, it's sometimes about the small little customizations that talented farmers are doing all over this country to solve problems or to just do things better.

We can't possibly know about all the different ideas out there, but when you have an opportunity to experiencing something different to what you already know, take it. It might just be an idea which helps you adapt your operation in the future.

Sharing the Knowledge is supported by funding from the Australian Government Department of Agriculture, Fisheries and Forestry under Farmready, part of Australia's farming future.

We approach Griffith, NSW and peer out the small windows trying to identify the various landmarks. Most of us have been here before, but it's the first time for a few of the presenters, so there's a level of excitement in the plane.

Gary (our Pilot) announces that we're clear to land and to make sure we're all strapped in. We quickly organize our notebooks and laptops and buckle up. Gary glides the eight passenger Fairchild Merlin twin turbo prop onto the tarmac for another smooth landing.

As we taxi over to the charter parking area, I reconfirm our arrangements for the day ahead.

Griffith was the last stop on this phase of the Sharing the Knowledge tour and it's one of the highlights for everyone. We've visited some great towns on the trip (Dalby, Bourke, Narrabri and Narromine), but seeing the extent of irrigation that goes on in Griffith, the support services and the town, we realized there was going to be a lot of interest at our presentation tomorrow.

A big part of this program is introducing the presenters to places they have not been to before. They join the program to share what they have accomplished in their operations, but usually end up learning even more from the people and places we visit.

We head to the Casella Winery in Yenda, stopping at the lookout over Griffith to get a full understanding of the town layout and various irrigation areas.

At Casella's we get to appreciate the scale of the operation and the vision it took to grow the business into what it is today. Leaving the winery, we stop in to visit Peter Cremasco. Peter happily shows us his orchards, drying plant and rice fields. This is the type of experience and interaction the presenters will never forget.

Our Griffith forum didn't disappoint. We had approximately forty attendees with a great deal of questions and overall interest in what others are doing.

It's a wonderful thing getting out and seeing this diverse country, but its truly invaluable getting to also talk to the people who make these areas their home.

Thank you to all those who attended the forums and welcomed us into their beautiful piece of Australia.

Visiting with Peter Cremasco at his farm in Yenda, NSW

FAST FLOW (SURGE) IRRIGATION WITH AUTOMATIC GATES

Situated in Padthaway, SA, Bradley and Krysteen McElroy own a 1235 acre (500 hectare) property, where they produce broadacre crops, irrigated small seeds, livestock and wine grapes.

Padthaway is located 300km South East of Adelaide, in the Limestone Coast Region. Classed as a high rainfall zone, the area features a shallow dark clay loam on top of limestone with the main source of irrigation water being underground aquifers.

Their main irrigated crop which utilizes surface irrigation is Sirosa Phalaris, also known as Phalaris Aquatica. This is a winter active plant which sheep and cattle find very palatable. Bradley & Krysteen grow Phalaris for first / second generation or certified seed.

Declining aquifer levels and a recent Water Allocation Plan which resulted in a 10% cut to their entitlement meant that Bradley and Krysteen needed to seriously evaluate their operation and the way they were using water.

The greatest water loss associated with surface irrigation in this area of South Australia is through seepage below the root zone. This is commonly related to slow water advance and the excessive infiltration opportunity with each water application. The resulting loss is an expensive and inefficient use of the water and energy resources.

Putting their hand up to participate in a study through the South Eastern Natural Resources Management Board (SENRMB) the purpose of which was to look at upgrading existing infrastructure (open channels and gates) to suit a modified Surge Flow irrigation management strategy. Bradley and Krysteen were successful and the study evaluated bay lengths, the fall on bays, flow rates and delivery channels to increase storage capacity and reduce seepage.

With the goal of reducing irrigation time by delivering an increased, but controlled, surge of water into each bay; thereby reducing infiltration opportunity time, the SENRMB study proved that by creating a higher head in the delivery channel, application efficiency improves with higher application precision as the volume of water delivered better suits the plant requirements.

Levelling – All bays were laser levelled to ensure a fall of 1 in 1600 per bay. The bays are 30 metres wide and between 350 to 450 metres long, equalling 1 to 1.3 hectares per bay.

Soil moisture monitoring equipment – Use of the GDot system allowed for a simple, robust, highly visible tool displaying soil moisture tension. The sensors which are buried at the plants root zone, measure the ability for the plant to extract water from the soil.

Irrigation was done on a average 10 day cycle but the soil moisture monitoring equipment has meant they now irrigate when the plant really requires it.

Installation of “Padman Stop” gate system – The “Padman Stop” is a 100% watertight rubber flap set in a concrete structure which makes it easy to automate the gravity flow of water into each bay.

These fully sealed gates have a four foot opening and were installed at each bay opening of the channel. Utilizing a bay sensor which is linked to a radio timer mounted on each gate, the bay sensor sends a signal to the gate when water reaches it and signifies that sufficient water has entered the bay, thus eliminating water waste.

Once that gate closes the channel refills and trips the float at a predetermined level, which then notifies the controller to open the next gate in the sequence.

Prior to upgrading their system, watering the paddocks took between 90 and 150 hours of pumping time and used an average of 3.3 ML per hectare. Since the new system has been in place the average pumping time is down to approximately 43 hours and is now producing significantly improved results on an average of 1.5 ML per hectare.

Even though this was an expensive trial, their expectations from this project were exceeded on almost all levels. They are now seeing a 20% increase in germination and a 33% increase in production, not to mention the water savings and energy savings associated with the reduced water use and pumping time.

Brad and Krysteen are now firm believers that this system could be applied to any surface irrigation system in any district, with similar results.

Contact with Brad and Krysteen can be facilitated through NSWIC.

Water Solutions for Irrigators

Providing customised water solutions to meet the needs of your business

Water Solutions offer numerous options for accessing allocation in the short, medium and long term

Entitlement Leasing

Access the benefits of Victorian water entitlements

- lease both High & Low Reliability Entitlement
- no capital outlay required
- access to Victorian carry over benefits

Carry-over Capacity

Securely store allocation water against Victorian water entitlement

- a cost effective water storage solution – your own 'virtual' dam
- preserve allocated water for use in later seasons
- allocation water can be purchased when prices are low assuring water availability when required

Water Share Farm

Receive a fixed volume of water for a fixed share of your crop

- minimal up-front costs to access the allocation water
- certainty of water supply
- capacity to expand your production
- payment on crop delivery based on yield

Customisation

Our staff work with you to build a Water Solution

- meet with you on-farm
- understand your annual seasonal needs and price points
- provide you with a customised solution
- provide water for the short, medium or long term

Future Farmi Landscapes

For more information contact
Rod Luke at Kilter on 0417 102 561
or watersolutions@kilter.net.au

A $10 BILLION BAND-AID

WORDS: **LOUISE BURGE**

When politicians rallied to save the environment of the Murray Darling Basin with the Water Act 2007, few had practical knowledge of what were the real issues at stake.

Decades of affluent economic times, saw the environment as a mechanism for political success. It was boom times for those with a passion for all things green in many fields of natural resource management.

Policies on salinity, biodiversity, conservation of land or forests, vegetation solutions for climate change and the expansion of marine parks, could trace their origins to the Rio de Janeiro Earth summit in 1992. Positions on the environment have been progressively implemented ever since. Debates of whether 15% or 50% should be conserved may have been lost in the final interpretation, but few politicians have taken stock of what was the original intent and what are the impacts, to the broader Australian economy.

The haste in developing the Water Act 2007 in response to the 'Millennium drought', raises some interesting comparisons. What are the issues and will the 'perceived' solutions be economically robust and effective, for delivering long term environmental outcomes.

The Guide to the Murray Darling Basin Plan in 2010, set clear objectives for increasing end of system flows. Of the minimum 3000 GL to be recovered for the environment, 2000 GL was to flow out the Murray Mouth. The Guide reflected the longer term strategy for a 'freshwater solution' to address environmental issues in the bottom of the Murray system.

Early indications suggest that this is still the case in the draft basin plan, due for release in late 2011.

This approach will have significant impacts on Australia's future food production and affect irrigation dependent communities in the three major states of the Basin. Therein lies the need to assess what it is, Governments are trying to fix?

At the start it appeared that policies were to restore the health of the broader Murray Darling Basin with water recovered from various parts of the basin. Closer scrutiny however, reflects a subtle shift in direction since the original media interest in floodplain extractions and concerns relating to the high profile Cubby Station.

The Wentworth Group in June 2010 released their report on Sustainable Diversions in the Murray Darling Basin and indications were to address environmental issues of concern, increased end of system flows would require significant water entitlements to be recovered in the Southern connected systems.

However, the Murray River itself had already been subject to significant planning under the Murray CAP and the Living Murray. Then as a whole of Basin approach, Government and communities had recently invested financial and human resources in developing new water plans as part of the National Water Initiative (NWI) agreed to in 2004.

The severity of the Millennium drought has meant that new provisions for the environment in the Living Murray and NWI water plans have never been tested. So why then the need to discard these significant water reforms, spend a further $10 billion on saving the basin, if the effectiveness of water planning introduced under the NWI have not been assessed?

At the height of the drought, many irrigation dependent communities were in crisis. Inflows to the basin catchments were at record lows. Despite this knowledge perceptions prevailed that someone upstream was taking the water. Up to January 2010, 81.8% of NSW was in dire drought and like other states, the concept of hidden water was not the reality.

In Northern NSW, overland flows had failed from more than ten years of drought. In the Southern more regulated systems, historical investments and good management of the major water storages ensured that the Murray River continued to flow to its mouth, albeit with significant extractions restrictions.

For younger generations, such severe drought was a difficult pill to swallow. For older people, there was a confidence there would be life after drought. For others the financial reality hit hard.

For politicians however it was a time of political opportunity, but their water decisions should have focused on the long term, not reflected short term drought responses.

The Murray Darling Basin Commission (MDBC) 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 saline water holes. In South Australia, sea water infiltrated upstream for a considerable distance from the mouth.".

"Since the completion of the Hume Dam in 1936, a continuous flow has been maintained throughout the length of the Murray. Without storages and regulation, the Murray would have 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"

The Living Murray Foundation report notes during drought conditions marine waters of the Southern Ocean extended to 250km upstream.[1]

In the 1914 drought, salinity readings at Morgan were recorded at 1436 EC (or 804 p.p.m). At Murray Bridge approximately 110 kms upstream of the Murray river mouth, salinity levels were at 12,373 EC (6,929 p.p.m) [2] . Salinity levels were attributed to influences from marine waters.

By comparison following the construction of five concrete barrages from 1935 – 1940, which converted the Murray estuary into permanent freshwater lakes, the 1945 drought saw Morgan salinity readings at lows of 1396 EC (782 p.p.m) and Murray Bridge 1487 EC (833 p.p.m.) [2]

Salinity risks to the Murray River, however remain a key driver for increased flows to the Murray Mouth. Views on salinity can be traced to the Salinity audit of the Murray Darling Basin (Murray Darling Basin Ministerial Council 1999) and the Prime Minister's

Science , Engineering and Innovation council (1999).

The National Salinity Audit of 2000 predicted that 5.7 million hectares was at risk of dry land salinity & by 2050, 17 million hectares would be at risk, mainly in Western Australia.

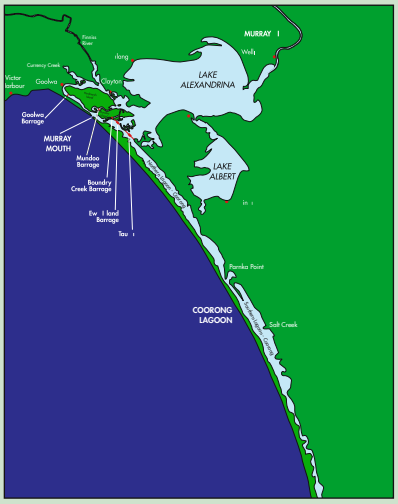
Despite the Federal Government's National Action Plan website referring to familiar messages that the 'area of salt affected land in Western Australia is increasing at a rate of one football field per hour' and 'if salinity is not effectively managed within 20 years the salt content in Adelaide's drinking water may exceed World Health Organisation's drinking water standards in two of every five days" , salinity levels did not match

ensure low levels of salinity but the influences of drought, salt borne winds and barrage seepages affect salinity levels in the Lower Lakes. Even in Murray River flood events, when the barrages are fully open, coastal conditions can create a reverse flow against the outgoing flood flows. In Autumn 2011, despite large flows. salinity levels at the Goolwa Wharf rose to 40,000 EC due to the incoming forces of the Southern Ocean.[10]

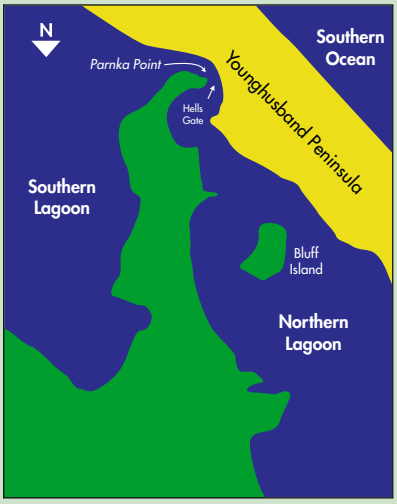
The draft Murray Darling Basin Plan will contain a salinity and water quality component, the targets of which, may pose flow objectives that may be the sleeper issue in the Basin plan. Will those targets reflect recent or old knowledge?

Historically sub surface and surface water flows to the Southern Lagoon of the Coorong were derived from the South East of South Australia, not the Murray River. The SA Department of Water, Land and Biodiversity (DWL&BC) as part of the water quality assessment under the Upper South East Drainage (USE) Plan, commission a report 'A Palaeoecological Assessment of Water Quality Change in the Coorong (November 2005) (Gell P.). The reports executive summary includes "At no time in the 300 years before European settlement has the Coorong been noticeably influenced by flows from the Murray River".

South East of South Australia was subject to large scale flooding for



Lower Lakes, Murray Mouth, Coorong



Coorong – The Narrows approx. 200m wide

modeled predictions.

A more realistic attitude to the causes and management of salinity has emerged but this is not so clear in water planning. Salinity concerns for the Murray River remain despite levels being well within the WHO drinking water standard of 800 EC

In September 2009, the SA Department of Water, Land & Biodiversity Conservation River Murray Water Resources Report (issue 45:4 September 09) noted that despite lower than minimum entitlement flows (ie 1800 ML/d compared to 4,500 Ml/d) "salinity levels above Lock 1 remain fairly low"

Below Lock 1, the barrages on average

This also applies for other natural resource decisions. For over a decade, information on the Coorong has been largely confined to high profile concerns of environmental degradation as a result of Murray River extractions.

On closer examination, environmental issues of the Coorong are much more complex. The Coorong is a long narrow waterway approximately 140 km in length. The water is separated from the Southern ocean by a narrow sand dune peninsula. The Coorong itself is separated into two lagoons at Parnka point, where the waterway narrows to just 200m wide, thus forming the Northern and Southern lagoon.

thousands of years. It is estimated that up to half the land was seasonally flooded, with many areas permanently inundated. Prior to European settlement the area was dominated by wetlands, of which it estimated only about 8% remain.

Freshwater flows moved through a landscape defined by a series of low ranges which separate the valley flats and this formation runs parallel with the coast [3]. . The natural drainage patterns then discharged water flows into the Southern Lagoon at Salt creek.

The landlocked Southern Lagoon would disperse high flow events through the narrow section at Parnka point into the Northern Lagoon, eventually

discharging out the Murray Mouth.

Without significant inflows from the South East, evaporation rates would concentrate salinity levels in the Southern Lagoon. Hyper salinity became a more permanent feature of the Southern Lagoon following land reclamation and drainage works, which diverted freshwater flows away from the Coorong, directly out to the Southern Ocean.

The SA Surveyor General Goyder had a vision "to double the area presently available for agriculture, improve transportation for general traffic and enable good roads to be built at reduced costs" [3] .

In 1993, following responses to predicted impacts of rising groundwater and risks of land salinisation, a new 270 km network of drains was initiated, the Upper South East Dryland Salinity and Flood Management Plan.

Funded under the National Landcare Program, the Federal Government imposed a condition on funding that on average, no more than 40,000 ML/yr could flow into the Southern Lagoon of the Coorong. This rule was to maintain the hyper saline conditions noted when the CLLMM site was defined as a Ramsar wetland in 1985.

Drainage schemes that altered the hyper saline status of the Southern Lagoon would therefore contravene

Lower Lakes & Barrages

Goyder's original report recommended a complete survey of the swamps and ridges to ascertain the practicality of installation of a series of drainage channels at right angles to the direction of the valleys intercepting natural flows to the Coorong and redirecting them to the Sea.[3]

The South East of South Australia drainage and land reclamation scheme was built from 1863 to 1975 and extends to regions such as Millicent, Kalangadoo, Penola, Narracoorte, Lucindale, Kingston and Robe.

In 2000, approximately 450,000 ML of water was discharged to the sea via the South East drainage network.[4]

the ecological condition of the site noted in 1985.

Curiously at a time when advocacy arguments seek fresh water flows from the Murray River to restore the health of the Southern Lagoon of the Coorong, there has only been minor attempts to restore flows from its traditional sources.

The Northern Lagoon of the Coorong historically was influenced by a range of water sources. Flows moving from the Southern Lagoon into the Northern lagoon discharging into the Southern ocean, local rainfall and Murray River flows into Lake Alexandrina.

The highly modified South East of South Australia, currently contributes only minor freshwater flows to the Southern Lagoon of the Coorong. In the Northern Lagoon, Murray River influence is predominantly confined to the Northern to mid section of the Northern Lagoon and is dependent on wind direction and tidal conditions.

Following the construction of 7.6km of concrete barrages from 1935 to 1940 to convert the Lower Murray estuary into permanent freshwater lakes, the window of Murray water flows to the Northern lagoon, is now determined by water released through the barrages, wind direction and twelve hour tidal forces through the remaining estuary at the Murray Mouth. This defines the length of time fresh water flows can travel before tidal forces, draw back the flows to the Southern Ocean.

The objective since 1940 has been to maintain a relatively static water level of 0.75 AHD in the Lower Lakes and this influences decisions to release freshwater through the barrages. When SA is limited to its entitlement flow of 1850 GL, the barrages are closed at the end of Spring and the Lakes are surcharged to 0.85 AHD. After evaporation rates of approximately 750,000 to 950,000 ML, lake levels fall back to the desired flood height of 0.75 AHD. This equates to 1/3rd of the total evaporation losses for the entire Murray Darling Basin.

The 0.75 AHD water level is maintained in the lower Murray River back to Lock 1. This is consistent with early SA Government plans to reclaim most of the wetlands and low lying swamps areas between Mannum and Wellington for irrigated agriculture through the construction of large scale levee banks, on either side of the main bed of the Murray River The levees created a perched river, where farm land lies below the main river channel. Irrigation does not require pumping as openings in the perched river bank, enable water to gravitate down to the land below.

The construction of the barrages had a major ecological impact on the Murray River estuary. The barrages constructed across the five main estuarine channels leading out to the Southern Ocean, removed 90% of the tidal prism (Bourman & Barnett, 1995; Harvey 1996) [6] which has caused

MURRAY MOUTH 1949

MURRAY MOUTH 1956

MURRAY MOUTH 1966

Images show the sedimentation or shoaling is not a recent feature

significant environmental impacts on the Murray Mouth.

In 1914 original estimates of the tidal influence on the Murray Mouth was estimated to be 16,900 ml/day (Johnston 1917). A further calculation of the pre barrage tidal Spring prism was done by Walker (1990) who estimated that the tidal prism was approximately 20,000 ML.[6]

With 89% of the natural estuary lost and only 11% remaining, the tidal influence on the Murray Mouth has now been reduced to between 643 ML to 2200 ML. [7] Advocates seek to increase use freshwater flows from the Murray River to replace the historical estuary influences.

A build up of sand is a natural function of Australia's tidal inlet systems, where inlet systems are influenced by river flows and coastal conditions. As far back as 1903, when the concept of building barrages to keep out the incoming tide was first planned, the risks of sedimentation or 'shoaling' of the Murray River estuary was predicted.(Moncreiff 1903)

Photographs today not only show the original location of an early timber sluiceway (1915) across the Mundoo channel, but over time, also identify the build up of sand deposits in the estuary opening to the Southern ocean. Images in 1940 show little signs of permanent sedimentation. By 1949 the growth of sand deposits is evident with vegetation restricted to one small location. Since then sand deposits adjacent to the Mundoo channel have grown and stabilised, with vegetation becoming a dominant feature.

Operational decisions and aging infrastructure of the Mundoo Barrage, mean that very little flows are released through the Mundoo estuary channel. The progressive build up and stabilization of sand deposits has led to the formation of Bird Island.

Shoaling in the Murray estuary is not new. Events in the Mouth were recorded in 1839, 1857, 1876 and 1914 (Johnston 1917) [8]. The Murray Mouth nearly closed during drought events of 1967 and 1973.

The operations of the barrages however have increased the risk of sedimentation of the estuary.

The iconic photograph of the Murray Mouth closure in April 1981, is held up as the symbol of over allocation. The reason for its closure though are not well understood.

The Living Murray Foundation reports states "When the Mouth closed in 1981, the blockage involved not just a plug of sand at the Mouth,

but also an unusual build up of the extensive Bird Island tidal delta over the previous months". "Over time, this flood tidal delta has gradually developed and consolidated landward of the Murray Mouth, primarily due to lack of discharge through the Mundoo Barrage (Bourman & Harvey)1, 1983).1 "The continuing growth of Bird Island has the potential to result in more frequent and more permanent blockage of the Mouth" [1]

A contributing factor to the 1981 Mouth closure, were conditions in the Southern ocean. Unusually calm seas prevailed between August 1980 and May 1981 which meant few coastal storm influences on the tidal inlet and with the barrages were shut for a period of 196 days, [8] the mouth sanded over.

South Australian efforts to maintain an open Murray Mouth in periods of low flow have focused on short term dredging and long term plans to increase end of system flows. The Living Murray Foundation report modeled solution suggested by increasing baseflows over the barrages each month, the flow in the river would tip the balance in the Mouth to a net outward flow that would assist in preventing sediment entering the inlet during a rising tide, and assist in flushing sediment during an ebb tide (Walker, 2002a, b) [1]

At the time, the proposal to increase flows over the barrages by 2000 ML/d was seen as a mechanism to address sedimentation while ensuring current operations of the lakes could continue.

The Water Act 2007 set the scene for the Federal Government to save the Murray Darling Basin. The basin itself however has made a strong environmental recovery in the post drought period, not from Government buybacks for the environment, but by nature response to rain.

The financial package of $10 billion accompanying the Basin Plan may well be an expensive bandaid that will not heal the sore. Increasing end of system flows will not resolve long term environmental issues in lower reaches of the Murray.

The CLLMM site remains a symbol of water recovery for the environment. The site was included as a wetland of international importance under the Ramsar Convention in 1985, but the plan of management was not completed until 2000. The ecological character description which sets benchmarks for measuring future change, was not released until 2005.

During the drought, a new plan of management (Securing the Future – A Long Term Plan of Management for the CLLMM) funded by the Federal Government Department of Environment, Water Heritage and the Arts (DEWHA) was co-released in 2010 by the South Australian Government and the Federal Environment Minister Penny Wong.

The plan's goals include:

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

The plan notes that "if 4700 GL flowed over the barrages every year the CLLMM ecosystem would probably be in good condition, average flows do not occur every year, and it is the below-average flows that cause concern". [4]

The MDBA Guide objectives were to raise the current average flows of 5100 GL up to 7100 – 7700 GL. This appears as the most striking example of a pre-determined position of the MDBA and reflects long term planning for the site by a range of interests.

Therein lies the problem for all irrigation dependent communities along the Murray River. Water Planning under the Water Act 2007 and the Murray Darling Basin Authority, is about securing the future of freshwater flows to the Murray Mouth in the absence of all other solutions.

The symbolic use of the Coorong, sedimentation issues of the Murray Mouth and Salinity risks to increase end of system flows, all require further investigation.

Under current planning scenarios, environmental issues will not be adequately addressed. For Lower Murray amenity values, including those of the Hindmarsh Island marina and housing development immediately upstream of the Goolwa barrage, the outlook is positive. For other communities the outlook is not so rosy.

The elephant in the room however remains. The Federal Government will be the largest water holder in Australia, much of it held in the Southern connected systems. There are no plans for how it will be safely stored and delivered from the Southern connected systems to the Murray Mouth.

A genuine understanding of the natural river system constraints has not yet appeared on the radar of Canberra water planners. The concept of flood risk in delivering this water remains an enigma!

References:

[1] Living Murray Foundation Report

[2] de L'Association International des Science - Sea Water Exclusion from Australia's River Murray

[3] Down the Drain; The Story of Events and Personalities associated with 125 years of Drainage in the South East of South Australia, Turner M; Carter D

[4] Securing the Future, A Long Term Plan of Management for the Coorong, Lower Lakes and Murray Mouth (June 2010)

[6] Rapid Coastal Geomorphic change in the River Murray Estuary of Australia; Bourman R; Murray-Wallace C.V, Belperio A.P; Harvey N;

[7] Murray Mouth Advisory Committee 1987

[8] Murray Mouth Flood Tidal Delta; Vol 1. 15/1983; Bourman Bob; Harvey N

[9] National Action Plan for Salinity and Water Quality (www.napswq.gov.au)

[10] Government of SA; South Australian Murray Darling Basin Natural Resources Management Board – Seasonal Summary Autumn 2011

[12] A Palaeoecological Assessment of Water Quality change in the Coorong, South Australia (November 2005) Gell P. A report for the Department of Water, Land and Biodiversity Conservation S.A.

[13] Water Planning and the Environment – Murray Darling Basin Submission, Burge L Southern Riverina Irrigators

DEALERS IN DODGY FACTS

WORDS: **ANDREW GREGSON**, NSWIC

Earlier this year, Austin Evans, the Senior Operations Engineer at Colleambally Irrigation, set out on what became a research odyssey to uncover the truth behind a figure often quoted by big environmental lobbyists, most frequently the Australian Conservation Foundation. The quest started from a simple desire to understand where a figure had come from.

On the ACF website was a claim that "90% of floodplain wetlands in the Murray-Darling Basin" were lost. The same figure was quoted on the website of the Commonwealth Environment Department. If it was true, Austin was as worried as the next person that lived in the Basin. After all, this "environment" was his home.

The first stop was Professor Angela Arthrington at the Australian Rivers Institute within the Faculty of Environmental Science at Griffith University in Queensland. She noted that statement in full was:

> *About 90% of the flood plain wetlands in the Murray-Darling Basin, 75% of the coastal wetlands of New South Wales, as well as 75% of Swan Coastal Plain wetlands in south-western Australia have been lost.*

According to Professor Arthrington, the data was attributable to Bunn et al from 1997. It was published by the Land and Water Resources Research and Development Corporation. Professor Stuart Bunn is the Director of the Australian Rivers Institute, based at the same University. He's also a Commissioner of the National Water Commission and was previously a Director of Land and Water Australia.

Austin went to the source of the information in an email to Professor Bunn seeking an understanding of the source of the statistic. The reply that he received makes it very difficult to conceive how anyone could still be using this unrealistic figure in the first place.

Professor Bunn pointed out that he had been the editor of the work in which the figure had appeared. He noted that there were "several reviews undertaken as background papers intended for publication", but that only 2 were completed. Another of the reviews – for central and southern Queensland and northern New South Wales – was received from Lukacs and Pearson in draft form only. These same two authors wrote a chapter on habitat modification in which they referred to a Murray-Darling Basin Commissioner Ministerial Council report that the

> *...south-eastern region of South Australia has lost more than 89% of its wetlands due to drainage.*

South-eastern region of South Australia? That's hardly the entire Murray-Darling Basin!

This same figure later appeared in a scoping review (1997) and was backed up in a conference presentation in 1999 given by Professor Bunn titled "The Challenges of Sustainable Water Use and Wetland Manager" given at a Water and Wetlands Management Conference run by the Nature Conservation Council of NSW in Sydney in November of 1998.

Professor Bunn advised Austin that the 90%

''THE INCORRECT FIGURES ARE STILL BEING QUOTED ON THE AUSTRALIAN CONSERVATION FOUNDATION WEBSITE. TO BE PERFECTLY CLEAR, THE ACF KNOW THAT THESE FIGURES ARE NOT CORRECT, YET THEY CONTINUE TO PROMULGATE THEM.''

figure across the entire Basin

> *...was drafted directly from my oral presentation and is clearly not correct i.e. that it suggests that 'about 90% of the wetlands in the MDB have been lost' when this should have either been 'up to 90% in some regions' or referred specifically to the SE region of SA.*

With the inaccuracy now uncovered, Austin set out on a path to have it corrected wherever quoted. He contacted the Australian Conservation Foundation and laid out for them their citations of the incorrect figures and also pointed to Environment Department citations of the same incorrect information. He then provided them with the details which had been furnished by Professor Bunn.

At the time of writing this article, the incorrect figures are still being quoted on the Australian Conservation Foundation website. To be perfectly clear, the ACF know that these figures are not correct, yet they continue to promulgate them.

In the same correspondence, in February this year, Austin pointed to the "Facts and Figures" page of the ACFs website in which they said

> *We remove around 11,500 gigalitres ... of water from the Murray and Darling Rivers per year, of its average total of about 14,000 gigalitres.*

Proving these numbers incorrect wasn't such a forensic exercise as the "90% of wetlands" furphy. The Guide to the Murray-Darling Basin Plan, published several months earlier, noted that total diversions of 10,940 gigalitres occurred out of a total of 32,780. On anybody's interpretation, the ACF were being less than direct in their figures.

The upshot was that the ACF changed their total diversion and total flow figures on their "Facts and Figures" page, yet continue to publish the 90% of wetlands figure in their "just add water" article that still appears at the time of writing.

Perhaps more distressingly, "State of the Environment" report from 2006 is still available on the Commonwealth Department of Environment website (at the time of writing), still citing "Ninety percent of floodplain wetlands in the Murray-Darling Basin" and still attributing those details to Professor Arthrington.

The policy debate surrounding environmental and productive water use is a tough one even when accurate figures are being used. When lobby groups such as the ACF, backed up by the Commonwealth Department of the Environment, insist on continuing to provide figures that they know are not accurate, it seems pretty clear there's an agenda at play.

Austin has put in the yards for all of us. *Productive Water* and all who NSWIC seeks to represent thank him for his hard work.

THE COMMONWEALTH WATER ACT.

HOW DID WE END UP WITH THIS?

The Basin Plan is a Regulation that draws its power from the Commonwealth Water Act (2007). For several years now, the NSW Irrigators Council has argued that the Act is the root cause of the Basin Plan problem and that it must be amended. Earlier this year, the Senate Legal and Constitutional Affairs References Committee published a report agreeing with that sentiment.

So if the Act is the root cause of such a problem, how did we end up with it?

INTRODUCTION

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

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

From the perspective of irrigators and their communities, the Basin Plan is the critical component of the Act.

BACKGROUND

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

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

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

In order to get that legislation right, the Commonwealth needed the cooperation of the States (either simultaneous legislation or, preferably, a referral of powers). Of course, the period during which this was occurring was becoming increasingly unstable for political reasons. Eventually, the relationship between Canberra (Coalition) and the States (all Labor) broke down to the extent that one State, Victoria, essentially withdrew completely.

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

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

CONSTITUTIONAL CAPACITY

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

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

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

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

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

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

EXTERNAL AFFAIRS AND THE WATER ACT

With the External Affairs power in mind, the Commonwealth turned to international agreements that Australia had executed in order to affect this head of power.

The primary agreement identified was the Ramsar Convention, although the Act does reference 8 specific relevant international agreements in Section 4 together with "any other international convention".

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

THE WATER ACT AS IT NOW APPEARS

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

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

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

HOW DOES THIS GET FIXED?

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

There are three ways in which change might be occasioned;

1. Change the Act (Parliamentary Process)

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

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

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

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

2. Change the Legislative Instrument (Ministerial Discretion)

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

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

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

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

3. Disallowance Motion (Parliamentary Process)

The Basin Plan must be laid before a House of Parliament pursuant to the Legislative Instruments Act (2003). In the current Parliament, it is possible that a disallowance motion pursuant to Section 42 of that Act would be moved but no guarantees can be made that such a motion would be successful. Note that, as a Regulation, the power of the Parliament is only to accept or reject – it cannot amend.

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

BEATING THE HEAT WITH PRECISION

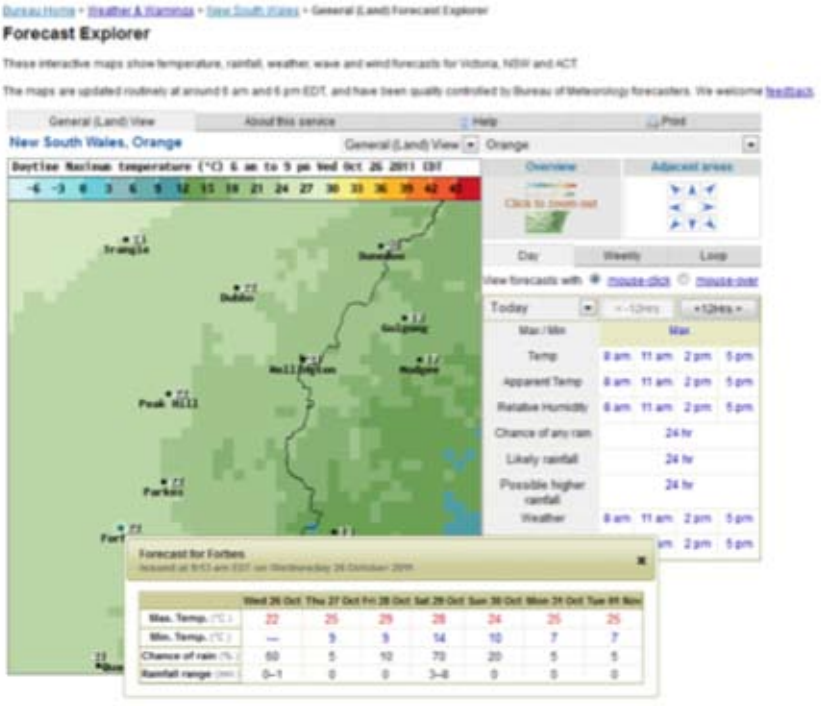
WORDS: **BILL WILLIAMSON**

Seasoned irrigators know the impact that wind and heat have on crops. And those with formal training in the field will know that there is a scientific relationship between plant water demand and the weather that is described by a bunch of complex formula and is known as EvapoTranspiration (ET). For most of us that is about as far as it has gone.

For others they may be able to get access to a weather station which gives data about the recent heat and temperature or even calculates ET on the fly. But that gives no idea of what might happen tomorrow, over the weekend or next week. Quantification of water use into the future is now a much more reliable and precise activity due to recent advances by the Australian Bureau of Meteorology.

We are just now seeing the result of years of effort and millions of dollars of investment by the BoM to bring a new weather forecasting model into operation for Australia. The output of the model is being rolled out in each state progressively as the Forecast Explorer, Vic and NSW are now up and running which you can see in Fig 1 below and at www.bom.gov.au/forecasts/graphical/public/nsw/ All radio, TV and web forecasts now originate from this.

FIGURE 1



The new forecasting model (ACCESS) is vastly more accurate than what we were being given before, especially for the parameters which affect plant water use, wind, temperature and radiation.

BoM are also busy spending the $500M they got from Water for the Future on better stream-flow forecasting in an attempt to answer the question "When will the dam fill up?" But as far as irrigators go, that is the most obvious benefit we will see. Other ways to spend that money include new data standards, water accounting standards, hydrologic systems and the National Water Account.

iWater, gives the matching forecast ETo for any location in Australia, allowing the user to reliably predict water use over the coming days. PWS iWater is delivered daily with both a forecast and a recent history, on the users email, phone or fax.

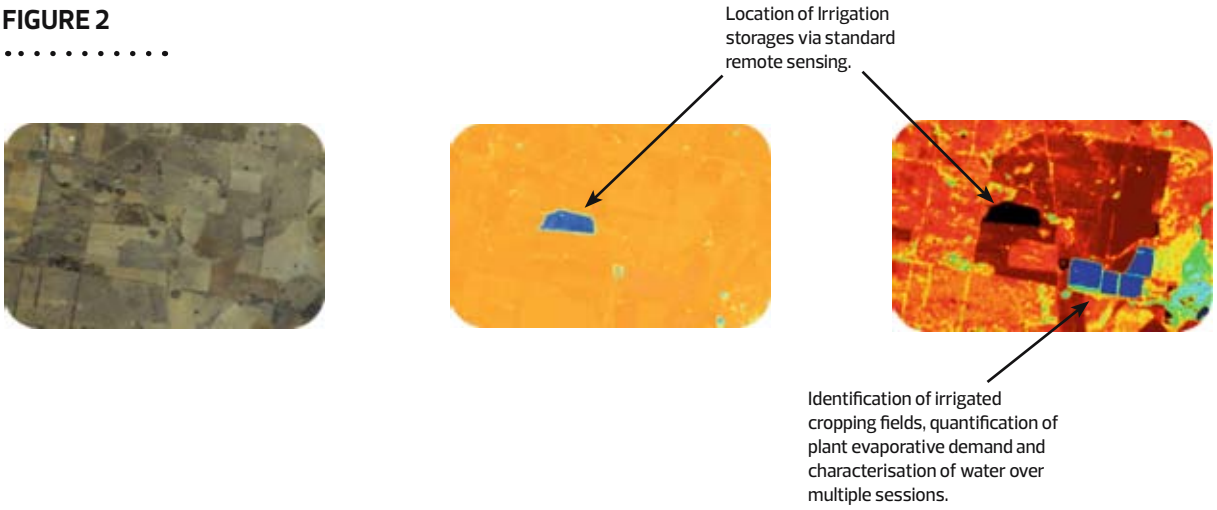
This system is a spinoff from research projects undertaken by the CRC for Irrigation Futures. Further work in this area by CSIRO will allow the development of crop factors in real time for field crops and the delivery of a complete forecast of water use for a site on a daily basis.

The work from CSIRO is making use of satellite imagery to measure the vegetation which is present in a field

the data is more easily accessible and processing systems have gotten more powerful. The estimation of irrigation water use based on remote sensing systems was a major input to the Sustainable Yields Project and by implication in the Basin Plan. The capability for this work exists in a few agencies in Canberra, but their estimation of the irrigated cropping areas in the Paroo Catchment in the past has left some doubt as to the level of skill which accompanies the science. A bit of local knowledge greatly improves the output.

Irrigators can now expect to get objective estimates of water use for days ahead for their crops. The opportunities for improved

FIGURE 2



How is this relevant for NSW irrigators? Well we know that water use of vegetation can be described by reference ET (ETo) multiplied by a crop factor or crop coefficient. This crop/plant information doesn't change much from week to week, it is really the weather (and most people underestimate the effect of wind) which drives the difference in water use from day to day. So with the good data that is now available, we can look at our water use for the past week, compare that to the ETo for the past week, back calculate the crop factor, and use that value with the forecast ETo to precisely describe water use for the coming week.

The BoM provides recent ETo data on it's WATL pages www.bom.gov.au/watl/eto/ . A commercial service, PWS

and provide realistic estimates of crop water use. Many irrigators in Griffith will be familiar already with this as the IrriSATSMS system and the continuing use of it is a good measure of the robustness of the science.

This remote sensing can be used in different ways. The satellite imagery can reveal what area of crop has been grown in a year, where "normal" mapping gives no clue (see panels 1 & 3 in Figure 2.) If operated correctly, it can reveal water storages and give a classification of depth of water in the storage (panel 2 in Fig 2.) Since the satellite imagery goes back more than 10 years, it provides an interesting record.

And these types of systems are becoming more widely used, since

management of the crop and of the water resource are immense.

Bill Williamson is a certified irrigation agronomist and deputy chairman of Macquarie River Food & Fibre.

www.productivewaterservices.com/iwater or phone 02 8458 0743

WATER MANAGEMENT

NEW DIRECTIONS

WORDS: **DOUG MIELL**

DOUG MIELL WAS CHIEF EXECUTIVE OFFICER OF NSW IRRIGATORS COUNCIL UNTIL 2007. HE NOW RESIDES IN ATLANTA IN THE UNITED STATES, FROM WHERE HE KEEPS A CLOSE EYE ON WATER POLICY IN AUSTRALIA AND GLOBALLY.

Water reform across North America is following a similar pathway to that experienced in Australia, with a range of competing interests, tensions and challenges in meeting expectations, delivering outcomes and maintaining reform momentum evident in many jurisdictions.

While the issues being addressed in these regions have, in many instances, a similar foundation to those driving reform in Australia: drought and low inflows; population growth; ageing infrastructure; lack of available funding; insufficient or incomplete data; and interstate legal conflicts, the solutions are somewhat different depending on where you are located.

The resource conditions driving reform in these regions, while serious, have not reached the devastating levels experienced across the Murray-Darling Basin in recent years.

In the United States, there are two distinct approaches to water management: the 'first in time, first in right' principle, which is prominent in western States and Alberta, Canada; and 'riparian rights' which is the predominate regime in the eastern States. The Mississippi River is the general demarcation point for the change in emphasis.

While there is much interest in the Australian move to establish a fully tradeable property right for water entitlements, at this time, even for the agricultural sector, that is a step too far, despite recognition by many of the attractiveness of the concept.

There is, however, much interest in and attention given to the policy and program settings being implemented across Australia. Of particular interest are the experiences and outcomes being achieved through implementation of water markets, water efficiency programs, integrated water resource management, the management of competing interests between productive water uses and users, environmental objectives and community aspirations and, in the body of research being undertaken into the wide range of issues associated with water resource managements across the full spectrum of sources, uses and users.

When the full scope of the challenges confronted by Australia irrigated

agricultural producers in recent years is outlined, there is great interest in the practical achievements from the on-farm management and infrastructure perspectives and the lessons learnt. Like NSWIC's members, farmers in these parts are inquisitive and keen to learn from the experiences of other and apply best practices relevant to their operations.

As I see it, sharing experiences, in particular those relating to on-farm water efficiency and irrigation management best practices, is one of two options for NSWIC members and other Australian irrigators to influence industry development around the world. In Australia, you have expertise to share that is world-leading in relevance and recognised accordingly.

The other area of opportunity for influencing global business trends is associated with the progressive engagement and adoption of sustainability principles and practices across business operations of many global corporations based in North America. This is obviously not a commitment exclusive to corporations headquartered in this region, but as the number of leading global brands engaged here is significant, much momentum is being generated around their activities.

Water resource management is one of the key areas of business operations benefiting from this sustainability focus, with consideration of demand/supply, risk management, internal business operations, wider supply chain efficiencies and community engagement being some of the initial parameters for assessment. Water is a critical ingredient to business operations and supply chain performance, hence the deep focus on this resoruce.

There is no single driver of corporate commitments to sustainability. The overriding business imperatives relate to: activities and outcomes generating bottom-line gains; being and being seen to be a good corporate citizen; shareholder and community activism; corporate social responsibility and global reporting initiative commitments; carbon accounting; a move to product life cycle analysis; resource stewardship commitments; and the fact that it makes good business sense to be as efficient with resources as possible.

As the time comes for NSWIC members' to give consideration to business operations in a more settled water resource management environment beyond the cut and thrust of today's politically-charged activities, the competitive landscape will be influenced and perhaps driven by sustainability initiatives that are being developed by some of the world's largest corporations.

My experiences in this space over the past 4 years suggests that sustainability initiatives being developed are positive for business, proactive, focused on triple bottom line outcomes and with significant relevance for agricultural producers and water supply, use and users. The strength of the commitment has progressed well beyond superficial interest, it is now a permanent feature of business management and it is gaining momentum.

From an analysis of the operations of the major global players, it is clear that there is a role for and indeed a need for agricultural producers to engage these major global corporations to be part of the development of sustainability policies, principles, programs and priorities to ensure that activities recognise industry's achievements to date; the priorities for industry; and the capability of industries to manage any change of production and managements emphasis.

To get some idea of the scope of the opportunity it is instructive to explore the sustainability commitments of global companies such as: McDonald's, Coca-Cola, Walmart, UPS, Pepsi, Kimberly-Clarke, Shaw Industries, Anheuser-Busch or SAB Miller. What quickly becomes obvious is that many have a large agricultural supply chains; most are significant water users; on a daily basis they reach and touch the lives of millions of consumers; and they are in a position to exert enormous influence across their global supply chain networks.

The sustainability objectives of these entities cannot be achieved without the cooperation of and partnerships with their supply chain partners. For the Australian agricultural industry, partnerships and relationships in this area will deliver competitive advantages, leadership opportunities and, for so many NSWIC members, a real chance to showcase production and management practices at levels as good as any being achieved around the world.

Sustainability is either coming to a marketplace near you, perhaps it has already arrived! The good news for NSWIC's members is that this is a market opportunity that plays to your sweet spot. There is much experience and expertise ready to be contributed to these emerging relationship options that will position the industry to be a leading voice in the global development of sustainability across diverse agricultural supply chains and industries.

Sustainability goals represent a business environment beyond, but not divorced from the rigours of today's water reform processes, while at the same time encapsulating many of the industry's responses to management challenges through recent years of water shortages and other industry events. The time to embark on engagement with and leadership of the global sustainability agenda for agriculture has arrived and members of NSWIC are well credentialed to participate in this global challenge.

Did you know Snowy Hydro produces c n annual W ater Operations Report?c

Snowy Hydro's Water Operations Report describes in high j level summary how the Snowy Scheme operates, our water j operations during the latest water year and how Snowy j Hydro meets its obligations under the Snowy Water Licence.j

The 2010-2011 Water Operations Report will be released in j December. The Report can be downloaded from our j website, or sign up to our mailing list to be sent a copy as j soon as it is released by emailing your details to:

communityfeedback@snowyhydro.com.au j

Snowy Hydro's website also has a dedicated Water j Resources section with information on everything j related to water. j

Find out what the current water levels are for the j Scheme's main storages, details about our water j licence obligations, or learn more about our Cloud j Seeding Project. Visit the website now for all the j latest, go to:j

www.snowyhydro.com.au/waterj

snowyhydro
renewable energy