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Assessment of Menindee water saving

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Assessment of Menindee option and Lower Darling recovery for entitlement creation

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History and Status

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1 Introduction

Chapter 7 of the Basin Plan allows SDLs to be adjusted if equivalent environmental outcomes can be achieved through works and measures with less environmental water recovery. For assessing potential SDL adjustments possible, MDBA in consultation with the states has been incorporating a number of SDL offset proposals developed by the states.

As a SDL adjustment measure, NSW has put forward a business case with operational and structural changes for the Menindee lakes system which has specifications to issue environmental entitlements.

The Menindee water saving project seeks to make evaporative water saving by works measures, operation measures and strategic purchase in the Lower Darling. The project aims to contribute water savings, improved river operations and environmental improvements.

The project includes a number of components including:

- construction of Morton–Boolka regulator to operate Lake Menindee independently to Lake Cawndilla,
- enlarged release capacity up to 14,000 ML/d and drainage channel to outlet regulator,
- operation of anabranch offtake regulator to supply regulated flow when needed up to 14,000 ML/d and reduced high flow losses when the regulator is closed,
- reducing high security irrigation and town water supply demands from the lakes through a combination of infrastructure works and reform of water management in the lower Darling River mechanisms,
- changes to shared management thresholds to allow for efficient use of storage, and
- environmental watering to Lake Cawndilla when Bourke flow > 600 GL/month and it has been more than three years since the last event.

Details on model implementation of the projects are already presented in the notification. Therefore they are not repeated in here. However, this report describes a further modelling study undertaken to determine the amount of water that can be called out from Hume Dam due to the water saving from this project.

2 Baseline for assessing the Menindee project

As specified in the notification, the Menindee project has been assessed using a two-step approach, which included the following steps:

1. Structural and rule changes modelled without additional flow from the North:
    a. Determine the size of entitlements in Murray that can be created without affecting third party users when the project is fully implemented.
    b. Asses the third party impacts against the Benchmark conditions.
    c. Create NSW Murray general security and Vic Low Reliability Water Share entitlements, so that long term yields are shared equally.
2. Assessment of benefit of additional Northern system inflows:
    a. Model additional benefits due to the increased inflows as a part of the assessment of the final package of SDL adjustment measures, using the default method as per schedule 6 of the Basin Plan.

3 Modelling assessment

For Step 1 of Chapter 2 (assessment of structural and rule changes), seven model scenarios were developed:

- Scenario 1: SDL benchmark (run 1130)
- Scenario 2: SDL benchmark with baseline inflows to the Menindee system
- Scenario 3: Scenario 2 with the changes of the Broken Hill water supply and Tandou IVT – this is the base case for reliability comparison
- Scenario 4: Scenario 3 with extraction of 0 GL/y
- Scenario 5: Scenario 3 with extraction of 94 GL/y
- Scenario 6: Scenario 3 with extraction of 106 GL/y
- Scenario 7: Scenario 3 with extraction of 111 GL/y

As described in Chapter 2, the SDL benchmark (Scenario 1) was modified to represent baseline flows to Menindee (Scenario 2). Further changes were required to the benchmark before assessing third party impacts. These changes include the Broken Hill water supply and Tandou IVT use, which will be treated as NSW Murray diversions when the Menindee project is fully modelled. It is thought that this modified model (Scenario 3) provides a better basis to assess the evaporative water saving components in isolation to the other components. In Scenario 3, NSW irrigation demands are scaled up to match the total take by the original users.

Once the Menindee project is included in the model, it allows the Menindee system to be used more effectively to meet downstream demands, thereby increasing water resources available in the Murray system. A long term average yield is to convert the additional water available into callable environmental water without affecting third party impacts. There are four additional scenarios developed with a range of volumes extracted at just downstream of Hume Dam.

When the watering saving project is implemented in the model without any extraction (Scenario 4), Table 1 shows increased irrigation diversions in the Murray. It indicates that improved water availability in Murray due to the Menindee project is socialised to all Murray users. As the extracted volume is increased, the socialised benefits are reduced (Scenarios 5, 6 and 7). Comparing reliability statistics among the last three scenarios against Scenario 3 shows marginal changes. This indicates that the range of extracted volumes presented in this report is reasonable. For NSW Murray, the long term averages of September and last 10 years allocations are slightly reduced, while the other indicators are slightly improved or the same compared to Scenario 3. Similarly for Vic Murray and SA Murray, most statistics are similar to Scenario 3. Scenario 5 shows there were small improvements in irrigation diversions (i.e. total Murray diversions were 2921 GL/y compared to 2918 for scenario 3) indicating that extraction could be increased further. However, Scenario 7 shows total Murray diversions (2916 GL/y) decreased, suggesting that the extraction of 111 GL/y is too high.

Table 1: Comparison of water balance and allocations for different volumes assigned to Environmental loss

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Long term averaged extraction (GL/y)	-	-	-	0	94	106	111
System diversions (GL/y)							
NSW Murray Diversions	1226.2	1222.8	1243.1	1259.3	1244.5	1243.6	1239.7
Lower Darling Diversions	40.5	39.7	30.0	10.1	10.2	10.1	10.1
Vic Murray Diversions	1195.8	1192.8	1193.7	1196.5	1194.9	1194.8	1195.3
SA Murray Diversions	481.0	480.8	480.8	482.0	481.7	481.5	481.5
Barrage flows	7089.8	6997.9	6989.5	7035.7	6975.3	6966.3	6965.2
NSW Murray allocation							
Long term average of %-age allocation at the start of year (HS)	96%	95%	95%	96%	96%	96%	96%
Long term average of %-age allocation in February (HS)	99%	99%	99%	99%	99%	99%	99%
Long term average of %-age allocation at the end of year (HS)	99%	99%	99%	99%	99%	99%	99%
Minimum %-age allocation at the end of year (HS)	97%	97%	97%	97%	97%	97%	97%
1999-2009 average of %-age allocation at the end of year (HS)	98%	98%	98%	98%	98%	98%	98%
Long term average of %-age allocation at the start of year (GS)	53%	52%	52%	55%	52%	52%	51%
Long term average of %-age allocation in September (GS)	70%	70%	70%	72%	69%	69%	69%
Long term average of %-age allocation at the end of year (GS)	90%	89%	89%	91%	90%	90%	89%
Minimum %-age allocation at the end of year (GS)	0%	0%	0%	0%	0%	0%	0%
1999-2009 average of %-age allocation at the end of year (GS)	60%	58%	58%	60%	57%	57%	56%
Vic Murray allocation							
Percentage of years with full HRWS allocation in February	98%	98%	98%	98%	98%	98%	98%
Percentage of years with full LRWS allocation in February	93%	92%	93%	93%	93%	92%	92%
Percentage of years with LRWS allocation in February > 0	98%	98%	98%	98%	98%	98%	98%
Minimum February allocation	40%	38%	38%	37%	43%	37%	43%
Long term average HRWS February allocation	99%	99%	99%	99%	99%	99%	99%
Long term average LRWS February allocation	97%	96%	96%	97%	96%	96%	96%
1999-2009 average HRWS February allocation	93%	93%	93%	92%	93%	92%	93%
1999-2009 average LRWS February allocation	77%	78%	77%	78%	77%	77%	77%

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
SA Murray allocation							
Percentage years with full entitlement in June	85%	85%	85%	88%	85%	85%	85%
Percentage years with full entitlement in May	88%	86%	85%	93%	92%	89%	89%
Long term average % entitlement in June	96%	96%	96%	97%	97%	96%	96%
Long term average % entitlement in May	99%	99%	99%	99%	99%	99%	99%
Minimum % entitlement in May	51%	50%	50%	48%	48%	48%	48%
1999-2009 average % entitlement in June	79%	78%	78%	79%	79%	78%	78%
1999-2009 average % entitlement in May	91%	91%	91%	92%	91%	91%	91%
Lower Darling allocation							
Long term average of Lower Darling General Security End of year Allocation	98%	96%	96%	98%	98%	98%	98%
Long term average of Lower Darling LWU End of year Allocation	100%	100%	100%	100%	100%	100%	100%

4 Conclusion

A modelling study has been conducted to inform a long term yield that can be created from the Menindee water saving project. In order to identify by what amount, a two staged approach was adopted. At the first step, the use of Tandou IVT is assigned to NSW Murray users and the Broken Hill township water need is supplied from Murray which is treated as NSW Murray diversions. Then the Menindee water saving project was added to the first step to calculate the size of entitlements that can be created from this project.

In this report, the improved water availability due to the saving project is counter balanced by extracting water at Hume Dam downstream. It is found that the project can allow a long term average of 106 GL/y to be extracted without affecting the existing water users.