Regional Water Strategy

Western – Attachment 3: Additional analysis on the Menindee trigger options

December 2022

NSW GOVERNMENT

Published by NSW Department of Planning and Environment
dpie.nsw.gov.au

Title Regional Water Strategy

Sub-title Western – Attachment 3: Additional analysis on the Menindee trigger options

First Published December 2022

Department reference number PUB22/1204

Cover image Image courtesy of Destination NSW. Menindee Lakes, Menindee.

More information water.dpie.nsw.gov.au/plans-and-programs/regional-water-strategies

An analysis of the benefits and the impacts of restricting upstream access when Menindee Lakes was at critically low levels. This was listed as Government Commitment 6 in the Draft Western Regional Water Strategy and has been shortlisted in the Final Western Regional Water Strategy as Action 3.1: Publish critical dry condition triggers and seek to implement them in water sharing plans.

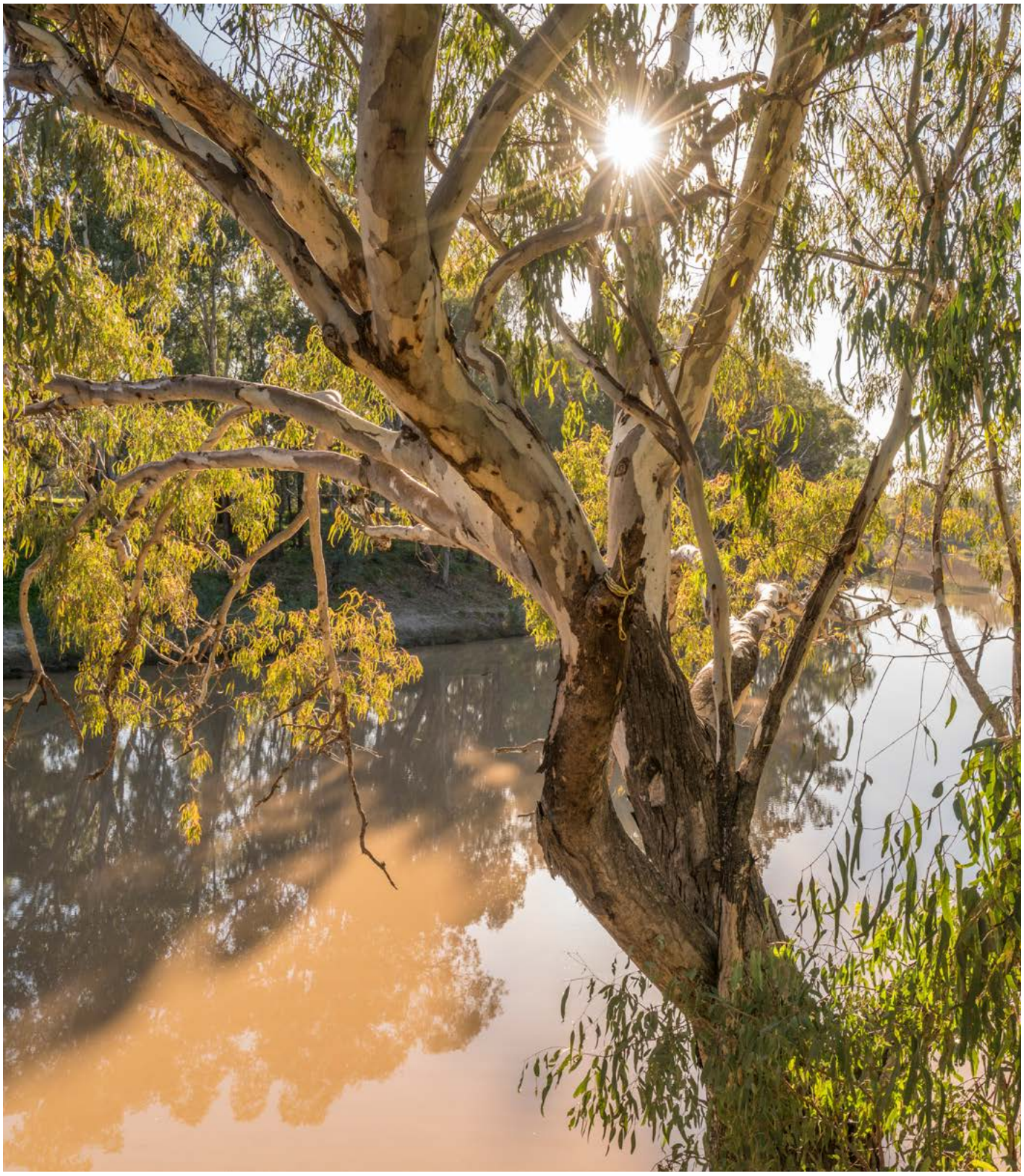

Image courtesy of Destination NSW. Darling River, Bourke.

1. Connectivity objectives addressed by this option

This option aims to deliver on the connectivity objective of protecting the first flush of water after an extended drought.

2. Option proposed in the Draft Western Regional Water Strategy

The Draft Western Regional Water Strategy included an option to restrict floodplain harvesting, B Class, C Class and supplementary licences when the triggers in Table 1 were met.

Table 1. Critical dry conditions targets proposed in the Draft Western Regional Water Strategy

Location	Trigger restrictions
Bourke	When there is a high confidence forecast cease-to-flow for 60 days at Bourke (0 ML/day in the Darling River at Bourke 425003). Trigger for lifting – forecast 972 ML/day for 10 days (or 9,720 ML).
Wilcannia	When there is a high confidence forecast cease-to-flow period of 120 days at Wilcannia (20 ML/day at Darling River at Wilcannia 425008). Trigger for lifting – forecast 400 ML/day for 10 days (or 4,000 ML).
Menindee Lakes and Lower Darling	Restrictions could be implemented if total Menindee Lakes storage is forecast to fall below 195 GL. If releases have ceased below the Menindee Lakes, restrictions would not be lifted until the lakes were forecast to have enough water to provide up to 12 months of water for human needs and allow the river to be restarted.
Northern valleys	Cease-to-flow for 30 days: • Border Rivers: below Goondiwindi Weir • Gwydir River: below Yarraman • Macquarie: below Warren Weir • Namoi: below Mollee Weir. Resumption of flow triggers are being developed for each of the northern tributaries for lifting restrictions.

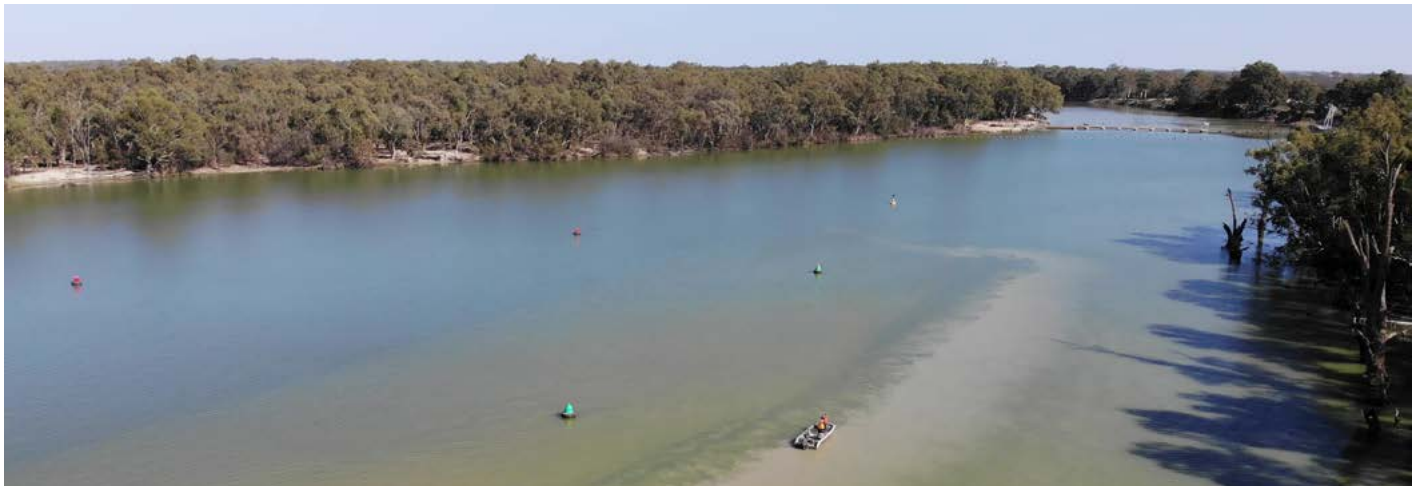

Image courtesy of Wentworth Shire Council. Lower Darling River at Wentworth, NSW.

3. Stakeholder feedback

The Draft Western Regional Water Strategy proposed restricting lower priority licences when the total storage of Menindee Lakes was below 195 GL. During public consultation we heard various views including:

- support for triggers that are effective at achieving their objectives
- that the Menindee trigger should be higher than the 195 GL total storage trigger proposed in the draft strategy and not include inactive storage, citing that a total 195 GL trigger would not adequately provide 12 months of critical needs in the Lower Darling
- suggestions that the trigger should be 450 GL to 480 GL excluding inactive storage to provide sufficient flows to the Lower Darling for 12 to 18 months
- general support for rules based triggers rather than relying on temporary water restrictions that are subject to Ministerial discretion and do not give businesses and the community certainty.

Since the public exhibition of the draft strategy, water sharing plans for the Border Rivers and Gwydir catchments have been amended to restrict floodplain harvesting taken when Menindee Lakes are below 195 GL.

4. Additional analysis undertaken as a result of stakeholder feedback

In response to feedback received during public consultation on the Draft Western Regional Water Strategy, the Department of Planning and Environment – Water analysed the benefits and impacts of restricting supplementary licences, B Class and C Class licences when there was less than:

- 195 GL active storage in the upper Menindee Lakes (Wetherell and Tandure lakes)
- 480 GL total storage in all of the lakes.

For analysis on a 195 GL trigger over all of the lakes and including inactive storage please see Attachment E of the Draft Western Regional Water Strategy, available at: www.dpie.nsw.gov.au/water/plans-and-programs/regional-water-strategies/public-exhibition/western-regional-water-strategy

Image courtesy of Destination NSW. Menindee Lakes, Menindee.

5. Outcomes of the analysis

When examining the 195 GL (all lakes), the 195 GL active, and 480 GL triggers in the context of the last drought (Figure 1), the analysis demonstrated:

- **The Menindee Lakes triggers do not stop the lakes from depleting**. The main benefit of the triggers is to accelerate drought recovery during the first flush. The triggers did not stop depletion of the lakes during the last drought because there were no upstream flows to protect.
- **A 195 GL active trigger in the upper lakes can help provide around 12 months of critical human and environmental needs** in the Lower Darling but increases impacts on upstream licence holders compared to a total storage trigger. Implementing this trigger by restricting supplementary, B Class and C Class licences is likely to result in a 24 GL/year average reduction in diversions across the northern Basin over the long-term, and expected to result in $175 million economic impact over a 40-year period across all impacted catchments. The 195 GL active storage can provide 12 months of water for critical needs if works are undertaken on the Pamamaroo inlet regulator to achieve efficient storage within the upper lakes. Without this repair, approximately 250 GL of water is needed to provide 12 months critical needs for the Lower Darling.[1] Upgrading the inlet regulator will commence once water levels in the lakes drop to manageable levels.
- **A 195 GL total storage trigger can provide approximately 6 months of supply** for critical human and environmental needs in the Lower Darling.
- **A 480 GL trigger** can help provide additional water in the lakes, but in extreme dry periods it only provides small additional benefits over a 195 GL active trigger and results in additional impacts on upstream users.
- None of the options materially change **end-of-system flows** in the northern Basin.

Changes to the storage levels of the lakes

We analysed how different critical dry condition triggers in Menindee Lakes would change the time in which Menindee Lakes are at critically low levels. We also assessed how a trigger would have changed the outcome of the last drought.

Figure 1 demonstrates that during critically dry periods, restricting upstream access would not have significantly stopped or slowed the depletion of Menindee Lakes regardless of implementing a 195 GL total, 195 GL active, or 480 GL trigger. This is because during the last drought there were limited flows upstream to restrict. For example, no supplementary announcements were made from 2018 until the drought broke in 2020. The main benefit of restricting upstream access is to accelerate the recovery of Menindee Lakes.

Similarly, Figure 2 and Table 2 demonstrate that neither a 195 GL trigger nor a 480 GL trigger significantly reduces the time the storage is at critically low levels on average over the long term. Figure 2 shows:

- around a 4–5% improvement in the time that the lakes are above 195 GL with an active trigger compared to the base case
- around a 6% improvement in the time that the lakes are above 195 GL compared to the base case with a 480 GL trigger.

However, a trigger of 480 GL in Menindee Lakes does improve the overall average and median volumes of Menindee Lakes, compared to alternative triggers, and reduces the percentage of time the Lakes are less than 25% of full storage volume (Table 2).

1. The Pamamaroo inlet regulator located between Pamamaroo and Wetherell lakes requires upgrading. Currently, the silty soils around the regulator means that water is required on both sides of the regulator to minimise the risk of the structure moving. By upgrading the regulator, more water can be stored in Lake Wetherell reducing the amount of water that is lost to evaporation from Lake Pamamaroo, which is larger and shallower than Lake Wetherell. If the inlet regulator is not repaired, more water would need to be stored in Lake Pamamaroo, meaning the trigger would need to be set at 250 GL active storage to provide 12 months of water for the Lower Darling. A key action in the Western Regional Water Strategy Implementation Plan is to upgrade the Pamamaroo Inlet Regulator. WaterNSW has funding to undertake this work and will commence the work once water levels in the lakes drop to manageable levels.

Figure 1. Menindee Lakes storage volumes during last drought with and without the 195 GL all lakes, 195 GL (active) and 480 GL triggers

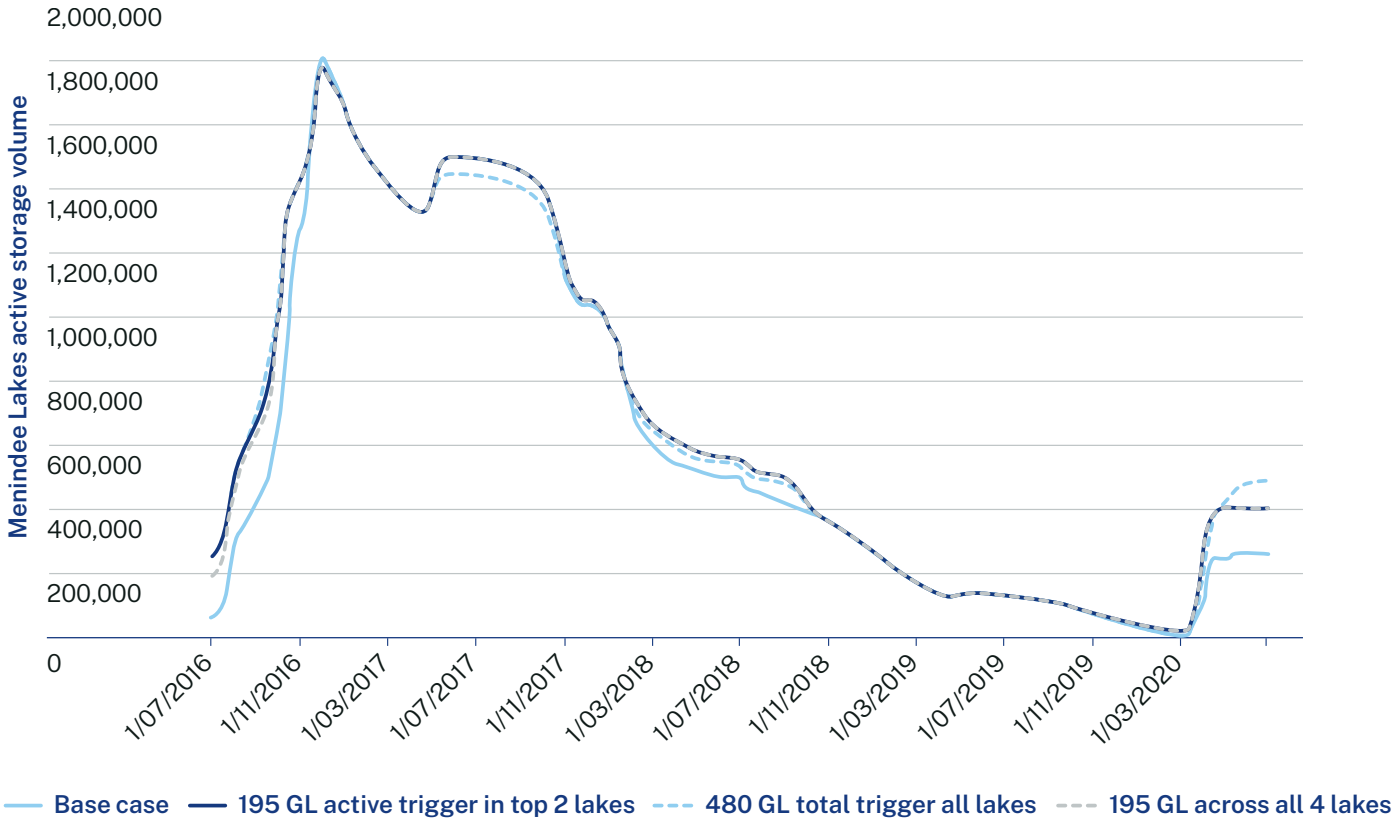

Figure 2. Menindee Lakes exceedance curve for the 195 GL active and 480 GL triggers

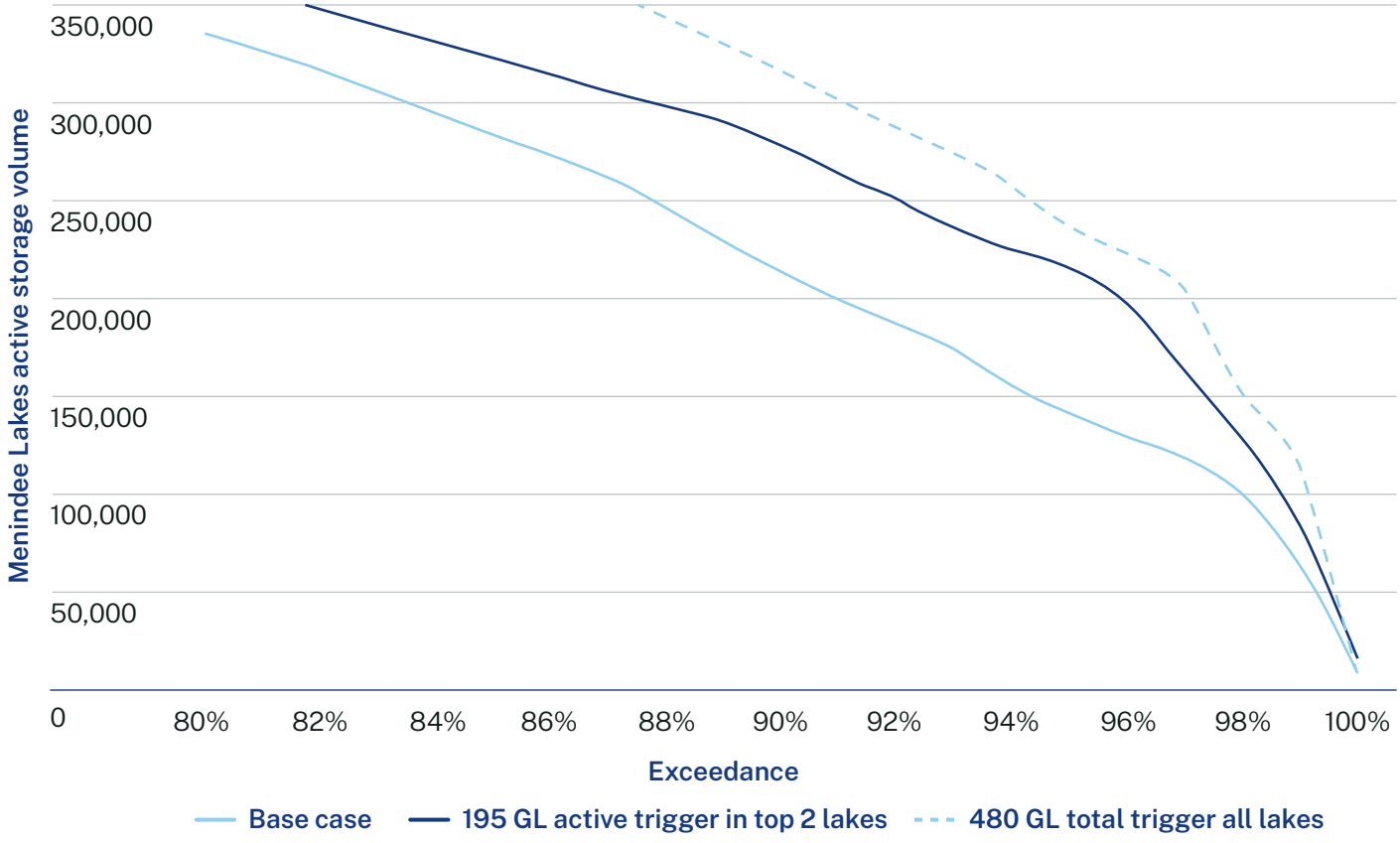

Table 2. Modelled change in Menindee Lakes storage volume

Metrics	195 GL active Menindee trigger	480 GL Menindee trigger	195 GL trigger applied to all lakes
Total (active and inactive) storage volume			
Combined Menindee storage			
Mean storage volume	Minor improvement	Minor improvement	Little improvement
Median storage volume	Minor improvement	Minor improvement	Little improvement
Percentage of time less than 25% of full storage volume	Little improvement	Minor improvement	No change
Percentage of time less than 5% of full storage volume	Little improvement	Little improvement	Little improvement
Mean percentage of time the storage volume is less than 25%, 20%, 15%, 13%, 10% and 5% of full storage volume	Little improvement	Minor improvement	Little improvement
Lake Wetherell (425020)			
Mean storage volume	Little improvement	Minor improvement	No change
Median storage volume	Little improvement	Moderate improvement	Little improvement
Percentage of time less than 25% of full storage volume	Little improvement	Little improvement	Little impact
Percentage of time less than 5% of full storage volume	No change	No change	Little impact
Mean percentage of time the storage volume is less than 25%, 20%, 15%, 13%, 10% and 5% of full storage volume	Little improvement	Minor improvement	No change
Lake Pamamaroo (425021)			
Mean storage volume	Minor improvement	Minor improvement	Little improvement
Median storage volume	Minor improvement	Minor improvement	Little improvement
Percentage of time less than 25% of full storage volume	Minor improvement	Minor improvement	Minor improvement
Percentage of time less than 5% of full storage volume	Little improvement	Little improvement	Little improvement
Mean percentage of time the storage volume is less than 25%, 20%, 15%, 13%, 10% and 5% of full storage volume	Minor improvement	Minor improvement	Little improvement

Table 2. Modelled change in Menindee Lakes storage volume (continued)

Metrics	195 GL active Menindee trigger	480 GL Menindee trigger	195 GL trigger applied to all lakes
Total (active and inactive) storage volume			
Lake Menindee (425022)			
Mean storage volume	Little improvement	Minor improvement	No change
Median storage volume	Minor improvement	Moderate improvement	No change
Percentage of time less than 25% of full storage volume	Little improvement	Minor improvement	No change
Percentage of time less than 5% of full storage volume	Little improvement	Minor improvement	Little improvement
Mean percentage of time the storage volume is less than 25%, 20%, 15%, 13%, 10% and 5% of full storage volume	Little improvement	Minor improvement	No change
Copi Hollow			
Mean storage volume	Minor improvement	Minor improvement	Little improvement
Median storage volume	Minor improvement	Minor improvement	Little improvement
Percentage of time less than 25% of full storage volume	Minor improvement	Minor improvement	Little improvement
Percentage of time less than 5% of full storage volume	Little improvement	Little improvement	Little improvement
Mean percentage of time the storage volume is less than 25%, 20%, 15%, 13%, 10% and 5% of full storage volume	Minor improvement	Minor improvement	Little improvement
Lake Cawndilla (425023)			
Mean storage volume	Minor improvement	Minor improvement	Little improvement
Median storage volume	Little improvement	Minor improvement	No change
Percentage of time less than 25% of full storage volume	Little improvement	Minor improvement	No change
Percentage of time less than 5% of full storage volume	Little improvement	Minor improvement	Little improvement
Mean percentage of time the storage volume is less than 25%, 20%, 15%, 13%, 10% and 5% of full storage volume	Little improvement	Minor improvement	Little improvement

Impacts on licence holders

Table 3 shows the possible impacts of the 3 Menindee targets (195 GL total, 195 GL active and 480 GL) on average diversions and the maximum impact on annual diversions. This analysis includes impacts on supplementary licences, and B Class and C Class licences only. The analysis does not include restrictions on floodplain harvesting entitlements as we are not yet able to simulate the additional proportion of floodplain harvesting that would return to rivers if restrictions were made. Nevertheless, floodplain harvesting restrictions are proposed to be included alongside supplementary, and B Class and C Class licence restrictions in the event that the critical dry conditions triggers are met.

Table 3. Average and maximum annual impacts on supplementary licences, and B Class and C Class licences from the proposed Menindee triggers

Trigger	Long-term average reductions in diversions	Maximum annual reductions in diversions
195 GL total trigger over all of the lakes	• Border: 2.8% • Gwydir: 1.8% • Namoi: 1.8% • Macquarie: 0.1% • Barwon–Darling: 2.8% • Average: 1.9%.	• Border: 20% • Gwydir: 21% • Namoi: 37% • Macquarie: 5% • Barwon–Darling: 58%.
195 GL trigger based on Pamamaroo, Wetherell and Tandure lakes not including inactive storage	• Border: 6.1% • Gwydir: 3.8% • Namoi: 3.7% • Macquarie: 0.2% • Barwon–Darling: 2.8% • Average: 3.3%. No significant change for general security licences in the NSW Murray.	• Border: 43% • Gwydir: 19% • Namoi: 56% • Macquarie: 10% • Barwon–Darling: 61%.
480 GL over all the lakes[2]	• Border: 8.4% • Gwydir: 5.7% • Namoi: 5.6% • Macquarie: 0.6% • Barwon–Darling: 10.2% • Average: 6.1%.	• Border: 34% • Gwydir: 29% • Namoi: 28% • Macquarie: 13% • Barwon–Darling: 76%.

2. It is not possible to maintain 480 GL in the top 3 lakes

The Department of Planning and Environment – Water used this analysis to undertake a high-level economic analysis to assess the impacts on licence holders in the northern NSW valleys and the Barwon–Darling if a 195 GL active storage trigger was implemented in the upper Menindee lakes. The analysis considered major extractive water users including towns, annual agriculture users, and permanent agriculture users within each region. Environmental benefits have not been captured within this analysis due to the high degree of uncertainty of their economic valuation. However, ecohydrology analysis (Table 2) has been completed which provides an understanding of changes in environmental metrics.

An economic analysis of benefits on the Murray system has not been undertaken as the hydrological modelling did not identify significant changes in general security water availability in the NSW Murray over the long-term (a 0.1% increase in extractions and 0.2% increase in start of year general security allocations). All economic values presented are averages of present values calculated over 13 overlapping 40-year periods of a historical climate dataset, from 1896 to 2020.

On average over a 40-year period, implementation of the 195 GL active trigger across the upper lakes may result in reductions of economic activity totalling of $175 million across all impacted catchments, which equates to a reduction of 2.7% in comparison to the base case. When individual impacts for each region are considered, the impacts are shown to be more significant within Border Rivers, Gwydir, and Namoi tributaries (between 3% to 5%) than those of Barwon–Darling and Macquarie (2% and 0.5% respectively).

Results of the analysis for each catchment and in aggregate are shown in Table 4.

During consultation on the Draft Western Regional Water Strategy, we heard that long-term average economic assessments will not capture the real economic impacts. This is because a volume of water may be more valuable depending on the climate cycle (for example after an extended drought) or at a particular time of the cropping cycle (for example towards the end of a crop's maturity by annual crop agricultural producers, such as cotton).

Quantifying the magnitude of potential impact of foregoing water late in crop growth cycles on farmers' productivity is a highly complex undertaking, spanning several fields such as hydrologic modelling, agricultural science, and the subsequent economic impact on farmers under these circumstances. For this reason, this analysis has not been undertaken but may be considered in future work. This would require more detailed work to understand the scope of the problem and how best to capture these incidents within hydrologic and economic modelling.

This work would consider that possible mitigating benefits of options that avoid these water supply shortfalls during the time crop's reach maturity are considered and could be considered in the next phase of progressing this option.

Table 4. Average present value (40 years) economic impacts to northern tributaries and Upper Darling

Valley	Average economic impact ($present value, million)	Average economic impact (%)
Border Rivers	-46.8	-4.6
Gwydir	-78.3	-3.2
Namoi	-31.9	-3.0
Barwon–Darling	-11.2	-2.0
Macquarie	-6.4	-0.5
Total	**-174.6**	**-2.7**

Changes to end-of-system flows

Restricting supplementary, and B Class and C Class licences when the 195 GL, 195 GL active in the upper lakes, or the 480 GL Menindee triggers are activated results in negligible changes to end-of-system flows on average over the long-term (Table 5, Table 6, and Table 7).

Table 5. Changes to end-of-system flows by restricting supplementary, and B Class and C Class licences when the 195 GL all lakes Menindee trigger is activated

Flow	Base case	195 GL all lakes target	Change
Border Rivers at Mungindi			
Very low or no flows (<160 ML/day)	42.3%	42.7%	0.4%
Baseflows (160–550 ML/day)	25.9%	25.4%	-0.5%
Small freshes (550–5,400 ML/day)	28.1%	28.1%	0.0%
Large freshes/floods (>5,400 ML/day)	3.7%	3.8%	0.1%
Gwydir Valley (Mehi at Collerenabri)			
Very low or no flows (<40 ML/day)	56.6%	56.2%	-0.5%
Baseflows (40–90 ML/day)	15.9%	15.6%	-0.3%
Small freshes (90–900 ML/day)	20.6%	20.9%	0.2%
Large freshes/floods (>900 ML/day)	6.9%	7.4%	0.5%
Gwydir Valley (Gil Gil Creek at Galloway)			
Very low or no flows (<25 ML/day)	56.8%	56.9%	0.1%
Baseflows (24–45 ML/day)	10.1%	10.2%	0.0%
Small freshes (45–750 ML/day)	29.5%	29.3%	-0.3%
Large freshes/floods (>750 ML/day)	3.6%	3.7%	0.1%
Namoi River at Walgett			
Very low or no flows (<30 ML/day)	42.4%	42.2%	-0.2%
Baseflows (30–200 ML/day)	27.4%	27.6%	0.1%
Small freshes (200–2,250 ML/day)	19.0%	19.1%	0.1%
Large freshes/floods (>2,250 ML/day)	11.1%	11.1%	0.0%
Macquarie River at Carinda			
Very low or no flows (<100 ML/day)	72.9%	72.5%	-0.5%
Baseflows (100–140 ML/day)	3.3%	3.3%	0.1%
Small freshes (140–700 ML/day)	12.9%	13.2%	0.3%
Large freshes/floods (>700 ML/day)	10.9%	11.0%	0.1%

Table 6. Changes to end of system flows by restricting supplementary, and B Class and C Class licences when the 195 GL active Menindee trigger is activated

Flow	Base case	195 GL active trigger	Change
Border Rivers at Mungindi			
Very low or no flows (<160 ML/day)	42.3%	42.8%	0.4%
Baseflows (160–550 ML/day)	25.9%	25.2%	-0.7%
Small freshes (550–5,400 ML/day)	28.1%	28.2%	0.1%
Large freshes/floods (>5,400 ML/day)	3.7%	3.9%	0.2%
Gwydir Valley (Mehi at Collerenabri)			
Very low or no flows (<40 ML/day)	56.5%	55.7%	-1.0%
Baseflows (40–90 ML/day)	15.9%	15.5%	-0.4%
Small freshes (90–900 ML/day)	20.6%	20.9%	0.3%
Large freshes/floods (>900 ML/day)	6.9%	8.0%	1.1%
Gwydir Valley (Gil Gil Creek at Galloway)			
Very low or no flows (<25 ML/day)	56.8%	57.1%	0.3%
Baseflows (24–45 ML/day)	10.1%	9.9%	-0.2%
Small freshes (45–750 ML/day)	29.5%	29.1%	-0.4%
Large freshes/floods (>750 ML/day)	3.6%	3.8%	0.3%
Namoi River at Walgett			
Very low or no flows (<30 ML/day)	42.4%	42.1%	-0.4%
Baseflows (30–200 ML/day)	27.4%	27.7%	0.3%
Small freshes (200–2,250 ML/day)	19%	19.0%	0.0%
Large freshes/floods (>2,250 ML/day)	11.1%	11.2%	0.1%
Macquarie River at Carinda			
Very low or no flows (<100 ML/day)	72.9%	72.5%	-0.5%
Baseflows (100–140 ML/day)	3.3%	3.3%	0.0%
Small freshes (140–700 ML/day)	12.9%	13.3%	0.4%
Large freshes/floods (>700 ML/day)	10.9%	11.0%	0.0%

Table 7. Changes to end-of-system flows by restricting supplementary, and B Class and C Class licences when the 480 GL Menindee trigger is activated

Flow	Base case	480 GL trigger	Change
Border Rivers at Mungindi			
Very low or no flows (<160 ML/day)	42.3%	43.3%	0.9%
Baseflows (160–550 ML/day)	25.9%	24.6%	-1.3%
Small freshes (550–5,400 ML/day)	28.1%	28.1%	0.0%
Large freshes/floods (>5,400 ML/day)	3.7%	4.0%	0.4%
Gwydir Valley (Mehi at Collerenabri)			
Very low or no flows (<40 ML/day)	56.6%	55.1%	-1.6%
Baseflows (40–90 ML/day)	15.9%	15.8%	-0.1%
Small freshes (90–900 ML/day)	20.6%	20.8%	0.2%
Large freshes/floods (>900 ML/day)	6.9%	8.3%	1.5%
Gwydir Valley (Gil Gil Creek at Galloway)			
Very low or no flows (<25 ML/day)	56.8%	56.8%	0.1%
Baseflows (24–45 ML/day)	10.1%	9.9%	-0.2%
Small freshes (45–750 ML/day)	29.5%	29.3%	-0.2%
Large freshes/floods (>750 ML/day)	3.6%	4.0%	0.4%
Namoi River at Walgett			
Very low or no flows (<30 ML/day)	42.4%	42.0%	-0.4%
Baseflows (30–200 ML/day)	27.4%	27.7%	0.2%
Small freshes (200–2,250 ML/day)	19.0%	19.0%	-0.1%
Large freshes/floods (>2,250 ML/day)	11.1%	11.3%	0.2%
Macquarie River at Carinda			
Very low or no flows (<100 ML/day)	72.9%	72.4%	-0.5%
Baseflows (100–140 ML/day)	3.3%	3.3%	0.1%
Small freshes (140–700 ML/day)	12.9%	13.3%	0.4%
Large freshes/floods (>700 ML/day)	10.9%	11.0%	0.1%

6. Proposed approach

It is not proposed to implement a 480 GL trigger at the Menindee Lakes. A 480 GL trigger goes beyond the critical needs objective as it sets aside more water than is required to meet 12-months supply in the Lower Darling River; this trigger also does not provide significant additional benefits during critical dry periods beyond alternative targets and does not significantly improve environmental metrics. Lower Darling general security allocations are often announced when the lakes are around 300 GL, so restricting upstream users to provide productive water for downstream users is not considered to be equitable.

Placing restrictions on supplementary, floodplain harvesting, and B Class and C Class licences is unlikely to help improve connectivity during droughts and prevent Menindee Lakes or weir pools from depleting. However, the critical dry conditions triggers would play an important role in accelerating drought recovery for Menindee Lakes, weir pools and the river systems. This will become increasingly important to support the resilience of the region if a drier climate results in more frequent droughts.

Applying this action will restrict water being taken by supplementary, floodplain harvesting, and B Class and C Class licences when:

- There is approximately 12 months of water remaining for critical human and environmental needs in the Lower Darling. This will depend on where the water is located and whether infrastructure changes have been made to the lakes. Restrictions will be imposed when there is:
  - approximately 250 GL of active water with current infrastructure. The current inlet regulator in Pamamaroo is in need of repair and requires additional water to be held in the Lakes. Until the inlet regulator has been repaired, 250 GL may be required to provide 12 months of critical needs in the Lower Darling. Upgrading the inlet regulator will commence once water levels in the lakes drop to manageable levels
  - 195 GL or less of active water the upper lakes of the Menindee Lakes storage (primarily Wetherell and Tandure lakes)[3] to provide approximately 12 months of water for critical needs in the Lower Darling once the Pamamaroo inlet regulator is repaired.
- extended cease-to-flow periods are forecast in the Barwon–Darling, Border Rivers, Gwydir, Namoi and Macquarie catchments.

Restrictions will be lifted when there is enough water to restart the Lower Darling. Table 8 sets out these triggers in more detail.

3. Active water refers to the volume of water in the Menindee Lakes that can be accessed using gravity alone. Note that the Murray–Darling Basin Authority uses alternative active storage figures that assume that most of the water in the lakes (aside from 36 GL) can be accessed using pumps.

Table 8. Proposed critical dry conditions triggers

Proposed trigger for implementing temporary water restriction	Proposed trigger for lifting temporary water restriction
Wilcannia When there is a high confidence forecast cease-to-flow period of 120 days at Wilcannia (20 ML/day at Darling River at Wilcannia 425008).	Forecast 400 ML/day for 10 days (or 4,000 ML).
Bourke When there is a high confidence forecast cease-to-flow for 60 days at Bourke (0 ML/day at Darling River at Bourke 425003).	Forecast 972 ML/day for 10 days (or 9,720 ML).
Menindee Lakes When the active storage in the upper lakes of the Menindee Lakes storage (primarily Wetherell and Tandure lakes) is forecast to fall below 195 GL capacity. Once this trigger is reached there would be no releases beyond the minimum flow requirements from Wetherell, Pamamaroo and Tandure lakes. NOTE: If the Pamamaroo inlet regulator has not been upgraded[4] then the trigger would be 250 GL active storage in Wetherell, Pamamaroo and Tandure lakes to provide 12 months supply to the Lower Darling River. **Upgrading the inlet regulator will commence once water levels in the lakes drop to manageable levels.**	If the active storage in the upper Menindee lakes storage is less than 195 GL and the Lower Darling has ceased to flow then restrictions would be lifted when the lakes are forecast to have enough water to restart the river. This is likely to be approximately 255 GL: 195 GL (active) + 60 GL to restart the river. If the Lower Darling has not ceased to flow then the restrictions can be lifted earlier (when there is 195 GL–255 GL of water in the Menindee Lakes). Restrictions can be lifted upstream once the peak of the flow has passed as long as the Menindee Lakes are forecast to have the required volume. If the upper Menindee Lakes active storage is greater than 195 GL but the critical dry conditions triggers (defined above) have been reached at other locations, then restrictions will be lifted once the lifting triggers at each location are reached.
Northern valleys All or most of the northern valleys and/or Barwon–Darling River system are classified as Drought Stage 4 criticality under the Department of Planning and Environment's NSW Extreme Events Policy. AND/OR Cease-to-flow for 30 days or more extended periods for any of the following locations:[5] • Border Rivers – Macintyre at Goondiwindi (416201A) • Gwydir River – Mehi at Moree (418002) • Macquarie – below Warren Weir (421004) • Namoi – below Mollee Weir (419039).	Resumption of flow targets for the northern tributaries such as: • Border Rivers – Macintyre at Goondiwindi – 3,600 ML over 7 days • Gwydir River – Mehi at Moree – 3,600 ML over 7 days • Macquarie – below Warren Weir – 21,000 ML over 7 days • Namoi: below Mollee Weir – 8,000 ML over 7 days.[6]

4. A key action in the Western Regional Water Strategy Implementation Plan is to upgrade the Pamamaroo Inlet Regulator. WaterNSW has funding to undertake this work and will commence the work once water levels in the lakes drop to manageable levels.
5. Locations and cease-to-flow period to be determined following feedback from consultation.
6. The northern valley triggers are interim proposals and linked to when the regulated valleys are in Drought Stage 4. We will continue to research the most appropriate trigger locations and durations.

These triggers are to be applied together to achieve the intended outcomes, including protections for access to water for towns, domestic and stock, and basic landholder rights and preventing deterioration in refuge pool conditions to reduce the risk of unacceptable damage to environmental assets. These triggers will be supported by additional actions that:

- **seek to implement the triggers through water sharing plan rules** as part of the remake of the Barwon–Darling Water Sharing Plan in 2024 and the northern tributary water sharing plans, to provide certainty and clarity for all communities
- **review potential offsetting actions to allow water users to take water during non-critical times** to make up for the water not taken during the first flush
- work with licence holders in the Lower Darling to **reduce risk of large water orders drawing the lakes down to critical levels**, which may need to be progressed through the NSW Extreme Event Policy
- **progress actions to allow for more 'active water' including:**
  - repairing Pamamaroo inlet regulator. Until this work is complete, 250 GL may be required to provide 12 months of critical needs in the Lower Darling
  - changing Menindee Lakes management to recognise operational water released down the Great Darling Anabranch, which requires agreement with the Murray–Darling Basin Authority and other basin states. This approach will help prioritise releases of water from less efficient lakes and allow for more accessible water to remain in Menindee Lakes when the lakes return to being under NSW control. Combining an active 195 GL trigger with releasing operational water down the Darling Anabranch could nearly halve the time Menindee Lakes are below critical levels
  - developing other ways to identify critical thresholds including active monitoring of refuge pools once flows have ceased. If viable, locations other than Bourke and Wilcannia could be identified where critical conditions will be monitored to inform future management options.

For critical human needs we have considered the water needs for towns, domestic and stock and basic landholder rights. For critical dry environment needs we have looked at the thresholds at which a deterioration in refuge pool conditions leads to an increased risk of unacceptable damage to environmental assets. These thresholds are the points when timely intervention may prevent damage altogether.

Image courtesy of Sally Anderson-Day. Barwon River, Brewarrina.

Department of Planning and Environment

NSW GOVERNMENT