

## Chapter 3

### Groundwater

3.1 In order to manage the entire water resource in the Murray-Darling Basin, the Basin Plan also sets Sustainable Diversion Limits (SDLs) and Baseline Diversion Limits (BDLs) for groundwater. The groundwater SDLs and BDLs have been developed in a manner similar to surface water SDLs and BDLs as discussed in the previous chapter. The definition of the SDL and BDL apply to groundwater in the same way as to surface water (see chapter two).

3.2 This chapter discusses how the Murray-Darling Basin Authority (MDBA) has set groundwater SDLs and BDLs and how they have changed significantly over the various iterations of the Basin Plan. It also discusses the key criticisms of the modelling of groundwater for the Basin Plan. Finally the chapter details the concerns with the treatment of the connectivity of surface water and groundwater resources in the Basin Plan.

#### ***Groundwater SDLs and BDLs***

3.3 In the final version of the Basin Plan, the MDBA set the Basin-wide SDL for groundwater at 3334 GL/y. The BDL for groundwater is set at 2386 GL/y.<sup>1</sup>

3.4 The SDLs and BDLs for groundwater proposed by the MDBA have varied significantly across the different versions of the Basin Plan. Table 3.1 lists the groundwater SDLs and BDLs from the MDBA's Guide to the Proposed Basin Plan (the Guide) through to the final Basin Plan.

3.5 As Table 3.1 indicates, the Guide provided for a relatively small increase (309 GL/y) between the total Basin SDL (2095 GL/y) than the total Basin BDL (1786 GL/y). The total allowable extraction of groundwater increased greatly under Basin Plan (November 2011) with a SDL/BDL difference of 1988 GL/y. Under the final Basin Plan this SDL/BDL difference was reduced to an increase of 948 GL/y but still represents a much larger increase in ground water extraction than proposed in the Guide.

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1 MDBA, *Basin Plan attachment G– Synthesis of analysis associated with the determination of an environmentally sustainable level of take (ESLT) for surface water and groundwater in the Basin Plan*, November 2012, p. 6, [www.mdba.gov.au/basin-plan](http://www.mdba.gov.au/basin-plan), (accessed 4 March 2013).

**Table 3.1—Groundwater SDLs and BDLs from the Guide to the Basin Plan**

	The Guide (October 2010)	Basin Plan (November 2011)	Basin Plan (May 2012)	Basin Plan (August 2012)	Final Basin Plan (November 2012)
BDL GL/y	1786 <sup>2</sup>	2352 <sup>3</sup>	2373 <sup>4</sup>	2378 <sup>5</sup>	2386 <sup>6</sup>
SDL GL/y	2095 <sup>7</sup>	4340 <sup>8</sup>	3184 <sup>9</sup>	3324 <sup>10</sup>	3334 <sup>11</sup>

3.6 Unlike surface water which had extractions limited by the 1995 cap agreed to by Basin states, no equivalent constraint has been applied to groundwater use. As a result, the MDBA developed the BDLs for the Basin in reference to current groundwater extraction levels and water entitlements. The Basin Plan divides the Basin up into 66 groundwater SDL resource units (based on state planning boundaries and hydrogeological regions) and sets a BDL and a SDL for each.<sup>12</sup> The number of SDL resource units has change across the various iterations of the Basin Plan – for example, there were 79 resource units in the May 2012 version, and

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- 2 MDBA, *Guide to the proposed Basin Plan*, Volume 1, Overview, 8 October 2010, p. 55.
  - 3 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, 2012, p. 21.
  - 4 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, 2012, p. 21.
  - 5 MDBA, *Altered Proposed Basin Plan*, Schedule 4, August 2012, pp 192–205.
  - 6 MDBA, *Basin Plan attachment G– Synthesis of analysis associated with the determination of an environmentally sustainable level of take (ESLT) for surface water and groundwater in the Basin Plan*, November 2012, p. 6, [www.mdba.gov.au/basin-plan](http://www.mdba.gov.au/basin-plan), (accessed 4 March 2013).
  - 7 Note this figure is quoted in the MDBA, *Proposed Basin Plan consultation report*, May 2012, p. 46 and includes a component for unassigned groundwater. The figure of 1601 GL/y for the Basin wide groundwater SDL which was listed in the Guide excludes unassigned groundwater; see MDBA, *Guide to the proposed Basin Plan*, Volume 1, Overview, 8 October 2010, p. 143.
  - 8 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, 2012, p. 21.
  - 9 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, 2012, p. 21.
  - 10 MDBA, *Proposed Basin Plan: Authority's views and consultation on the matters raised by the Murray-Darling Basin Ministerial Council – Volume 1*, August 2012, p. 35.
  - 11 MDBA, *Basin Plan attachment G– Synthesis of analysis associated with the determination of an environmentally sustainable level of take (ESLT) for surface water and groundwater in the Basin Plan*, November 2012, p. 6, <http://www.mdba.gov.au/basin-plan>, (accessed 4 March 2013).
  - 12 *Basin Plan*, Schedule 4, August 2012, pp 201–213.

70 SDL resource units in the August 2012 version.<sup>13</sup> The Basin-wide groundwater BDL and SDL is the sum of individual BDLs and SDLs across all the groundwater resource units, respectively.

### ***Determination of groundwater baseline diversion limits***

3.7 As a reference point, the MDBA determined the BDL for each SDL resource unit on the following basis:

1. where a water management plan or proposed plan exists, the BDL is the plan limit unless the plan limit is greater than the level of entitlement, in which case the BDL is the entitlement;
2. where there is no plan, the BDL is the entitlement along with the effect of any rules managing extraction; and
3. where there is a cross-border agreement for groundwater management, the extraction limit under the agreement is the BDL.<sup>14</sup>

3.8 The MDBA has indicated that this policy is the most 'accurate reflection of the limits of use imposed on current groundwater planning arrangements.'<sup>15</sup> The Basin states provided the MDBA with estimates of average use of groundwater resources for the period 2003-04 to 2007-08. The MDBA stated that 'small changes to some BDL estimates' had to be made following receipt of this information.<sup>16</sup>

### ***Modelling for groundwater sustainable diversion limits***

3.9 According to the MDBA, the proposed groundwater SDLs were informed by numerical groundwater models or an analytical risk assessment which provided the 'potential volume of water available for consumptive use' or the preliminary extraction limit (PEL).<sup>17</sup>

3.10 The MDBA undertook numerical modelling for 13 of the 79 groundwater resource units where numerical models were already available. The MDBA also needed to supplement this analysis with a Recharge Risk Assessment Method (RRAM) for the remaining 66 groundwater resources units, as numerical models were not available in all areas. The MDBA explained this approach:

Numerical modelling was carried out in 13 SDL resource units where there were fit for purpose numerical models available. Where numerical models

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13 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, 2012, p. 4 and MDBA, *Basin Plan: Authority's views on the Minister's suggestions on the altered proposed Basin Plan*, November 2012, p. 9.

14 MDBA, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012, p. 22.

15 MDBA, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012, p. 23.

16 MDBA, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012, p. 23.

17 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, 2012, p. 10.

were not available the [MDBA] has used a recharge risk assessment method (RRAM), developed for the MDBA (CSIRO and SKM 2010), to inform the proposed SDLs. Both the numerical groundwater modelling and the RRAM provide the potential volume of water available for consumptive use.<sup>18</sup>

3.11 The MDBA stated that the numerical models used 'represented systems that covered 73% of the groundwater [extracted] in the Murray-Darling Basin in 2007/08.'<sup>19</sup>

3.12 The MDBA explained that for the development of SDLs for resource units where numerical model were not available (i.e. through RRAM) that:

...the first step in determining the PEL using RRAM was to determine recharge across the Basin using the Water Vegetation Energy and Solute (WAVES) model and upscaling techniques developed for the Murray-Darling Basin Sustainable Yields project and subsequently refined for the Basin Plan (Zhang and Dawes 1998 and CSIRO 2010). Additional recharge information was also used where it was made available by the states.<sup>20</sup>

3.13 Modelling of groundwater SDLs included the MDBA developing a 'groundwater assessment framework' which involved two stages:

The first stage considered the characteristics of the individual groundwater resource units. Each groundwater SDL unit was characterised as either:

- Deep groundwater;
- Non-renewable groundwater;
- Connected groundwater; or
- Non-connected groundwater.

The second stage assessed the Authority's determination of the BDL and assessment of the PEL in conjunction with the current or proposed groundwater management arrangements to determine the SDL for each groundwater SDL resource unit. The assessments within each of the characterisation groups considered:

- is there an existing reduction program in place;
- is the BDL greater than the PEL;

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18 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, 2012, p. 12. Note the number of resource units changed over the various iterations of the Basin Plan. The final Basin Plan has 66 groundwater resource units. However, in answer to question on notice 23 November 2012, the MDBA directed the committee to this report for information about how groundwater SDLs (especially in terms of connectivity) were determined. MDBA, answer to question on notice, 23 November 2012, (received 28 November 2012).

19 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, April 2012, p. 11.

20 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, April 2012, p. 12.

- is the BDL equal to the PEL;
- is the BDL less than the PEL; and
- is there more up to date science or knowledge, or existing or proposed water management arrangements in place and how do they relate to the BDL and PEL considerations.<sup>21</sup>

#### *Addendum Report on Groundwater modelling*

3.14 In July 2012, the MDBA released the *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report* (Addendum).<sup>22</sup> This report provides updated information regarding the modelling for groundwater BDLs and SDLs. This included a review of the groundwater assessments by the MDBA and other groundwater experts and led to a decrease in the Basin-wide groundwater SDL from 4340 to 3184 GL/y in Basin Plan (May 2012).<sup>23</sup> The review included:

- an explanation of how the potential impacts of groundwater take on surface water were accounted for when setting the groundwater SDLs;
- a discussion on data quality and how it was considered in the review; [and]
- changes to deep groundwater SDL resource units.<sup>24</sup>

3.15 The MDBA acknowledged there was limited science available for setting groundwater SDLs and stated a 'conservative approach' should be adopted. According to the MDBA, this approach provided the justification for *some* SDLs being reduced in the Basin Plan from the initial estimates that were outlined in the Guide.<sup>25</sup> This is despite the significant *overall* increase in the Basin-wide SDL from the Guide to the first iteration of the Basin Plan.

3.16 The MDBA reassessed the information and data used to inform the SDLs in the Basin Plan (November 2011) and determined that the most appropriate method of revising the groundwater SDLs was to alter the 'unassigned groundwater assessment' in three broad groundwater systems, the: Lachlan Ford Belt System; Highland System; and the Western System. The revisions in these groundwater SDLs focussed mainly on unassigned groundwater and deep aquifers. Unassigned

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21 MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, April 2012, p. 13.

22 This report was an addendum to the MDBA, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, April 2012,

23 MDBA, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012, p. 2.

24 MDBA, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012, p. 2.

25 MDBA, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012, p. 3.

groundwater is the groundwater that can be 'made available for consumptive use above the BDL'.<sup>26</sup>

3.17 The MDBA's major reports that publicly detail groundwater SDLs, BDLs, and SDL resource units pre-date some changes to the groundwater SDLs, BDLs and SDL resource units that are listed in the final Basin Plan. Some of the evidence discussed below refers to SDL, BDL and SDL resource unit figures from earlier versions of the plan and therefore may differ from the figures included in the final Basin Plan. However, despite the changes in numerical values, the committee considers that the general thrust of the criticisms raised below have not been altered by the final version of the Basin Plan.

*Key criticisms of groundwater modelling*

3.18 In April 2012, the Wentworth Group of Concerned Scientists (Wentworth Group) stated in its analysis of the groundwater in Basin Plan (November 2011) that the BDLs have 'changed considerably' since the Guide (from 1786 to 2352 GL/y) and that no evidence had been provided to justify these increases:

Across the Basin as a whole there have been some baselines that have increased and some that have decreased.

However the accumulated decrease in baselines across the Basin is less than 20 Gl. On the other hand, the accumulated increase in baselines across the Basin is in excess of 600 Gl. This dramatic increase in claimed baseline water use matters. Since the Baseline Diversion Limit is used to establish the Sustainable Diversion Limit this large creep in baseline use in just 13 months has the effect of increasing the Sustainable Diversion Limits available for consumptive use and decreasing the available environmental water.<sup>27</sup>

The Murray-Darling Basin Authority provides no evidence to justify the 600 Gl increase in baselines over the 13 month period since the publication of the Guide.<sup>28</sup>

3.19 The Wentworth Group claimed there was no new modelling undertaken since the Guide and which would explain the groundwater SDLs as per the Basin Plan (November 2011):

In the 12 months since then, there has not been any new science done—let us make that clear—but there has been a change of 2,600 gegalitres. We

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26 MDBA, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012, p. 28.

27 Wentworth Group of Concerned Scientists, *Analysis of Groundwater in the 2011 Draft Murray Darling Basin Plan*, April 2012, p. 7.

28 Wentworth Group of Concerned Scientists, *Analysis of Groundwater in the 2011 Draft Murray Darling Basin Plan*, April 2012, p. 7.

have increased the amount of groundwater we can take by 2,600 gigalitres. I am a little bit shocked at that without new science to back that up.<sup>29</sup>

3.20 The RRAM approach was criticised by stakeholders for the lack of scientific review. Environment Victoria's Healthy Rivers Campaigner, Ms Juliet Le Feuvre explained this criticism stating the groundwater SDLs:

[are] based on the recharge risk assessment model, which estimates on a very broad basis what recharge to groundwater is. They [the MDBA] say that they have taken a precautionary approach and halved it and halved it again, but there is no scientific review of the model that they have used, so it would not be a precautionary approach at all.<sup>30</sup>

3.21 The Wentworth Group also challenged the validity of the modelling undertaken for groundwater SDLs stating there were key limitations and flawed assumptions made with this approach:

The draft Basin Plan divides the Murray-Darling Basin aquifers up into 79 groundwater units [Basin Plan (November 2011)]. Numerical groundwater models currently cover 13 of these 79 resource units. The areas covered by the models are generally the most heavily used alluvial systems...

The Recharge Risk Assessment Method was used as a prioritisation tool for the Guide to the Basin Plan. Its results were never intended to be used to provide quantitative recharge estimates...

Given the great uncertainties in the calculation of the recharge rates, the need to retain groundwater resources for future generations, and the limited information available about reliance of ecosystems on groundwater discharges, using risk factors of 50% and 70% of the recharge is very concerning.<sup>31</sup>

3.22 Given the information gaps regarding groundwater in the Basin, many stakeholders have argued for a precautionary approach to be taken. For example, the National Water Commission (NWC) has stated that the potential impacts regarding extraction of water from groundwater systems will take a long time to emerge so an adaptive and precautionary approach is essential.<sup>32</sup>

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- 29 Mr Tim Stubbs, Environmental Engineer, Wentworth Group of Concerned Scientists, *Committee Hansard*, 23 April 2012, p. 17. The MDBA stated that the 'figure of 2,600 GL/year represents the difference between the total groundwater baseline diversion limits (BDLs) in the Guide to the total groundwater SDLs in the draft Basin Plan and is hence not an accurate representation of the change'. MDBA, answer to question on notice, Senate Standing Committee on Environment and Communications Legislation Committee, additional budget estimates, February 2012, question no 184.
- 30 Ms Juliet Le Feuvre, Healthy Rivers Campaigner, Environment Victoria, *Committee Hansard*, 24 April 2012, p. 31.
- 31 Wentworth Group of Concerned Scientists, *Analysis of Groundwater in the 2011 Draft Murray-Darling Basin Plan*, April 2012, pp 5–6.
- 32 National Water Commission, *Coal Seam Gas and Water Position Statement*, December 2010, p. 1.

3.23 The Basin State Ministers also supported a precautionary approach for all aquifers consistent with the NWC position and also noted that extraction limits for groundwater resources may shift over time depending on new information and the best available science in relation to these resources.<sup>33</sup>

3.24 Despite the prospect for future review some stakeholders claimed the proposed amount of extraction is too high. For instance Dr Paul Sinclair from the Australian Conservation Foundation stated:

The increase in groundwater extraction contemplated by the proposed basin plan is reckless. The draft plan proposes to increase the extraction of groundwater by 2600 gegalitres, about the same amount it once returned to the rivers. Enormous amounts of public money and effort are being dedicated to addressing the problems that have arisen from past decisions to over-allocate surface water based on poor understanding and political self-interest. The authority should be prevented from repeating the mistakes of the past.<sup>34</sup>

3.25 The Wentworth Group was also critical of the modifications made to groundwater extractions after Basin Plan (November 2011), arguing that the Basin-wide groundwater SDL in subsequent version of the Basin Plan were not based on strong scientific evidence. As Mr Tim Stubbs explained:

We have had a pretty comprehensive look at that huge increase [in Groundwater Methods Report] and we released a submission asking a lot of questions about the science justifying that increase. We could not see that science. The authority put out a subsequent document [Addendum] but again it really lacked the details and proved to have some very dubious assumptions in it—assumptions that were made to get to those final numbers. It was very interesting that a number of weeks after that version a subsequent version of the plan [Basin Plan (August 2012)] came out and we saw a drop of around 1,000 gegalitres in those groundwater numbers. Craig Knowles said at a media conference, I think, that he got the boffins in a room and looked at the numbers. That translated to a one-day workshop with a handful of groundwater experts and others. The big concern is that we are making decisions about the future of the Murray-Darling basin through a one-day workshop. It is an interesting way of going about public policy, particularly when we are spending huge amounts of money and time modelling the surface water and saying how much water needs to go back in there, and then completely separately having a one-day workshop to adjust the volumes of groundwater by around 1,000 gegalitres. And the two are connected.<sup>35</sup>

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33 Ministerial Council, *Murray-Darling Ministers' comments on the proposed basin plan*, 9 July 2012, p. 9.

34 Dr Paul Sinclair, Australian Conservation Foundation, *Committee Hansard*, 24 April 2012, p.35.

35 Mr Tim Stubbs, Environmental Engineer, Wentworth Group of Concerned Scientists, *Committee Hansard*, 10 September 2012, pp 14–15.



### ***Connectivity between surface and groundwater resources in the modelling***

3.26 Groundwater and surface water connectivity was perhaps the single most contentious issue regarding the treatment of groundwater in the Basin Plan. The committee heard extensive evidence that the two resources should be treated as closely linked and that Basin Plan did not adequately address this issue.

3.27 The National Water Commission has stated that although it is not always apparent, these resources are 'intimately linked' and should be managed as a single resource, unless proven otherwise.<sup>36</sup>

3.28 Conservation Councils in particular have stated that the water resources in the Basin need to be considered as connected when considering how much groundwater is sustainable to extract. For example Mr Tim Kelly, Chief Executive of the Conservation Council of South Australia stated that 'by default, these systems should be treated as connected' and that the MDBA 'should not be allocating further water from them.'<sup>37</sup>

3.29 This position was echoed by the Wentworth Group that stated the Basin Plan's failure to include the impact of increasing groundwater extractions in the surface water modelling means the surface water SDLs are unlikely to deliver the claimed outcomes. The Wentworth Group analysis of the Basin Plan (November 2011) stated:

The failure to adequately analyse the impacts of increasing groundwater extractions on surface water means the draft basin Plan will not adequately protect environmental assets, particularly those dependent on low flows.<sup>38</sup>

3.30 Dr Bill Young from the CSIRO advised the committee that, as with the surface water SDLs, the adaptive management approach that the MDBA have stated it will use will allow for further consideration of new science and information in relation to groundwater and surface water connectivity:

The surface water impacts from the groundwater...will take a long time to emerge. There is a review process that has been put in place. There may be no demand for that increase in groundwater use to happen in a hurry, but that does not necessarily mean it is scientifically defensible. But it does not mean it is necessarily risky either. There is an opportunity to review this. If the authority follows through with its commitment to adaptive management, we will be monitoring the increases in use, we will be monitoring the

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36 National Water Commission, *Groundwater-Surface Water Connectivity*, 13 December 2011, <http://nwc.gov.au/groundwater/connectivity>, (accessed 5 September 2012).

37 Mr Tim Kelly, Chief Executive, Conservation Council of South Australia, *Committee Hansard*, 24 April 2012, p. 24.

38 Wentworth Group of Concerned Scientists, *Analysis of Groundwater in the 2011 Draft Murray-Darling Basin Plan*, April 2012, p. 3.

impacts on stream flows and we will be monitoring the consequences and outcomes for environments across the basin.<sup>39</sup>

3.31 The CSIRO was also critical about the level of rigor that MDBA applied to this issue:

...the evidence base that has been presented by the authority to date to support the [Basin Plan (November 2011)] has not demonstrated that it has undertaken a rigorous assessment of the surface water impacts of the proposed levels of groundwater take.<sup>40</sup>

3.32 Other Basin stakeholders also voiced concerns regarding the limited knowledge and scientific understanding of the impact of the proposed groundwater extractions. Professor Mike Young noted that he did not believe the appropriate amount of information was available for the approach the MDBA was taking with groundwater under the Basin Plan (November 2011) and that he supported the NWC approach to connectivity.<sup>41</sup> Another witness, Ms Beverly Smiles from the Inland Rivers Network explained:

One of the concerns is that where this new groundwater extraction is being proposed overlays the Great Artesian Basin in recharge areas, and there is a whole range of concerns around this proposal. Those of us who have been following water for a long time know that the knowledge and science around groundwater is relatively new compared to what we know about what is in front of our faces on a regular basis with surface flow.<sup>42</sup>

3.33 Some stakeholders have suggested any increases to groundwater extraction should be delayed until detailed evaluations are completed:

Any consideration of increased extraction should be delayed until a thorough assessment of characteristics, surface groundwater connectivity, groundwater dependent ecosystems and resource sustainability can be carried out.<sup>43</sup>

3.34 The Wentworth Group have strongly criticised the assumptions used to calculate the diversion limits and have stated the assumptions used 'ignore the long-term connectivity of surface and groundwater' resources:

...in documentation supporting the draft Basin Plan [November 2011] the [MDBA] states that for the purpose of determining Sustainable Diversion Limits, rivers that are classified as losing streams (i.e. ones where there is a

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39 Dr Bill Young, CSIRO, *Committee Hansard*, 23 April 2012, p. 62.

40 Dr Young, Director, Water for a Healthy Country Flagship, CSIRO, *Committee Hansard*, 23 April 2012, p. 61

41 Professor Michael Young, Professor of Environmental and Water Policy, University of Adelaide (Private Capacity), *Committee Hansard*, 23 April 2012, p. 79

42 Ms Beverly Smiles, President, Inland Rivers Network, *Committee Hansard*, 24 April 2012, p. 20.

43 Ms Juliet Le Feuvre, Healthy Rivers Campaigner, Environment Victoria, *Committee Hansard*, 24 April 2012, p. 25.

flux of water from the rivers to the underlying aquifers) can be treated as unconnected systems. This is then used to justify the assumption that drawing these aquifers down further will not increase the loss of water from the overlying rivers.

However, this assumption is incorrect. The aquifers that receive water from losing river reaches will provide water to these rivers further upstream or downstream; i.e. there are gaining reaches elsewhere. Allowing additional extractions from these aquifers simply means that the level of the watertable will drop, and the extent of the losing stream will increase into areas that are currently gaining streams. Reducing the length of these gaining streams will affect river flows, including important base flows.<sup>44</sup>

3.35 Dr John Williams summarised the Wentworth Group's concerns about the Basin Plan (November 2011) introducing uncertainty by not considering the water resources as connected:

...we need to realise that groundwater and surface waters are connected, in most instances. At the moment, until you establish where the groundwater systems are and without recognising the implications of taking water out of the groundwater system on the surface water—and that being done properly, which the Basin Plan does not do—you have no understanding of the impact of the groundwater allocations on the subsequent surface water allocations, which makes them most uncertain.<sup>45</sup>

3.36 The issue of groundwater connectivity remained a key concern of the Wentworth Group as the final Basin Plan was presented to Parliament in November 2012. On this basis, one representative of the Wentworth Group raised doubts about the reliability of the 3200 GL/y relaxed constraints surface water modelling:

We accept that the 3,200 modelling, with the eight constraints removed, would produce a substantive improvement in the health of the river system, subject to two significant and important caveats. The first is: that would require an assumption that increases in groundwater extraction would not have a negative impact on stream flow, which is an enormous assumption that we do not believe is valid...<sup>46</sup>

3.37 This was detailed further by the Wentworth Group as the following exchange shows:

**Mr Cosier:**...the plan proposes an increase in surface water flow of 2,750 gegalitres. It also proposes an increase in extraction of groundwater by 1,700 gegalitres. The modelling for the environmental outcomes for both the 2,750 gegalitres and the 3,200 gegalitres with the constraints removed assumes that groundwater will have no impact on streamflow.

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44 Wentworth Group of Concerned Scientists, *Analysis of Groundwater in the 2011 Draft Murray-Darling Basin Plan*, April 2012, p. 6.

45 Dr John Williams, Founding Member, Wentworth Group of Concerned Scientists, *Committee Hansard*, 23 April 2012, p. 16.

46 Mr Peter Cosier, Convenor and Member, Wentworth Group of Concerned Scientists, *Committee Hansard*, 23 November 2012, p. 27.

**Senator NASH:** Assuming there is no connectivity.

**Mr Cosier:** Assuming there is no connectivity. The National Water Commission advice to government is the absolute opposite. If you cannot demonstrate no connectivity, you should assume 100 per cent connectivity. As it stands, we are looking at a scenario of 2,750 gigalitres being added to the river [through increased surface water flows] and potentially 1,700 gigalitres being taken from the river [through increased groundwater extractions].<sup>47</sup>

3.38 As a result of the MDBA's treatment of ground-surface water connectivity, the Wentworth Group claimed the environmental outcomes achieved by the 2750 GL/y reduced surface water extractions could not be properly evaluated because of the lack of information about the impacts of increased groundwater extractions. As Mr Cosier and Mr Stubbs explained:

**Mr Cosier:** ...The plan as it has been presented to parliament is for a 2,750 gigalitre SDL target. The public documentation we have from the [MDBA] is that that will achieve a certain number of environmental outcomes based on 113 indicators that have been referred to recently. All of those comments, all of those statements...ignores groundwater extraction. So parliament is being presented with a basin plan that pretends to produce certain environmental outcomes for the volumes that parliament believes it is being asked to sign up to, when in fact none of those outcome targets have incorporated anything to do with groundwater extraction.

**Senator XENOPHON:** And that is the question you think ought to be put to the [MDBA]...?

**Mr Cosier:** Yes. And, our view is that, if it is not satisfactorily answered by the [MDBA]...the parliament should reject this plan.

**Mr Stubbs:** I think the question to be asked is: can the [MDBA] quantify the volumetric impact of that groundwater extraction on the river system? If the [MDBA] cannot provide you with a number which you can then subtract from the 2,750 to understand what volume will actually be flowing down the river and then go and look at the outcome targets or rerun the model to find out what that volume will actually achieve—if the [MDBA] cannot reply to you with a number—then clearly you cannot understand what we are actually getting, because you can never subtract that number from the 2,750 and you can never rerun the model to find out whatever that number is and what environmental outcomes you will actually be signing up to. Until you can do that, you do not know what you are signing up to as far as environmental outcomes.<sup>48</sup>

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47 Mr Peter Cosier, Convenor and Member, and Mr Tim Stubbs, Environmental Engineer, Wentworth Group of Concerned Scientists, *Committee Hansard*, 23 November 2012, p. 29.

48 Mr Peter Cosier, Convenor and Member, and Mr Tim Stubbs, Environmental Engineer, Wentworth Group of Concerned Scientists, *Committee Hansard*, 23 November 2012, p. 30.

3.39 The Australian Conservation Foundation also noted the new modelling for 3200 GL/y did not take into account any future impacts from additional groundwater extraction.<sup>49</sup>

3.40 The MDBA responded to this issue and challenged the groundwater extraction figures used by the Wentworth Group:

The [MDBA] strongly refutes the statements by Mr Cosier at the public hearing on 23 November 2012 that the Basin Plan “proposes an increase in extraction of groundwater by 1,700 gigalitres” and “potentially 1,700 gigalitres being taken from the river”. The Basin Plan sets the Basin wide groundwater baseline diversion limit (BDL) at 2,386 GL/y, which reflects a more accurate determination of the potential extraction under current planning arrangements than the estimate of the BDL as at late 2010 which appears to inform Mr Cosier’s remarks. The Basin wide groundwater SDL of 3,334 GL/y allows for an additional 984 GL/y of overall groundwater use above the groundwater baseline.<sup>50</sup>

3.41 The MDBA also challenged the idea of assuming 100 per cent connectivity of surface and groundwater resources. As Dr Rhondda Dickson told the committee:

...The Wentworth Group have characterised groundwater as if it were one whole combined pool that was all directly linked to surface water. That is very simplistic and wrong—that is not how the system works...

There are 66 different aquifers that have been assessed... [F]or most of the aquifers that are highly connected to surface water—a lot of the alluvial aquifers—there is no increase in the diversion limit. The baseline diversion limit is determined and then the sustainable diversion limit is the same as that—there are a couple where it is a little bit lower; there is one up in Queensland.

There are a lot of other aquifers that have very little connection, or no connection in the case of some fossil aquifers, with surface water, so there are different issues to consider. The issue of recharge is a key consideration in determining the sustainable limits of those. The simplistic point that is being made is just not correct and does not have any grounding in science. It is just a simplistic expression of how the system works...<sup>51</sup>

3.42 The MDBA further stated that:

As part of the determination of groundwater SDLs the [MDBA] has categorized the level of connectivity between surface and groundwater resources as high, medium or low. There are 30 of 66 groundwater SDL areas where the connectivity level has been classified as low.<sup>52</sup>

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49 Mr Jonathan La Nauze, Healthy rivers Campaigner, Australian Conservation Foundation, *Committee Hansard*, 23 November 2012 p. 22.

50 MDBA, answer to question on notice, 23 November 2012, (received 28 November 2012).

51 Dr Rhondda Dickson, Chief Executive, MDBA, *Committee Hansard*, 23 November 2012, p. 45.

52 MDBA, answer to question on notice, 23 November 2012, (received 28 November 2012).

3.43 The MDBA also explained:

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

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

The groundwater SDL revisions since May 2012 do not change the scale of the Authority's assessment undertaken for the revised draft Basin Plan.<sup>53</sup>

*Committee view*

3.44 The committee considered the issue of surface-groundwater connectivity in its interim reports for this inquiry and is disappointed that this issue continues to be only partially addressed by the MDBA through separate groundwater modelling. The committee supports the Wentworth Group's statement that the Basin Plan fails to fully assess the impacts of increasing groundwater extraction in the surface water modelling which undermines the effectiveness of the MDBA's SDLs to deliver a healthy basin.

3.45 The committee also supports the recommendation of the Windsor report which states that 'the Murray Darling Basin Authority improve data of groundwater availability, use and connectivity with surface water prior to proposing sustainable diversion limits for groundwater.'<sup>54</sup> The committee notes with concern that the MDBA has not done more to address this important recommendation.

3.46 The MDBA has acknowledged that groundwater SDLs may be adjusted according to new information presented through current research projects.<sup>55</sup> The committee welcomes and acknowledges that the MDBA has taken steps to improve groundwater information. While it is accepted that certain groundwater information will take time to develop and that SDLs should be adapted accordingly, the MDBA needs to make the rationale for future changes as clear as possible to the public and the Parliament.

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53 MDBA, answer to question on notice, 23 November 2012, (received 28 November 2012).

54 House of Representatives Standing Committee on Regional Australia, *Of drought and flooding rain*, 2 June 2011, p. 71, [www.aph.gov.au/Parliamentary\\_Business/Committees/House\\_of\\_Representatives\\_Committees?url=ra/murraydarling/report.htm](http://www.aph.gov.au/Parliamentary_Business/Committees/House_of_Representatives_Committees?url=ra/murraydarling/report.htm).

55 MDBA, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012, p. 11.

3.47 The committee supports the suggestion by the workshop of groundwater experts for an ongoing Groundwater Advisory Group<sup>56</sup> to provide technical advice to the MDBA on groundwater matters. The committee strongly encourages that any such group include experts in relevant fields, such as climate change and coal seam gas mining to inform changes to groundwater SDLs. The committee considers that formal and public updates from such a group would help Basin stakeholders and communities further understand groundwater issues and improve the public accountability of the MDBA regarding this issue.

### **Recommendation 6**

**3.48 The committee recommends that before 2016 the MDBA undertake a thorough review of the groundwater aspects of the Basin Plan including:**

- **the methodology and the assumptions underpinning the groundwater BDLs and SDLs; and**
- **the connectivity of all groundwater and surface water resources to ensure that the modelling used in the Basin Plan is scientifically sound.**

### **Recommendation 7**

**3.49 The committee also recommends that in conducting this review the MDBA should consult with a range of scientific experts. To ensure reliability, the final review findings should be peer reviewed by the CSIRO. To ensure transparency, the results of the review should be published by the MDBA.**

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56 MDBA, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012, pp 27–30. The workshop of groundwater experts was held on 17 May 2012 to provide advice to the MDBA on certain groundwater issues.

