MODERN MURRAY BASIN PLAN MYTHS AND CONFLICTS

INTRODUCTION AND SUMMARY

The claim by South Australian senior Labor Government politicians, and others, that implementation of the Basin Plan will ensure that the Lakes Alexandrina/Albert and Coorong environment will never again suffer like they did in the Millennium Drought is false, as is the argument that keeping the present Lakes full with fresh water is justified on the basis that prior to settlement the Lower River Murray estuary consisted of fresh water 95% of the time.

On the latter, construction of the Goolwa Barrages in the 1930's to create much larger Lakes of allocable fresh water should instead rely on contemporary reasoning. This has not happened and was dismissed as a relevant issue by the Basin Plan proponents in the public meeting held in the Adelaide Convention Centre. – words to the effect that "we won't be touching existing storages". The storage of fresh water in the Lower Lakes should have been based on water allocation review, discussion and decisions leading to the Basin Plan because SA's pre Basin Plan water entitlement of 1850 GL included 800+ GL to offset Lake and other evaporation which was a substantial existing allocation.

Sometime later, and before the Plan was approved I heard a comment "on the grapevine" that the examination of the role of existing storages was a "political no go area".

However the Plan finally recognized that evaporation losses are a significant issue to be pursued. And quite recently modification proposals were put forward to reduce evaporation losses from the existing Menindee Lakes storages. These shallow storages have large evaporation losses like that which occurs from Lakes Alexandrina and Albert, which I consider a fundamental aspect of Basin water availability and use.

There are substantial opportunity costs associated with the annual evaporation loss of around 800 GL from the Lakes.

Myth 1 is either due to a misunderstanding and wishful thinking of the potential Basin Plan environmental outcomes, or political spin in the knowledge that the frequencies of severe droughts are beyond "political lifetimes". The Basin Plan is actually very clear on the fact that there is no way of drought proofing the Basin.

Myth 2 is related to both moderate and severe droughts and along with Myth 1 could be creating unrealistic environmental expectations because Lake levels are expected to drop at least once every six years on average based on analyses using 1970s data. In fact drought impacts on the Lakes are now expected to be much worse than previously predicted.

On conflict, weirs and dams on Basin streams have altered the natural flow regimes while moderating the impact of all but major floods and droughts. Although the main stem of the River Murray is now virtually "full" all of the time compared with pre development intermittent overfull and empty periods the Basin environmental objectives are attempting to preserve and enhance the remaining pre development ecological features such as flood plain river red gum forests that rely on relatively short term periodical flooding, the frequency of which has been reduced by the construction of dams.

In contrast, new environmental features created by the larger Lakes Alexandrina and Albert following construction of the Goolwa Barrages are now deemed worthy of preservation and

maintenance in conjunction with predevelopment ecological features of the Lower Murray, Coorong and the Mouth. These objectives are "locked in" by the International RAMSAR agreement but are conflicted by the desire to keep the Lakes full with fresh water, thus sacrificing that water to evaporation or otherwise refreshing the Coorong and keeping the Murray Mouth open.

This submission is relevant to the Royal Commission terms of reference regarding the additional 450 GL issues particularly item 5, and 13. Further detail on my issues follows later.

My Credentials

I have worked professionally as a water resources engineer, specializing in hydrology around Australia in Canberra (during the 1967 severe drought), the Northern Territory and finally in South Australia where I was project leader for the Metropolitan Adelaide Water Resources Study (MAWRS) report, published by the SA Government in 1978.

This Study examined a wide range of potential long term water supply options for Adelaide which among other things recommended that the emphasis on the River Murray as the major source of supply should remain, and be secured. Part of this study incorporated a hydrological modeling examination of River Murray water allocation to South Australia including the probability and frequency of drought impacts which are detailed later below.

In the 1980's I subsequently worked on River Murray water allocation issues including initiating the removal of unused SA River Murray irrigation water licenses, (and before they became transferable). Reductions were achieved by averaging an irrigator's last three years water use, then adding a "factor of safety", resulting in a reduced licence amount after withdrawing the unused gap.

Ultimately I managed the Government sale process of the seven South Australian commercial ports, but my longstanding interest in the River Murray remains including formal comments submitted on the Guide and proposed Basin Plan during the consultation process.

MYTH 1 on DROUGHT PROOFING

Notwithstanding the planned redistribution of available River Murray Basin water between consumptive and environmental uses on a year to year basis, there has been no additional water created to combat a future drought. In other words the same amount of water is being used each year, on average, apart from possible minor carry over from the previous year (which now applies to environmental as well as consumptive uses). While the River and Lakes Alexandrina and Albert will be healthier on average due to increased environmental flows, this will not apply in an extended drought when the remaining stored water upstream on drought commencement is then decreasingly shared throughout the Basin as the drought intensifies. Dwindling inflow into the Lower Lakes as in the past then becomes insufficient to replenish the Lakes evaporation losses. (See conclusions for potential opportunity on environmental water storage.) Hydrologic insight suggests that more dams like Dartmouth could be built in the Alps but they would not necessarily create significantly more water because a severe drought would also deplete any such additional storage. Furthermore, building another "Dartmouth" somewhere in the Alps for the sole purpose of providing a standby resource for use only in a severe drought would probably not be of sufficient capacity (depending on drought severity) and would be very uneconomic. The only (farcical if not) totally uneconomic way to drought proof the rainfall runoff dependent Basin water supply system would be to create and pump desalinated sea water from the east coast of Australia over the Alps into the headwaters of the River Murray.

The Basin system will be more environmentally robust at the onset of a future severe drought but this benefit is likely to soon be significantly eroded even with a pre drought additional 450 GL per annum up to drought commencement, or thereabouts.

MYTH 2 on CONFLATION OF THE FRESH WATER LAKES

This myth is due to invalidly extrapolating the pre development River Murray estuary average water quantity and levels and claimed freshness to justify the currently maintained higher water levels and volume in Lakes Alexandrina and Albert, following construction of the Goolwa Barrages in the 1930s.

The claim that the pre development estuary was fresh for 95% of the time is based on modeling done by the MDBA . Ref MDBA Fact Sheet "All about the Barrages" publication 24/11 in 2001. This modeling and claim was limited to the impact of sea water on Lake freshness but without any consideration of River Murray salt laden low flows in dry periods. This result is also doubtful in my view for reasons presented below, but even if it is true it is a giant leap in logic to claim, as environmentalists and others do, that this justifies that the "man made" Lakes, at a much higher level and volume, should be kept full with fresh water at all times, particularly in a moderate or severe drought.

These Barrages resulted in a complete change to the flow regime through the Mouth. The current top water level of 0.75 m above mean sea level and greater volume of water extends upstream to and past Murray Bridge to Blanchtown as well as fully across to Meningie on the eastern shore of Lake Albert.

"The Barrages were constructed to a high level to keep sea water from entering the Lower Murray estuary under low river flow and high tide levels thereby enabling irrigators around the Lakes a continual supply of fresh water and to permit watering by gravitation of reclaimed areas between Mannum and Wellington which would otherwise be affected by the salt water after long periods of salinity" – (from The South Coast Story by J C Tolley 1968). Another reason for the higher water levels behind the Barrages was to assist river navigation regarding river boat trade between South Australia, Victoria and New South Wales.

DOUBTS ON PRE DEVELOPMENT FRESHNESS

Captain Charles Sturt on his summer 1829/30 voyage down the Rivers Murrumbidgee and Murray encountered water that was brackish and "quite unpalatable" on his entry to the top of Lake Alexandrina near Pomanda Island. Reports based on his journal describe the significant flow in the Murrumbidgee which he traversed in a whaleboat. - "At Jugiong, instead of a river that had almost ceased to flow (I think a comment related to his prior experience on the Darling as written below) I now looked down on a stream whose current would have been difficult to breast". Sturt also described the Murray on entry as a "capacious channel". His sketch at the junction of the Murray and Darling shows plenty of water and he was able to travel some miles up the Darling, and then floated on the Murray down to the Lake. This experience alone, of encountering salty water at the top end of Lake Alexandrina, under non drought flow conditions in mid summer casts doubt on the 95% of the time fresh water claims. It is of course possible that the salty water that Sturt found at the entry to Lake Alexandrina resulted from earlier salty low river flows during the 1826 drought from pre development saline water table entry into the River of 800 tonnes of salt per day on average. So in low flow years the estuary was being impacted by both seawater entry at the Mouth and salty minimally diluted drought condition River flows. Sturt found this condition in the Bogan in January 1829 and then the Darling during a drought that commenced in 1826 "and lasted for some

years". At the Bogan Sturt said "I shall never forget the cry of amazement or the look of terror with which they cried out to inform me that the river was so salt as to be unfit for drinking". The cause was after "traced to the effect of brine springs along the banks which in dry weather was strong enough to impregnate the river". Later, in March 1829 the Darling consisted only of pools of salty water "and unfit to drink". Refer Captain Charles Sturt : Discovery of the Darling River (chapter 17 of The Story of Australia" by Martin Humbleton Oct 2013.

A review of Basin drought history shows that over the last 130 years since 1884 the River Murray has experienced drought in at least 35 of those years i.e. once every four years on average. Since 1884 seven of these droughts have lasted for 3 years or more, and although the 1967 drought was a single year occurrence it was Australia wide and had a big impact on the Murray system, leading to a halt in South Australia of the issue of further irrigation licences. This information also suggests a higher frequency and quantum of salt water entry into the Lower River Murray estuary, along with salt laden inflows from upstream.

Among the MDBA publications there is a photo of a man standing in the bed of the non flowing River Murray at Mildura in the 1902-03 drought. In the 1911 to 1915 drought my Auntie Edith (who was at the time 5 years old) straddled the River Murray "channel" at Merbein with one foot on either side! It is difficult to imagine that significant sea water was not entering Lake Alexandrina in these extended periods.

All this information casts serious doubt over claims that the River Murray estuary was fresh 95% of the time prior to settlement and river regulation.

RIVER MURRAY TO SOUTH AUSTRALIA LOW FLOW ANALYSES

The MAWRS Report (EWS Library Ref 77/42 in section 5.3.4 headed Entitlement and Below Entitlement flows to SA, from page 46 indicates the following examples of the estimated probability of incurring low River flows to SA. Firstly be aware that the post Dartmouth "Entitlement" flows to SA were 1850GL per annum which under fully regulated flow conditions was just sufficient to keep Lakes Alexandrina and Albert full around the start of a water year, and without any spillage to the Coorong and Murray Mouth. Water levels in the Lakes would then fall over summer due to regional water extraction, evaporation, and any potential releases to the Coorong and/or Murray Mouth.

So the probability of getting:

- Only entitlement flows in any one year was 17% i.e. once every six years on average
- Below Entitlement flows in any one year was 3.3%, or once every 30 years
- Below entitlement flows 2 years in a row at 1.4% i.e. once in every 80 years
- 3 years in a row 0.6% at once every 167 years on average
- 4 years 0.2 % i.e. once in every 500 years.
- 5 years 0.1% and once in a 1000 years

Under all the above situations there would be no flows to the Coorong or through the Murray Mouth and once every six years on average Lake levels would drop, and then continue to fall substantially if this first event above was the start of a drought.

The latter two entries above suggest that the Millennium Drought was a 1 in 500 to 1000 year event, while noting that Premier Rann at the time called it a 1 in 500 year occurrence.

When drought conditions approach, Basin water usage restrictions come into force under River operating rules leading to "entitlements" not being met and ultimately "water for critical human needs" predominates.

The above data says that water levels in the Lower Lakes would start to fall early in any drought sequence of years.

I must emphasize that this suite of probabilities are estimates which are sensitive to changing input variables, particularly demand and water allocation policies which were relevant to the 1970s.

Historical options for securing SA River Murray water supply included Premier Dunstan in the 1960s seeking to build a shallow storage on the River in South Australia at Chowilla just upstream from Renmark due to his "mistrust of interstate interests". Evaporation losses would have been horrendous and after site engineering investigations and representation from the South Australian EWS Dept Engineer in Chief the proposal was discarded in favour of Dartmouth in the Alps.

Of the post Dartmouth water entitlement to SA, now slightly modified by the Basin Plan, over 800 GL - about four times Adelaide's annual consumption evaporates from the Lower Lakes.
Creation of the RAMSAR agreement among other things seeks to protect the new ecosystem of the Lakes which reinforces my views on the conflict between the competing demands for optimal use of the water allocation to the Lower Lakes (Refer again MDBA publication 24/11 – All About the Barrages.)

While the MAWRS Report's analysis of probabilities was based on 1970 levels of demand on River Murray water, it also considered the potential impact of a nominal increase in demand by the year 2000 which "revealed an extremely sensitive response to a small increase in demand of approximately 15%. Under these increased demands water supply deficits occurred in all three states more frequently, with higher intensities and over longer durations than is currently the situation".

In 1970 total Basin diversions were around 8000 GL per annum. (Ref Dr Lindsay White – Water Management in the Murray Darling Basin: A Brief Study 2017). In fact under the Basin Plan the current total Sustainable Diversion Limit is 10873GL plus 2750 GL for the environment totaling 13623 GL per annum i.e. 70% higher! This suggests that the drought probability impacts on South Australia will be much worse than the estimates prepared using 1970 diversion levels. I have not the tools or access to update these probabilities but someone needs to do it to put the Basin Plan environmental objectives for the Lower River Murray into a realistic perspective.

CONCLUSIONS

Notwithstanding killing off the Chowilla proposal we have ended up with an evaporation basin at the very end of the River with the competing objectives of keeping it full to maintain a post settlement created fresh water environment, while starving the Coorong and Murray Mouth of flushing flows.

Keeping the Lakes full with fresh water in a drought is impossible and putting aside political activism, attempting to find ways to keep them full is wasted effort which should instead be directed towards more sophisticated water resources management based on up to date consideration of competing drought water use options.

If the claim is correct that the River Murray estuary was fresh 95% of the time prior to settlement and River regulation, simplistic logic inadvertently would suggest that this was also the case for the upstream River Murray.

My presentation herewith suggests that this was blatantly not the case given the drought history and omission in the MDBA analysis of pre development natural ingress of salt into the Basin rivers which was particularly evident in low flow periods.

This has led to spurious reasoning and justification for keeping the Lower Lakes full with fresh water and has diverted serious attention from Lower River Murray water management opportunities.

Now that the main stem of the River Murray is kept full virtually 100% of the time by the weirs and head works storages, salinity along the length of the River has been moderated and evened out under a post development ecological regime. The ecological benefits of this regime seem to be overlooked by environmentalists whose focus is more on the flood plain gum trees and other remnant pre development ecology in contrast to that for the Lower Lakes where they proclaim the need for both maintenance of the new man made freshwater environment as well as trying to maintain and enhance the remnant pre development ecological features of the Coorong and Murray Mouth. While the River was still "full" at the end of the Millennium drought with water dribbling over the weirs including Lock 1 at Blanchtown, this does not apply to the Lower Lakes which ended up at an all time low of 1 metre below mean sea level.

In addition, keeping the Lakes full with fresh water at (most) other times and doing nothing with the water has resulted in a dead storage that uses a large amount of valuable River Murray water to mainly offset the Lakes evaporation losses, while benefiting recreation and Lakeside irrigation, (both of which are replaceable by other means).

I first raised this issue around 40 years ago in a public forum at Adelaide University without much success. Finding ways to reduce this evaporation loss was a recommendation in the MAWRS Report which has since received only scant attention.

Enlivening the Lower Lakes should be open to wide analysis and realistic consideration in view of serious expected drought impacts and the opportunities associated with the annual value of 800+ GL of River Murray water "loss".

One of the many opportunities that could be considered is redirecting Lake water to periodical flushing of the Coorong and Murray Mouth, given higher levels of expected drought impacts on South Australia.

A comprehensive comparative analysis of negative drought impacts involving a trade off between short and longer term environmental damage might help resolve the future of the Lower Lakes.

IF this analysis found in favour of the Lower Murray then this could be achieved by holding back all or part of annual available environmental water in headworks storages for use in major droughts, i.e. extending the carryover concept for environmental water (only).

Yours sincerely

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