

# Lower-Darling Operations Plan

November 2018

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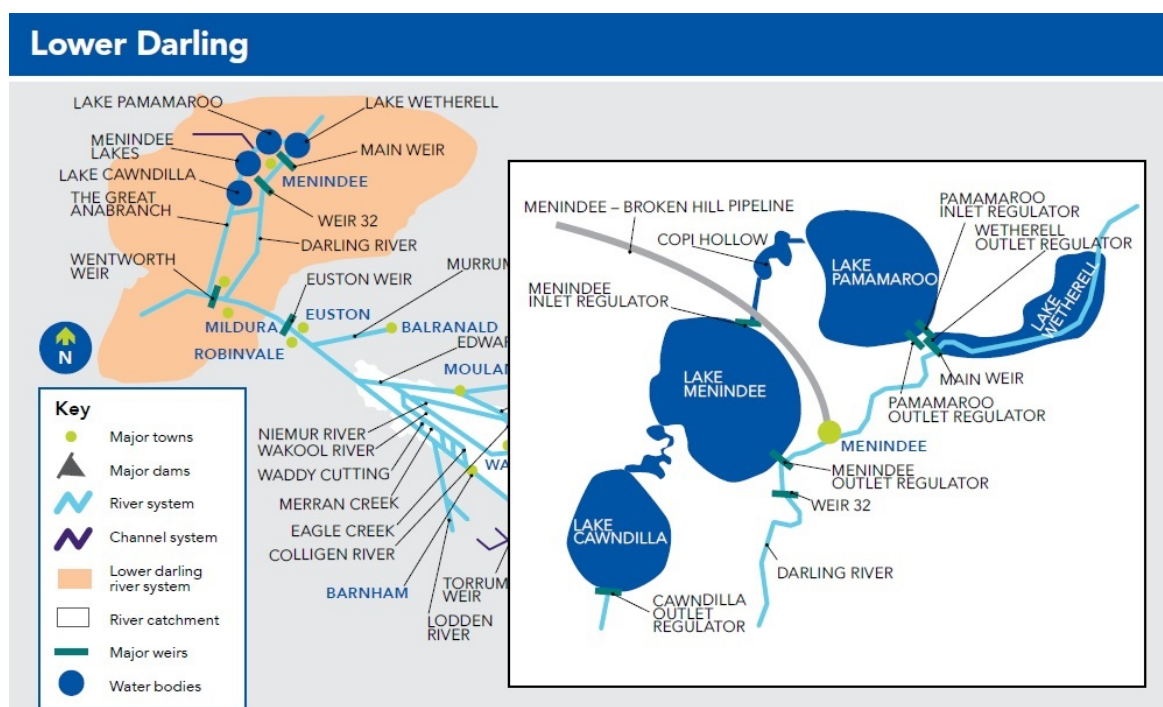
# 1. Highlights

WaterNSW has developed the Lower-Darling Operations Plan to ensure water supplies for Broken Hill and surrounding communities and reliable water supply to the customers along the Lower-Darling can be maintained through a repeat of the worst drought of record. This plan is a living document and will be updated regularly based on changing conditions.

Water is stored in Menindee Lakes to meet water needs including provision for water losses (seepage and evaporation), maintaining the Lower-Darling environment supply for essential requirements (e.g. town water supply, domestic and stock and basic land holder rights) and General Security Licenses in the Lower-Darling and Lower Murray systems.

This plan looks to optimise water delivery through maximising releases from the lower storages (Menindee and Cawndilla) and retaining water in the more efficient Upper Lakes (Wetherell and Pamamaroo) until demands and outlet capacity constraints of the lower storages necessitates releases from the upper lakes.

We have analysed the lowest inflow sequences and maximum evaporation rates for the region to ensure operations of the lakes are optimised for supply through a repeat of the drought of record and drier scenarios.



## 2. Operational objectives

The aim of the plan is to maximise the use of the resource to meet customer demands within the Lower-Darling water source and to meet NSW and Victoria's contribution to the Murray while ensuring that essential water needs can be met through a repeat of the worst drought on record. The plan also identifies the key actions required to extend supplies if inflows are lower than previous droughts.

The plan therefore has been developed to ensure that critical water needs can be met, and the environmental needs of the Lower-Darling river are maintained for as long as possible.

Key operational objectives

- Maintain supply to Broken Hill.
- Maintain a continual flow of water along the Lower-Darling (maintain flow at Burtundy) through a repeat of the lowest inflows on record.
- Maximise use of water in the lower Lakes to meet customer demands first.

The operations plan has considered three inflow scenarios that will guide operational decisions. They provide assessment of a range of conditions that may occur in the coming 12-24 months.

- Scenario 1: Sahara – no inflow occurs at Wilcannia through to resource being exhausted;
- Scenario 2: Drought – minimum statistical inflow sequence on record - applied from Dec 2018 – with resources managed to the next significant inflow; and
- Scenario 3: Dry scenario - 80th percentile inflow sequences applied from Dec 2018 to represent the likely no inflow scenario. The dry scenario considers an inflow sequence that could be expected to be exceeded 8 years out of 10 based on historical records.

We will continue to review the system operations forecast with the aim to implement drought measures as the volume of water in the lakes reduce.

As there is no guarantee that the next drought will not be more severe than the last, the design scenario is considered to be scenario 1, it is the worst-case, no inflow scenario.

Scenario 2 provides for a repeat of the worst inflow sequence; this scenario considers the measures required to manage the systems water resources through a repeat of these conditions to provide the best outcome possible.

Scenario 3 provides scope of the potential system operations in the event of some inflows, but overall the system remains relatively dry, and what this would mean for river flows and town water supplies.

Overall it is unlikely that the conditions presented in these scenarios will be repeated. Rather they will be used to help inform customers and community about potential system operations over the next 12 – 24 months and guide operational decisions as time progresses. Ultimately the decisions made will be in response to the conditions that do occur.

## 3. Operational rules

### 3.1 Water Sharing Plan (WSP)

The WSP provides a framework for sharing of water resources within the Lower-Darling, aiming to provide a balance between environmental, economic and social objectives. The plan establishes a bulk access regime for the extraction of water under access licences providing for environmental water rules or planned environmental water, water for basic landholder rights and extraction under a number of access licence categories.

The WSP was originally gazetted in 2003 and as such the framework has been established based on inflow sequences prior to this time. Since gazette of the plan, the minimum inflow sequence prior to 2003 has been exceeded (by lower inflows) on at least 2 occasions.

The WSP provides for licenced entitlements of:

- Domestic & stock
- Local water utility
- Regulated river (high security)
- Regulated river (general security)
- Supplementary – although all supplementary entitlement is now held by government and has essentially be retired from extractive use

The WSP provides that minimum releases be delivered at Weir 32 for the suppression of algae, noting the seasonal variability, the minimum release requirements are as follows:

January-March	350 ML/d
April	300 ML/d
May-October	200 ML/d

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November-December	300 ML/d
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These releases total 95.6 GL/year.

### 3.2 Murray-Darling Basin agreement

The Commonwealth Water Act 2007 provides the Murray-Darling Basin Agreement within Schedule 1 of the Act. Clause 95 of Schedule 1 provides the New South Wales entitlement to water from Menindee Lakes.

Clause 95 provides that:

- Whenever water in the Menindee Lakes storage falls below 480 GL, New South Wales may use stored water as it requires until the volume next exceeds 640 GL.
- Whenever sub clause 1 does not apply, the resources within the storage are shared in accordance with Clause 94 (c), meaning that inflows to the storage are shared 50:50 between Victoria and New South Wales.

The agreement provides that the Murray-Darling Basin Authority, acting on behalf of the signatories to the agreement, shall manage the access and delivery of resources held within the Menindee Lakes storage in accordance with system operating requirements.

## 4. Customers

### 4.1 Domestic and stock

There are 115 Domestic & Stock licences with a total share component of 1,370 ML. Domestic & Stock use in the Lower-Darling generally exceeds 400 ML/year. Average annual use has been impacted by periods of no access in the Lower-Darling in recent years. Figure 1 shows the annual historical use for domestic and stock from 2012/13. Domestic & stock water is required all year round and requires a continual flow along the Lower-Darling between Weir 32 and Burtundy Weir.

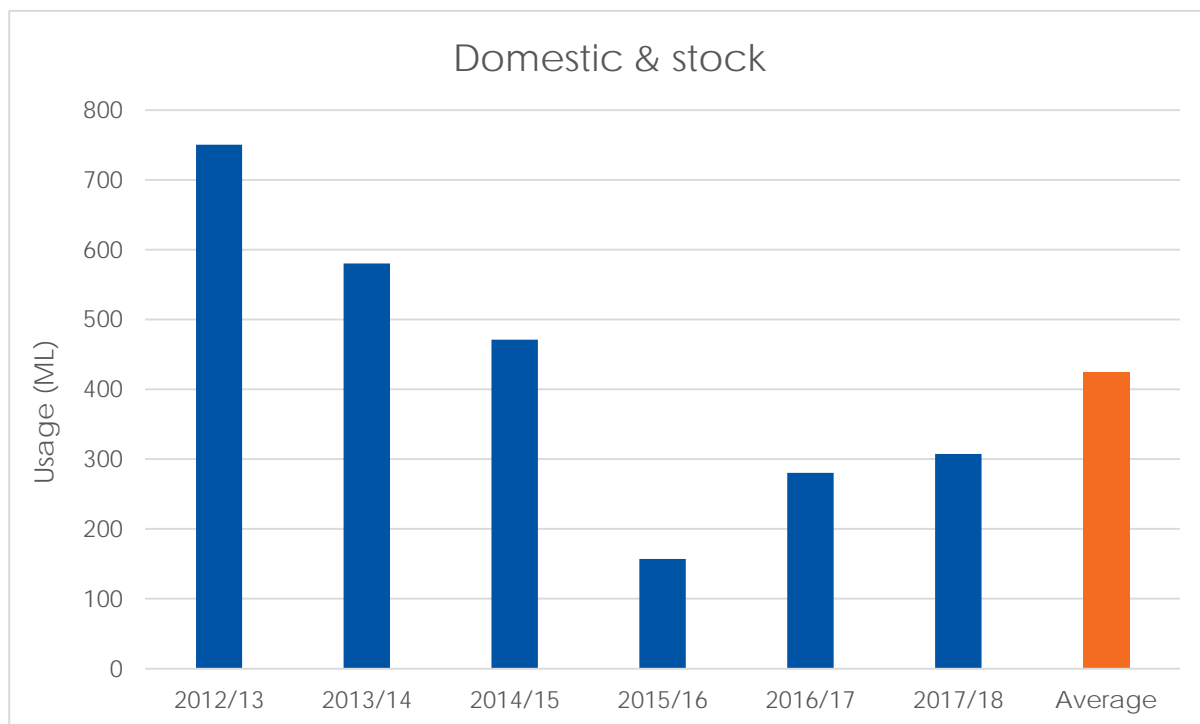


Figure 1: Historical Use - Domestic & Stock

#### 4.2 Local water utility – Broken Hill, Pooncarrie

There are two Local Water Utility (LWU) with share component of 9,975 ML for Broken Hill and 160 ML for Pooncarrie. Broken Hill demand varies from 15 ML/d over winter to 35 ML/d over summer. Historical use shown in figure 2 indicates that use is usually over 3,500 ML/year, and regularly exceeds 5,000 ML/year.

Water quality can be a major issue for town water supplies with salinity content above 1,000 EC resulting in taste concerns and above 1,500 EC resulting in corrosive issues on residential, commercial and industrial equipment. Once water quality exceeds these levels additional levels of treatment is required to ensure the water can be used for town supply.

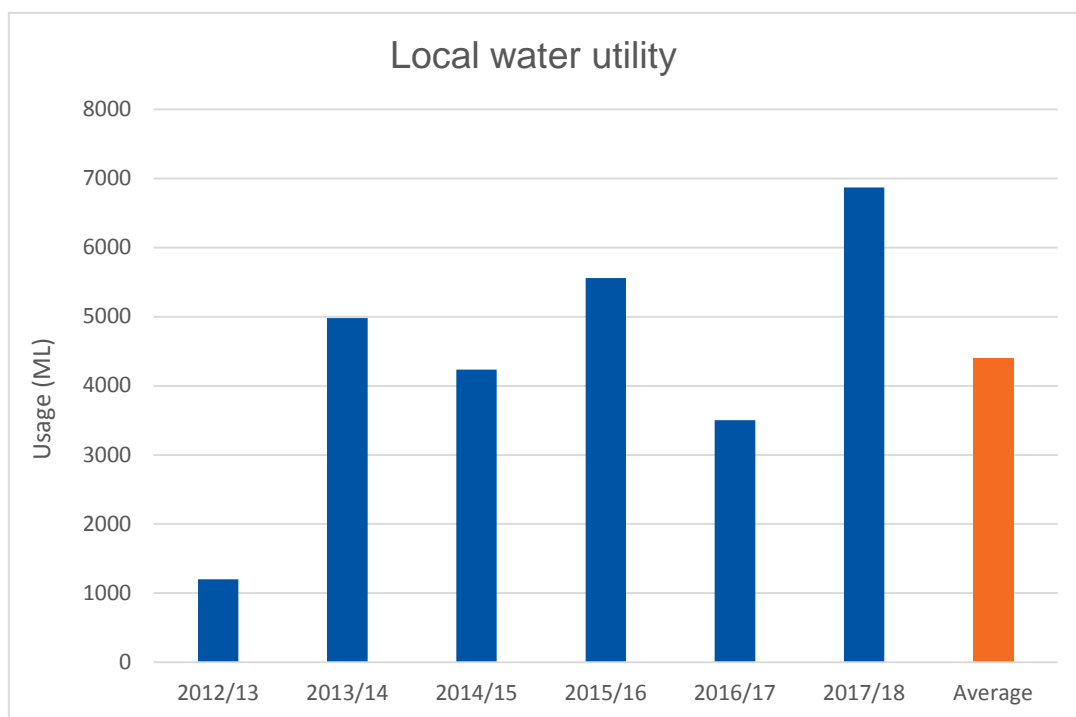


Figure 2: Historical use – Local water utility



### 4.3 Regulated river (high security)

There are 69 High security access licences with a total share component of 7,771 ML. Out of which, Consumptive use account for 4,196 ML and environmental water account for 3,575 ML. Historical use shows that use is in most years over 3,000 ML/year, and regularly exceeds 3,500 ML/year (refer to figure 3). The exceptions being years in which use restrictions have been in place for drought management.

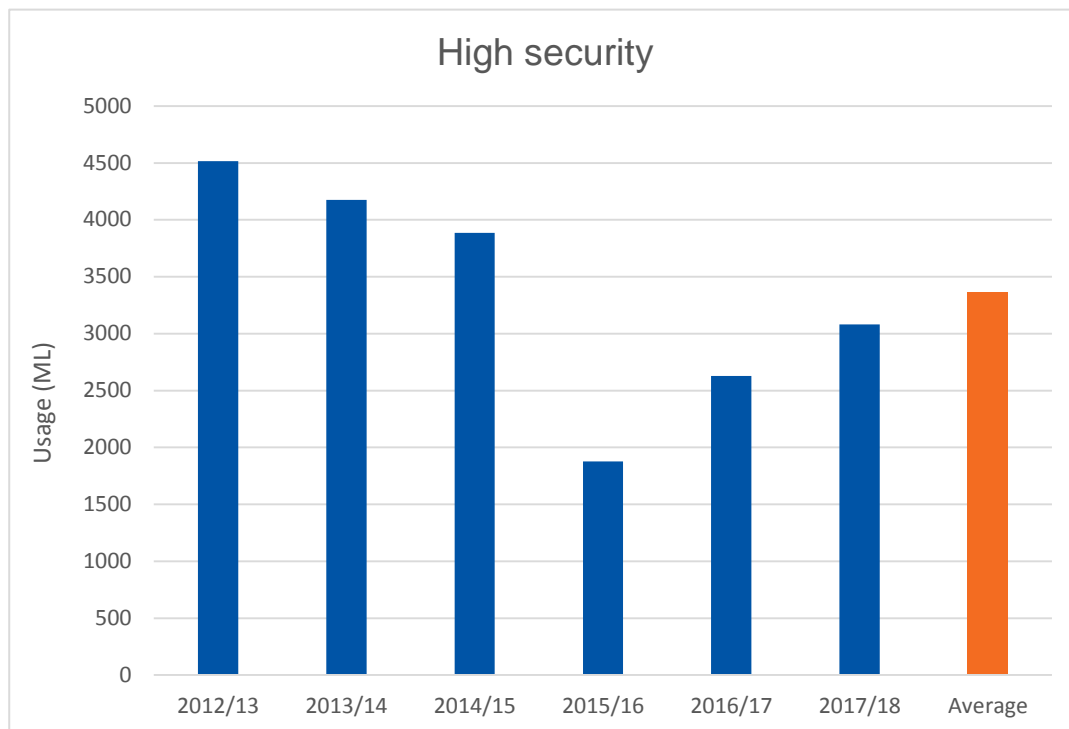


Figure 3: Historical use - high security

#### 4.4 Regulated river (general security)

There are 92 General security access licences with a total share component of 79,507 shares. Out of which, Consumptive use account for 10,143 shares and environmental water account for 69,364 shares. The history of general security use has been highly variable. Recent years has been boosted by significant allocation assignments into the Lower-Darling system by both consumptive users and the environmental water managers.

While the average use is calculated as 91,100 ML/year, that annual use ranges from 900 ML in 2015/16 to 185,000 ML in 2016-17, where e-water holders used 183,000 ML. Figure 4 shows the historical general security uses since 2012/13.

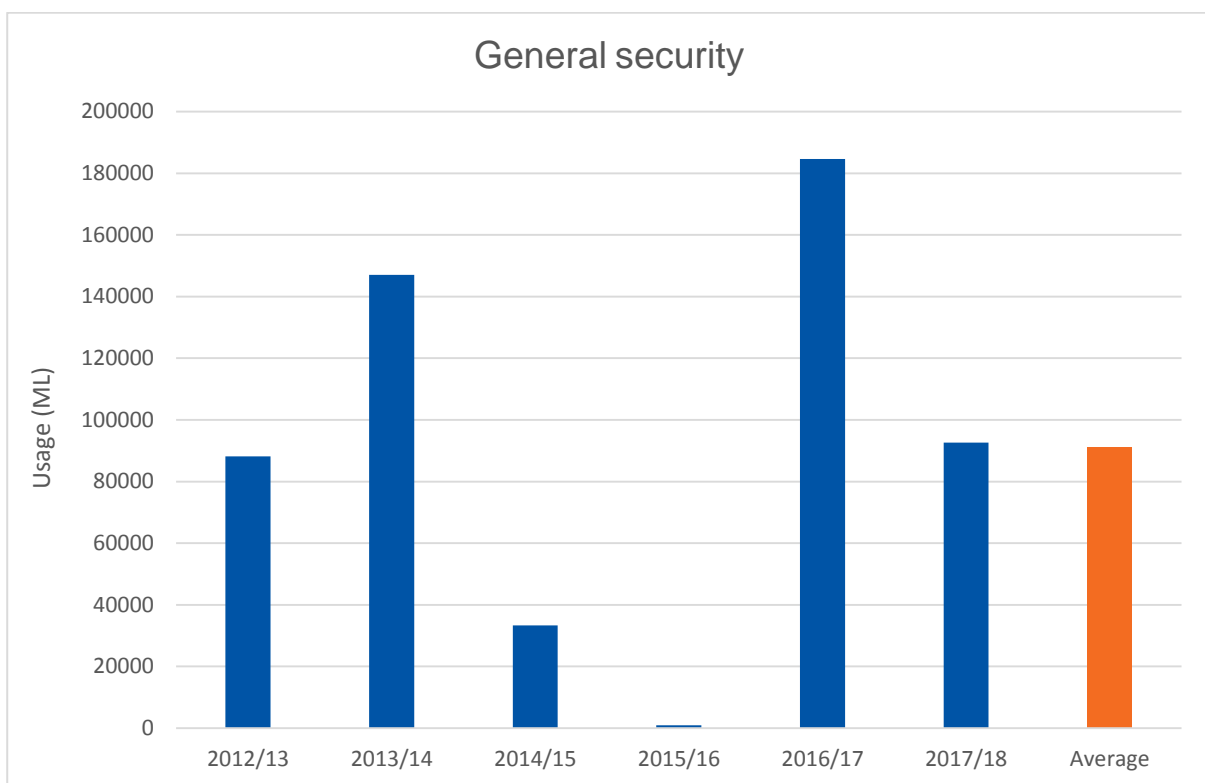


Figure 4: Historical use - general security

## 5. Drought management measures

### 5.1 Reduce water sharing plan minimum flow requirements

The WSP provides 95.6 GL (Section 3.1) of water for release over Weir 32, in a seasonal pattern for improved water quality in the Lower-Darling. Meeting the WSP requirement is a significant draw on the available resources, once the system reaches 480 GL and access to resources transfers solely to NSW.

WaterNSW has allocated a budget of 63 GL per year for releases downstream of Weir 32, once the 480 GL trigger is achieved – when no significant inflows are in transit upstream of the storage.

The WSP minimum flow requirements have been set based on what is assumed necessary to maintain ecological function and minimise risk of Blue Green Algal outbreaks. Reducing below the minimum required flows during Summer will create an increased risk of algal outbreak, that is unlikely to be mitigated through increased flow.

The option of maintaining minimum flow requirements at Weir 32 will reduce the duration of time that flow through the system can be maintained if no further inflows occur. That is, the resources will be depleted sooner, and as such, without inflow, cease to flow at weir 32 will occur sooner.

In this plan greater value has been placed on maintaining a reliable supply to the Lower-Darling water users, extending the duration of stock, domestic and town water supplies. However, if higher rates of release are supported by community and customers for management of water quality, these would be considered.

### 5.2 Pumping to Copi Hollow (maximum storage volume 12GL)

Additional storage in Copi Hollow requires the installation of a block bank across the interconnecting channel between Copi Hollow and Lake Pamamaroo. Pumping from Lake Pamamaroo to Copi Hollow needs to commence before the water level and water quality in Pamamaroo drops too low, commencing when Pamamaroo reaches 108GL, and can only be achieved to a volume of 72 GL.

Pumping to Copi Hollow extends the period of time that supply can be made to Broken Hill without the need for reverse osmosis.

### 5.3 Pumping lake Tandure to lake Wetherell

Lake Tandure is a small flat storage lake that is usually connected to Lake Wetherell. Naturally the two lake bodies separate when the storage reaches 57.8 m or approximately 9.4 GL.

However, efficiency in system storage can be achieved by installing a bank and isolating Lake Tandure when the Lake Wetherell total storage reaches around 53 GL, and pumping the volume held in Lake Tandure to Lake Wetherell. This reduces the surface area of the stored volume and provides efficiency through reduced evaporation.

Pumping from Lake Tandure can extend the period that supply can be made to Broken Hill.

### 5.4 Reverse osmosis (Broken Hill)

Water quality in Lake Wetherell decreases as the water evaporates and leaves the salt behind. The electrical conductivity (measurement of salinity) increases to a point where it becomes unsuitable for domestic supply (above 1,500 E.C.). Essential Water has capacity to install a reverse osmosis treatment plant for use when water supplies from the Menindee scheme exceed 1,500EC. This requires some work by Broken Hill to re-instate the facility.

Essential Water have a primary extraction point for supply from upstream of Weir 32. The Weir 32 weir pool has continuous monitoring of E.C. at the WaterNSW hydrometric gauging station. Essential Water may also source water from Copi Hollow for drought supplies. Monthly monitoring of Lake water quality is the normal regime, however, this would be increased during drought management periods or algal outbreaks. Essential water is also likely to complete a rigorous water quality monitoring program of all supplies.

### 5.5 Lower-Darling River block banks

When the water supply is insufficient to secure both Broken Hill and maintain continuous flows in the Lower-Darling, block banks are constructed as temporary weirs in the Lower-Darling. The water behind these block banks would then extend the supply of stock and domestic and high security supplies in these locations. However, they supply only a limited number of customers and do not address the need of all customers along the Lower-Darling.

## 5.6 Temporary bore field for Broken Hill and Menindee

Bores have been installed in the Menindee Lake and Tallyawalka aquifers. The water quality in these aquifers is suitable for supply to Broken Hill and Menindee township, although the Menindee bore-field would still require reverse osmosis treatment due to salinity marginally above the 1,500 EC threshold. Commissioning of these bore-fields would require; power, pumps and substantial pipelines that would take about six months to construct.

This action has been strongly opposed by the Broken Hill community in past years.

# 6. Resources analysis

## 6.1 2017/18 water year

Inflows to Menindee Lakes System have been very low during 2017/18 water year. Storage volume peaked at 1,585 GL on 17 December 2016 and since then has decreased due to releases to meet downstream demands and system losses, including evaporation, seepage, etc.

As shown in figure 5, the storage volume was 768 GL at the start of 2017/18 water year which has depleted to 209 GL at the end of water year by 30 June 2018.

The 2017/18 total flow at Willcannia was 52 GL and inflows to the lake system was 21 GL. Most of the inflows arrived during July to Dec 2017 and a small inflow arrived at the end of the water year from Northern Connectivity Event i.e. when Environmental water was released from Gwydir and Border River Catchments and s324 order was in place to protect the water.

Around 2 GL inflow was recorded since the start of 2018/19 water year and that was mostly from Northern Connectivity Event. Figure 6 shows the recorded flows along the Barwon Darling River system since July 2017.

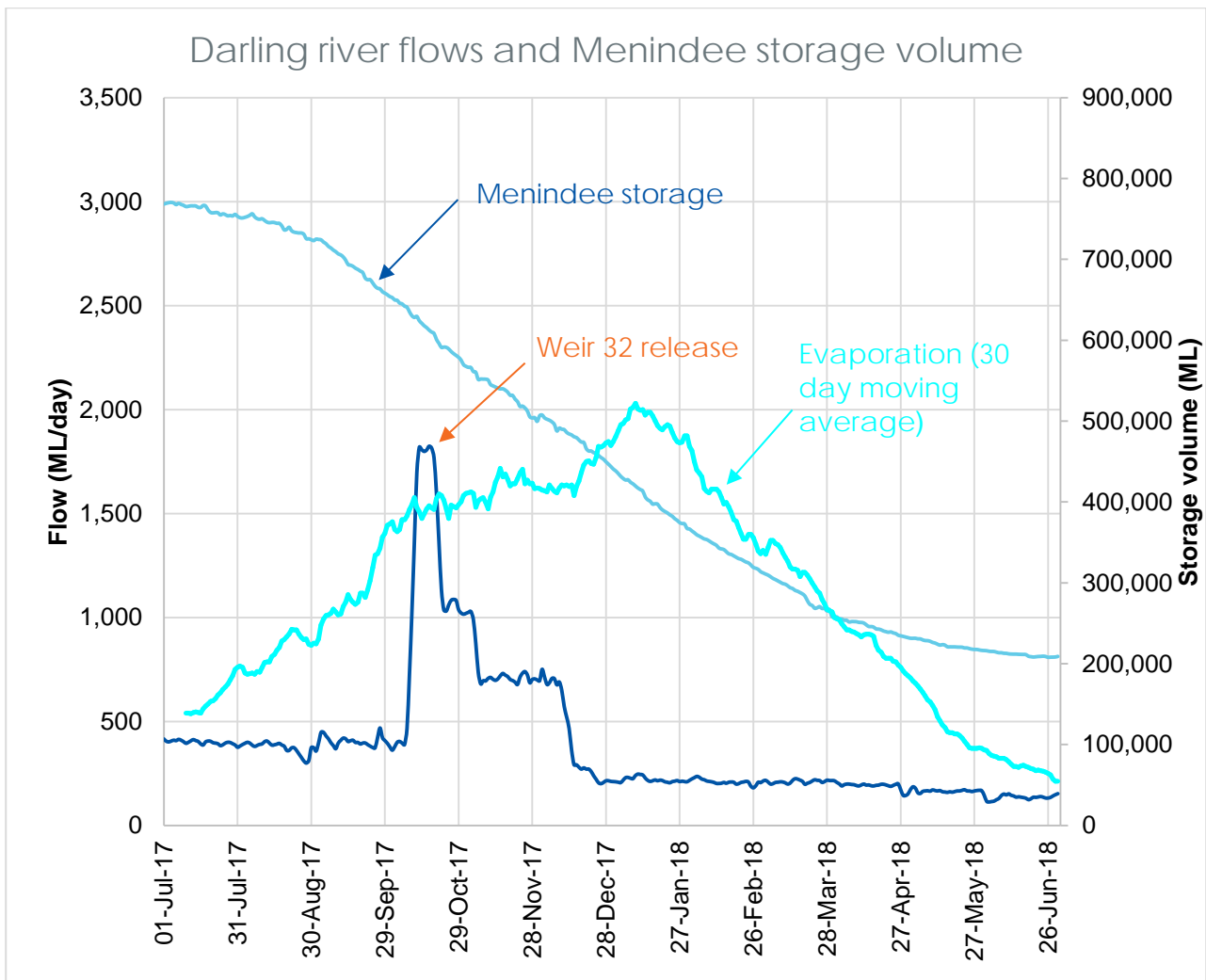


Figure 5: Menindee Lakes Total Volume, Storage release and Evaporation – 2017/18

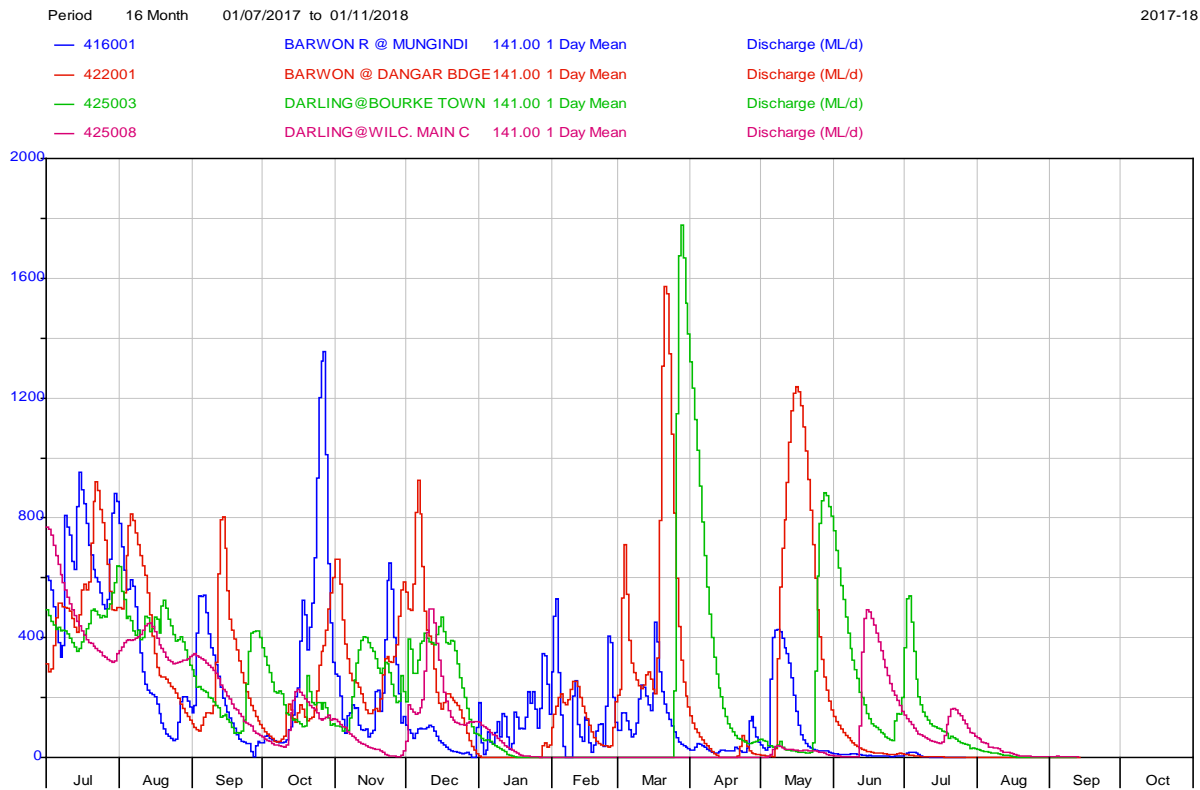


Figure 6: 2017/18 Recorded system Inflows

## 6.2 2018/19 water year forecast

### 6.2.1 Water allocations

Water allocation for the Lower-Darling were announced in early July with 100% allocation provided to High Security customers and no allocations for General Security customers. Average carryover was 15%.

Customer group	Account volume (ML)
Local water utility	10,135
Domestic and stock	1,370
High security, irrigation	4,196
High security, environment	3,575
General security (AWD)	0
General security, irrigation (carryover)	2,152
General security, environmental (carryover)	10,061

Table 1: Available water as at 1 July 2018

## 6.2.2 Water availability in 2018/19

This information was current as 31 October 2018.

Licence category	Share component	Carryover in	AWD volume	Allocation assignments in	Allocation assignments out	Usage	Balance
Domestic and stock	335	0	335	0	0	31	304
Domestic and stock (domestic)	424	0	424	0	0	62	362
Domestic and stock (stock)	612	0	612	0	0	5	607
Local water utility	10,135	0	10,135	0	0	1,949	8,186
Regulated river (general security)	79,507	12,213	0	5	43	517	11,658
Regulated river (high security)	7,771	-1	7,771	224	186	757	7,051
Supplementary water	250,000	0	250,000	0	0	0	250,000
<b>Grand total</b>	<b>348,784</b>	<b>12,212</b>	<b>269,277</b>	<b>229</b>	<b>229</b>	<b>3,321</b>	<b>278,168</b>

Table 2: Account balance



### 6.2.3 Current situation

As of 6 November 2018, the total storages were at 124.7 GL and about 77 GL of that is active volume. Table below shows the storage breakdown of the lakes as of 6 November 2018.

Lake ending	Current storage volume (ML)	Dead storage (ML)	Active storage (ML)
Tendure	9,488	6,188	3,300
Wetherell	22,387	490	21,897
Copi and Pamamaroo	81,706	31,710	49,996
Cowndilla	11,102	8,950	2,152
Total	124,683	47,388	77,345

Table 3: Storage breakdown as of 6 Nov 2018

The Barwon – Darling River system was mostly disconnected during the second half of 2017/18 water year. Wilcannia was at cease to flow condition for 97 days starting from 27 January 2018. Flow arrived at Wilcannia during 1<sup>st</sup> week of May from rainfall events of Moonie and Culgoa in Queensland then continued with Northern Connectivity Event. Barwon Darling River is not currently flowing, and flow ceased at the end of Northern Connectivity Event. The Menindee Lakes system has received around 1.5 GL of inflow over the winter months.

Currently, with the total storage is below the trigger volume of 480 GL, several drought mitigation measures are in place:

- Installation of block bank between Lake Tandure and Lake Wetherell was completed on 15/03/2018. Water was pumped from Lake Tandure into Lake Wetherell to reduce the evaporation loss from the former. About 7,200 ML was pumped into Lake Wetherell between 26/03/2018 and 17/05/2018
- Reduced flow targets at Weir32 to target minimal flows at Burtundy, since 15 December 2017.
- Installation of block banks in the LowerDarling River to provide a reliable supply to water users in the Lower-Darling River.
  - Jamesville Bank: Located near Pooncarrie the bank was constructed on 4 July 2018 and filling has commenced with reduced supply to Lower-Darling River. The bank was about 3.65m full on 19 November 2018.

- o Ashvale Bank: Located near Burtundy the bank was constructed on 3 August and filling has commenced with reduced supply to Lower-Darling River. The bank was about 1.41m full on 19 November 2018.
- o In addition, approvals have been received for two more banks at Karoola and at Court Nareen. Installation of those block banks will start soon.
- Installation of a bank to isolate Copi Hollow from Lake Pamamaroo has been completed on 24 August as originally planned. Around 11 GL was pumped to Copi Hollow between 25 September and 5 November with an aim to extend the supply to Broken Hill.

With low storage volume and nil inflows, demands for town water supply, stock and domestic and expected to be delivered during this summer. Very limited supply will be available only for permanent plantings during the summer months. Any supply will be dependent upon future inflows and after ensuring enough water is available to provide connectivity and critical human water needs.

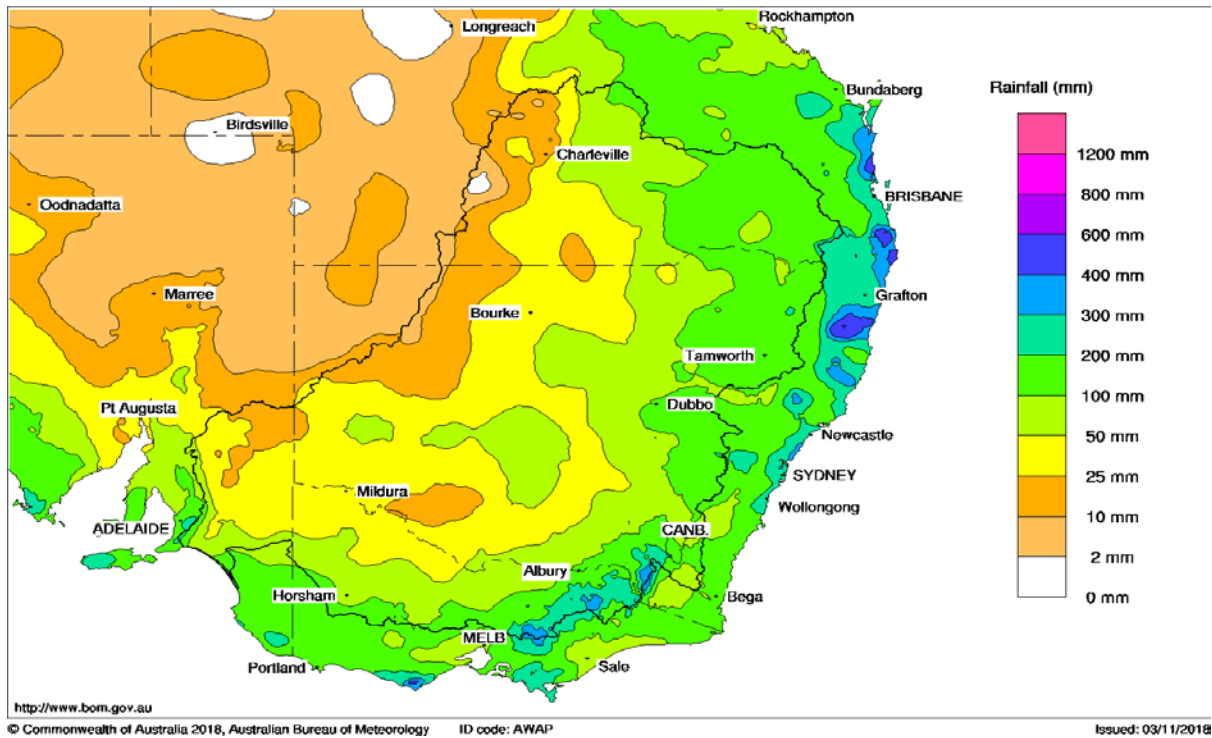
Supply for town water, stock and domestic will be varied depending location within the system.

#### **6.2.4 3-months rainfall**

Rainfall over last three months has been average to very much below average across NSW, with large areas especially in the north west receiving below to very much below average rainfall. Areas west of the Great Dividing Range has received less than 200mm of rain during last three months. South West Queensland has experienced average to below average rainfalls with the Murray Darling basin catchment receiving less than with only 2-25mm of rain falling.

Northern Connectivity Event, with s324 order in place, delivered more than 7.4 GL at Wilcannia with a peak of 500 ML/day. Flow ceased at Wilcannia by the end of August. Since then, there has been no flow generated along the Barwon Darling catchment from rainfall and hence no inflow has arrived at the lake system.

Murray-Darling Rainfall totals (mm) 1 August to 31 October 2018  
 Australian Bureau of Meteorology



Murray-Darling Rainfall Deciles 1 August to 31 October 2018  
 Distribution Based on Gridded Data  
 Australian Bureau of Meteorology

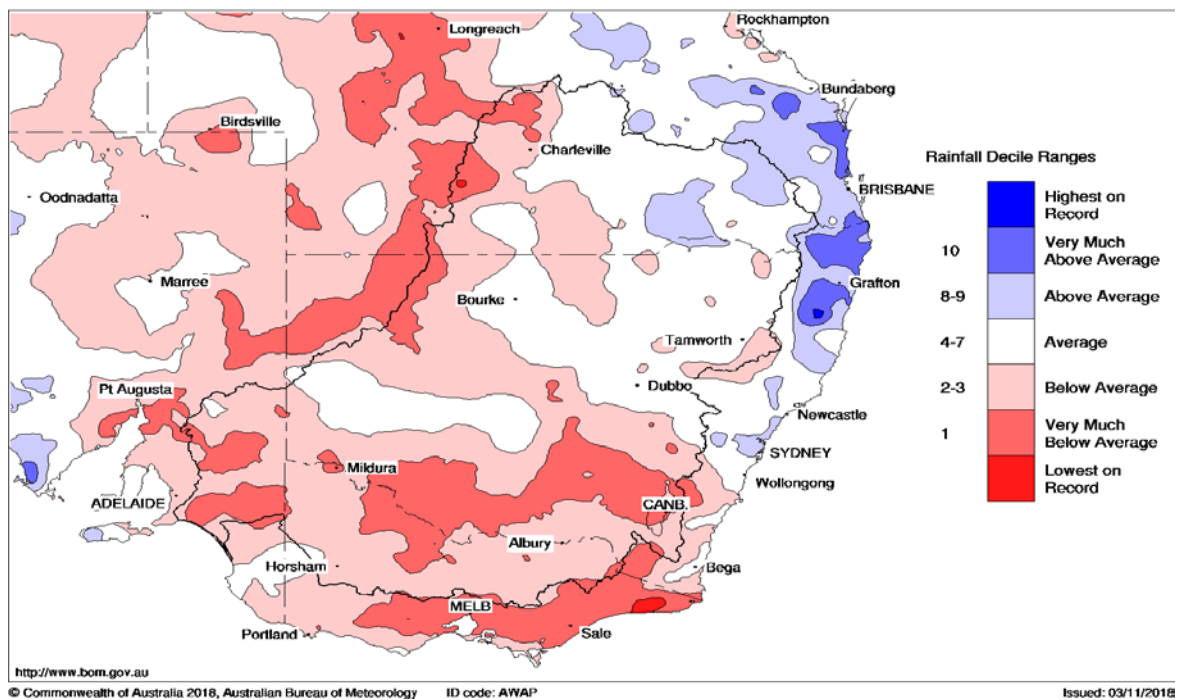


Figure 7: Last 3 months rainfall in the Murray Darling Basin

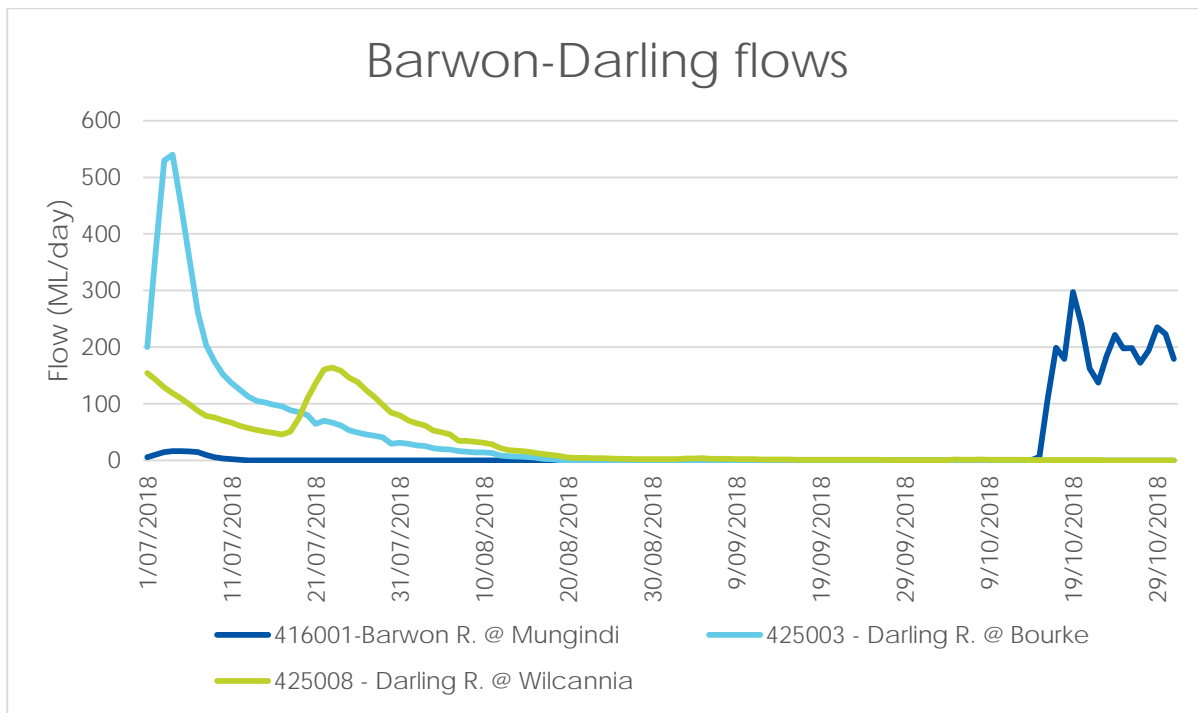


Figure 8: Flows in the Barwon Darling since 1 July 2018.

## 7. Operational strategy

WaterNSW will operate the storages to ensure that key objectives can be met based on the worst-case scenario (repeat of the drought of record) inflow sequence. However, the plan also looks at a less conservative strategy (80<sup>th</sup> percentile) to show the variability of water to allow for broader planning.

WaterNSW has engaged with customers to understand demands for the current year and has developed a release strategy that addresses the system key objectives including ensuring a continuous flow along the Lower-Darling and supply to Broken Hill.

The main drivers for customer demands in 2018/19 will be to:

- Maintain the supply for Broken Hill town water supply until delivery of the Wentworth to Broken Hill pipeline (8-9 GL)
- Maintain the supply for Menindee and Pooncarrie for the longest duration possible;
- While flow connectivity can be achieved:
  - Supply consumptive high security and general security licence holders;

- Provide critical supply for stock, domestic and permanent planting once resources reach critical levels – the priority will be to fill in river storages for drought supply.

As outlined in the Operational Objective (Section 2) WaterNSW has consider a number of scenarios within the operational strategy. All strategies assume that there will be no inflows until the end of November 2018. Figure 9 shows the Menindee lakes storage volume forecasts for three different scenarios.

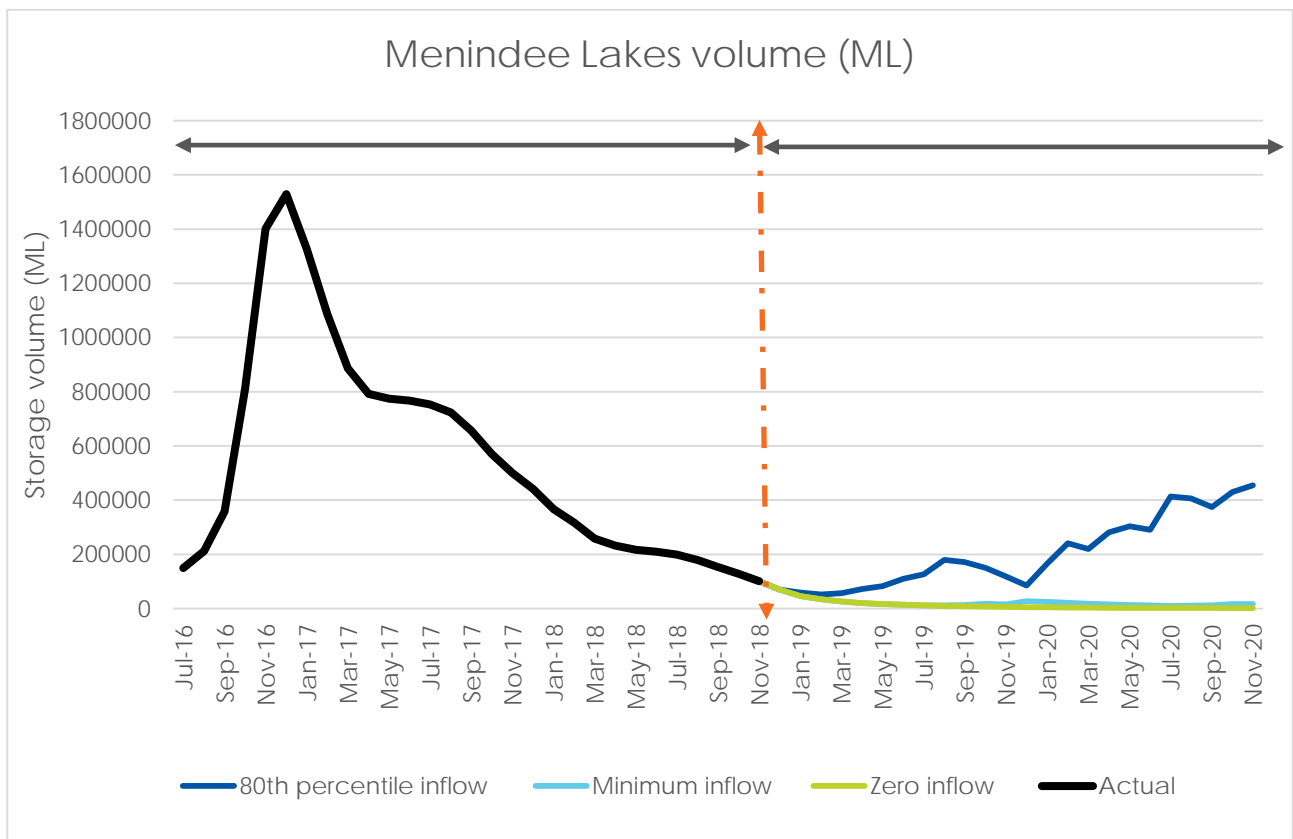


Figure 9. Menindee Lakes volume based on the three inflow scenarios

## 7.1 Drought strategy

To ensure that customer demands and operational objectives are met a number of drought management measures will be needed as the drought sequence intensifies. These drought management measures include reducing the minimum environmental releases along the Lower-Darling and implementing drought storages (Copi Hollow) and treatment options (Broken Hill Reverse Osmosis). Timeframes for implementing these measures have been identified in the Operational Plan based on storage triggers.

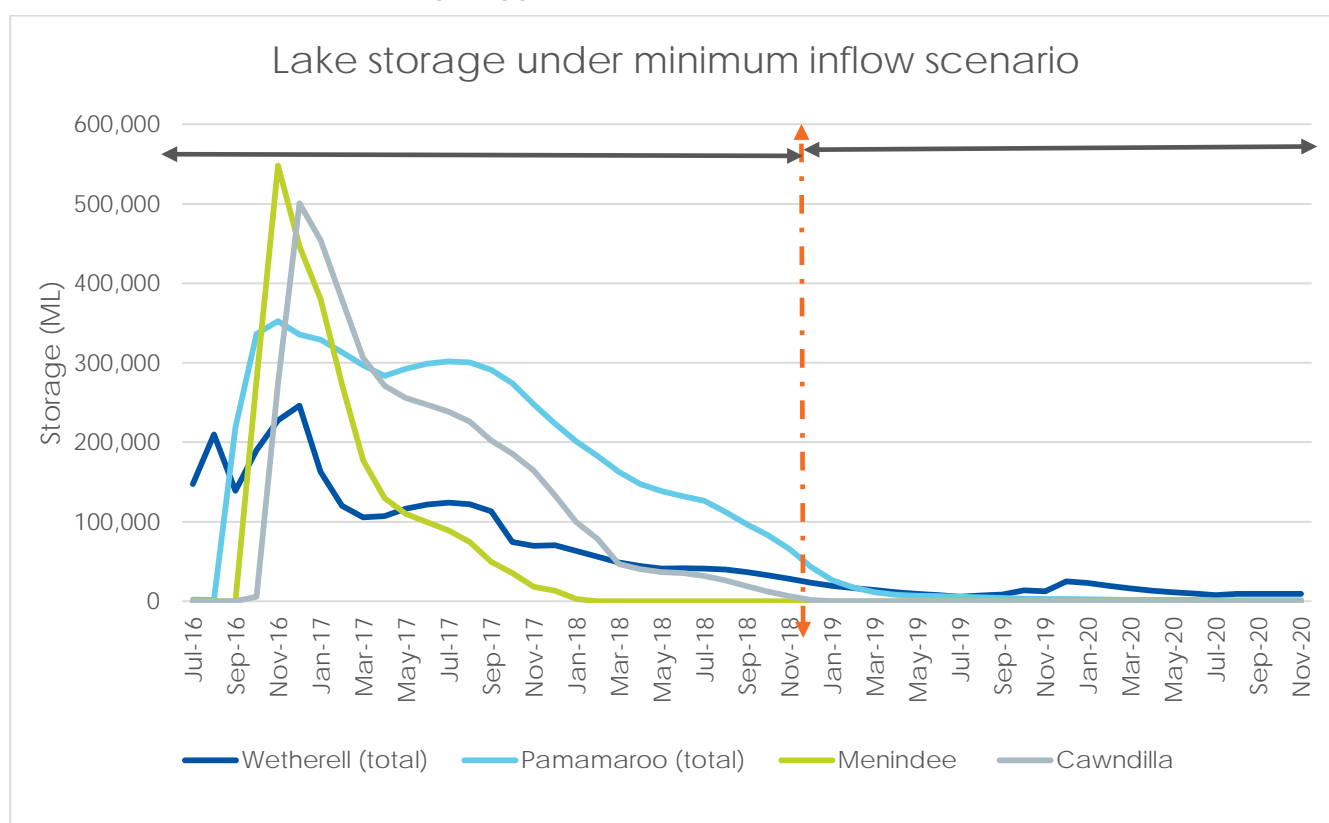


Figure 10. Individual lakes total volume (minimum inflow scenario)

Quarter	Inflows during the ending quarter			End of quarter storage		
	Sahara (Zero Inflow)	Minimum inflow	80th percentile inflow	Sahara (Zero Inflow)	Minimum inflow	80th percentile inflow
Dec-Feb 18	6,917	6,917	6,917	316,654	316,654	316,654
Mar-May 18	0	0	0	216,310	216,310	216,310
Jun-Aug 18	3,198	3,198	3,198	178,618	178,618	178,618
Sep-Oct 18	0	0	0	127,663	127,663	127,663
Nov-Feb 19	0	0	32,760	33,769	33,769	52,274
Mar-May 19	0	0	84,240	16,371	16,371	82,750

Jun-Aug 19	0	3,640	141,090	9,019	12,000	179,061
Sep-Nov 19	0	12,870	49,180	5,948	15,617	117,884
Dec-Feb 20	0	18,380	247,540	3,426	21,197	240,495
Mar-May 20	0	0	176,180	2,426	12,946	303,150
Jun-Aug 20	0	3,640	189,880	1,960	10,573	406,239
Sep-Nov 20	0	12,870	159,056	1,145	16,440	454,982

Table 4: Total Lake Inflow Scenarios

WaterNSW has adopted the drought scenario recommencing in Dec 2018 (24-months of minimum inflows based on historical records), as the basis for its drought preparedness. The tables below outline the likely inflows, releases and evaporation from the storages to enable the development of a drought management plan to be prepared for the system.

<b>Total Lakes</b>					
<b>Quarter ending</b>	<b>Inflows</b>	<b>Release</b>	<b>Evaporation</b>	<b>End of quarter storage</b>	<b>Weir 32 daily flow (ML/d)</b>
Dec-Feb 18	6,917	73,450	141,960	316,654	285
Mar-May 18	0	30,305	65,180	216,310	189
Jun-Aug 18	3,198	20,160	29,320	178,618	182
Sep-Oct 18	0	15,860	32,077	127,663	219
Nov-Feb 19	0	15,694	79,786	33,769	129
Mar-May 19	0	3,887	12,778	16,371	42
Jun-Aug 19	3,640	4,724	3,259	12,000	51
Sep-Nov 19	12,870	5,097	4,388	15,617	56
Dec-Feb 20	18,380	5,460	7,467	21,197	60
Mar-May 20	0	5,244	3,051	12,946	57
Jun-Aug 20	3,640	4,724	1,255	10,573	51
Sep-Nov 20	12,870	5,097	2,045	16,440	56

Table 5: Total Lake Forecast Data (minimum inflow sequence)

### Upper Lakes (Wetherell and Pamamaroo)

Quarter ending	Inflows	Release	Evaporation	End of quarter storage	Weir 32 daily average flow (ML/d)
Dec-Feb 18	6,917	30,240	69,010	238,344	285
Mar-May 18	0	23,250	38,210	179,714	189
Jun-Aug 18	3,198	20,160	18,470	152,248	182
Sep-Oct 18	0	15,860	22,000	115,640	219
Nov-Feb 19	0	15,694	67,572	33,741	129
Mar-May 19	0	3,887	12,666	16,369	42
Jun-Aug 19	3,640	4,724	3,167	11,998	51
Sep-Nov 19	12,870	5,097	4,297	15,615	56
Dec-Feb 20	18,380	5,460	7,376	21,195	60
Mar-May 20	0	5,244	2,959	12,944	57
Jun-Aug 20	3,640	4,724	1,163	10,571	51
Sep-Nov 20	12,870	5,097	1,981	16,438	56

Table 6: Upper lakes (Wetherell and Pamamaroo) forecast data (minimum inflow sequence)

### Lake Cawndilla

Quarter	Release	Evaporation	End of quarter storage
Dec-Feb 18	43,210	51,090	78,310
Mar-May 18	7,055	26,970	36,596
Jun-Aug 18	0	10,850	26,370
Sep-Oct 18	0	14,327	12,043
Nov-Feb 19	0	12,015	28
Mar-May 19	0	26	2

Table 7: Lake Cawndilla forecast data (minimum inflow sequence)

## 7.2 Dry scenario (80<sup>th</sup> percentile inflows)

The dry scenario considers the 80<sup>th</sup> percentile inflow sequence to the lakes, inflows that would be exceeded 8 years in 10.

Under this scenario the volume of water held within the lakes would start to increase from Dec 2018. Refer to figure 11 for Menindee lakes storage volume forecast for this scenario. No major drought management measures will be required.



Under this scenario supply along to customers would continue. However, depending upon timing of the inflows it is high likelihood the total volume in the Lakes will remain below the 480GL and not increase above the 640GL over the two-year period. This means no water will be available for the MDBA to meet demands in the Murray over that period.

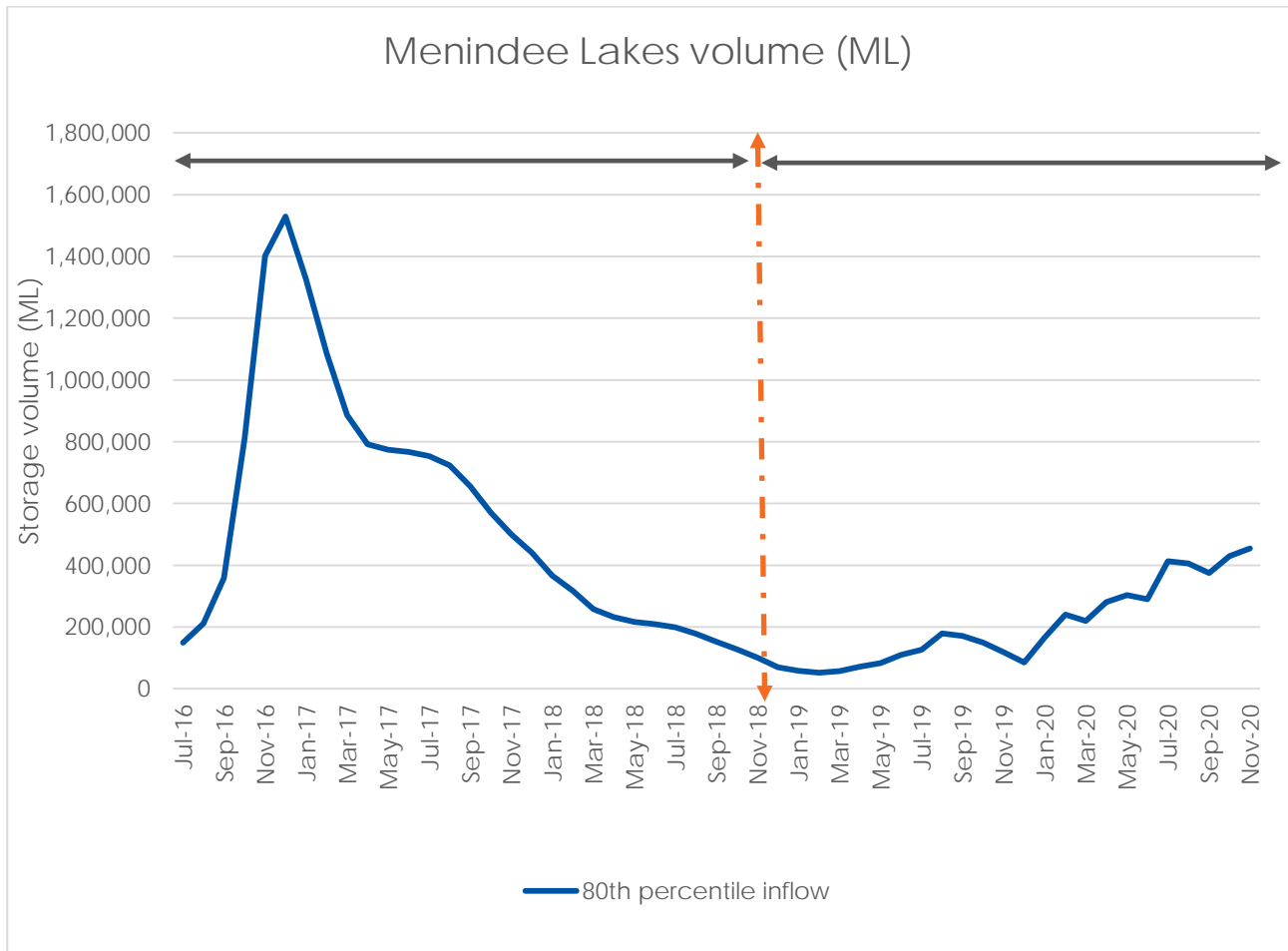


Figure 11: Lakes total volume under the 80<sup>th</sup> percentile inflow sequence.

### 7.3 Water quality

Based on current minimum inflow sequence forecasts the salinity levels will reach 1,000 electrical conductivity (E.C.) in November 2018 and 1,500 E.C. in April 2019. Figure 12 shows the lake Wetherell salinity levels for minimum inflow sequence. Figure 13 shows the lake Wetherell salinity levels for zero inflow sequence.

If raw water salinity levels increase above 1,000 E.C. it will begin to have an impact on the taste of the Broken Hill water supply and once salinity levels reach 1,500 E.C. the water quality will have a corrosive impact on water using appliance and equipment.

Water quality in Lake Wetherell will be key to the time of alternating supply from Weir 32 to Copi Hollow for supply to Broken Hill. Future of Broken Hill water supply will depend on the completion of Wentworth to Broken Hill pipe line project.

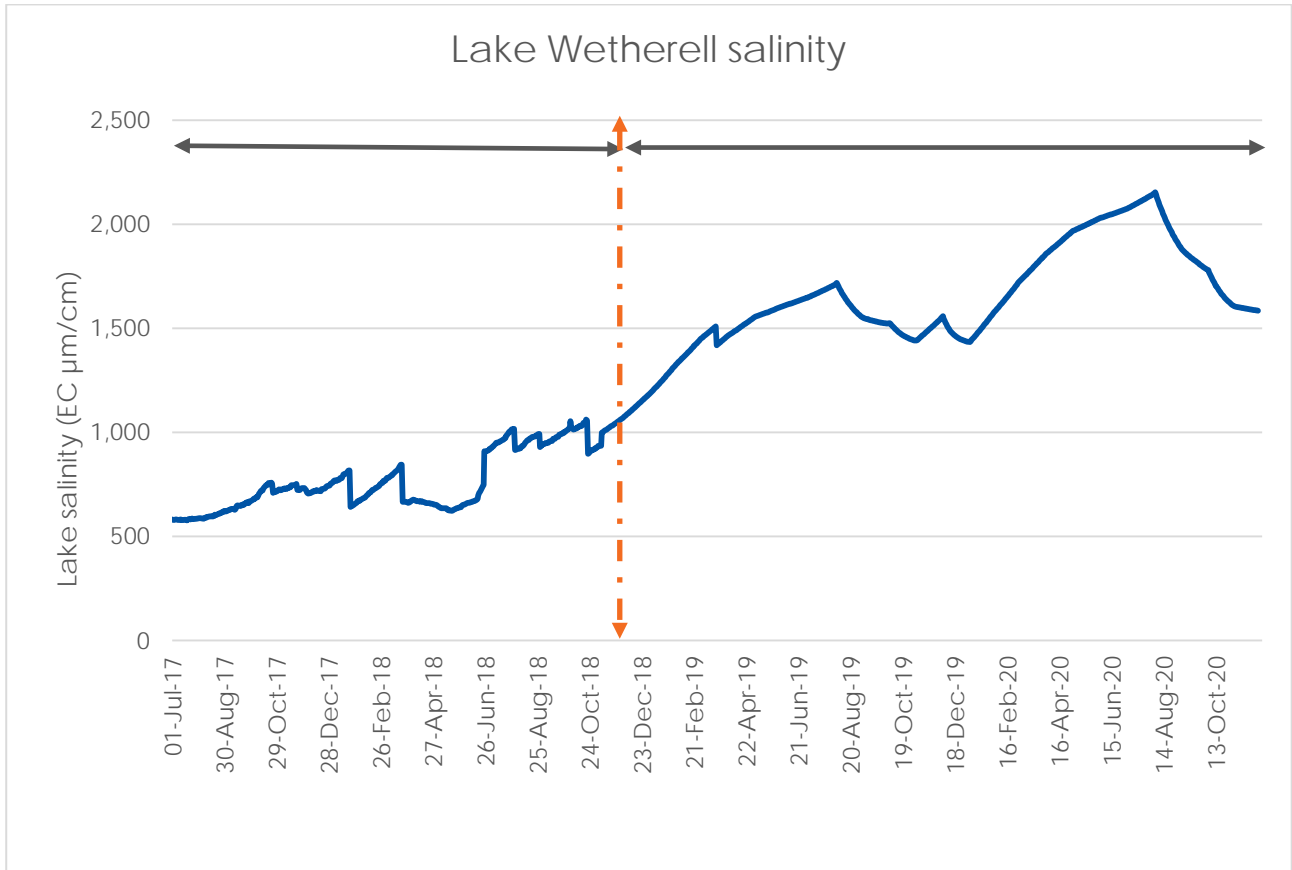


Figure 12: Salinity levels in lake Wetherell (minimum inflow sequence)

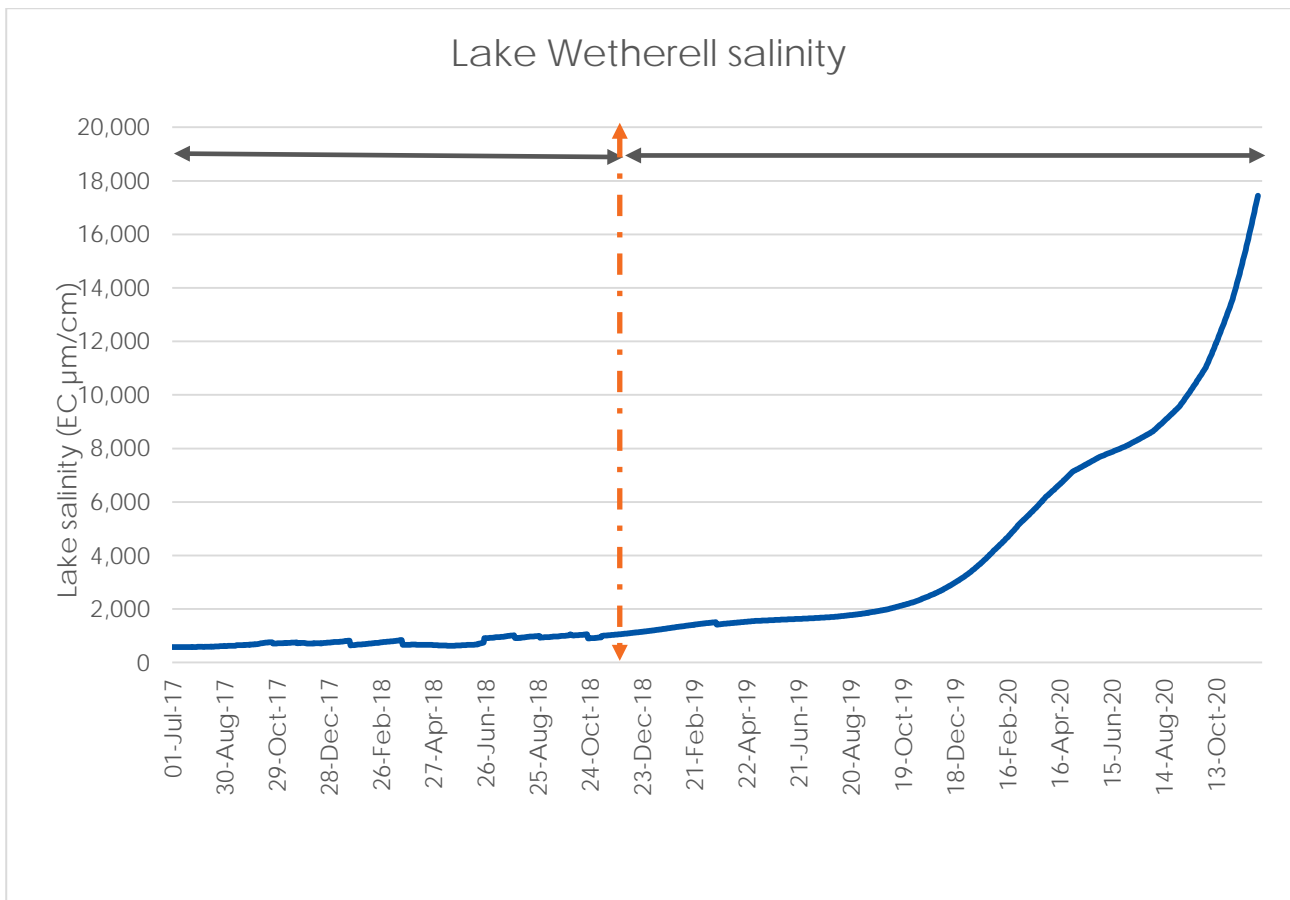


Figure 13: Salinity levels in lake Wetherell (zero inflow sequence)

### 7.4 Key operational decisions and dates

The below table outlines dates for key operational changes required to ensure operational objectives are met. The model optimises the use of Lake Wetherell first drawing water from the flood plain then transferring releases to Pamamaroo. The model has also used the worst recorded evaporation data.

#### Key operational changes

Assumptions	Sahara (zero inflow)	Minimum inflow	80th percentile inflow
Inflow	No inflow beyond recession of current inflow	Statistical worst inflow sequence on record - Applied from Dec 2018	80th % Inflow sequence - Applied from Dec 2018
Broken Hill reserve	Planned 50 GL of active storage - but due to switch to Copi Hollow when Weir 32 EC forecast to exceed 1,500 EC.		

MDBA delivery	Ceased since second week of December 2017		
MDBA delivery cease - 480 trigger	15-Dec-17	15-Dec-17	15-Dec-17
Volume in Wetherell + Pamamaroo @ 480GL	307 GL	307 GL	307 GL
Volume in Cawndilla + Menindee @ 480 GL trigger	172 GL	172 GL	172 GL
<b>Results</b>	<b>Sahara (zero inflow)</b>	<b>Minimum inflow</b>	<b>80th percentile inflow</b>
Weir 32 Flows - NSW control - post 480 GL	Currently 200ML/day Releases will be reduced depending on Pamamaroo outlet capacity.  Flow cease by end of Dec 2018 / early Jan 2019	Currently 200ML/day Releases will be reduced depending on Pamamaroo outlet capacity.  Flow cease by end of Dec 2018 / early Jan 2019	Per Water Sharing Plan
MDBA volume accessible	Not available	Not available	Not available
Tandure pumping	First phase completed – 25 Mar to 17 May 2018.	First phase completed – 25 Mar to 17 May 2018.	First phase completed – 25 Mar to 17 May 2018.
Pumping to Copi Hollow	First phase completed 25 Sep to 5 Nov 2018	First phase completed 25 Sep to 5 Nov 2018	First phase completed 25 Sep to 5 Nov 2018
Lower-Darling Cease to Flow	End of Dec 2018/early Jan 2019	End of Dec 2018/early Jan 2019	No supply issue forecast
Switch Supply to Copi Hollow (depending upon EC level in Wetherell)	Dec 2018	Dec 2018	Dec 2018
Broken Hill Supply switch back to lake Wetherell	Late April 2019* On hold pending W2BHill pipeline	Late April 2019* On hold pending W2BHill pipeline	End of Feb 2019
Broken Hill supply fail	September 2019 On hold pending	Secure end of forecast period 30 Nov 2020	Secure end of forecast period 30 Nov 2020

	W2BHill pipeline		
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\* Salinity is likely to be high

Table 5: Key Operational changes required

## 7.5 Key messages regarding drought measures

Drought measures have been progressively implemented since Dec 2017. WaterNSW is continuously monitoring the situations and implemented various measures to manage the resources during drought. Following are the highlights regarding key drought management measures

- WaterNSW has numerous works in place to secure water supply to Broken Hill until the pipeline is available, and to extend Lower-Darling supplies to S&D and High Security.
- Block Bank in place between Wetherell and Tandure isolating lake Tandure providing efficiency through reduced evaporation.
- Block Bank between Copi Hollow and Lake Pamamaroo is in place to continue supply to Broken Hill without the need for reverse osmosis.
- Two temporary block banks downstream of Pooncarie (Ashville and Jamesville) have already been installed to maintain continuous flows with limited supply to number of customers.
- Approvals have been received for two additional temporary block banks upstream of Pooncarie at Karoola and at Court Nareen to secure S&D supply.
- Increased frequency of lake water quality monitoring of all water supplies.

Broken Hill Pipeline project is expected to provide assistance supplying the Broken Hill community after December 2018.

### More information

Subscribe to our customer information (weekly water availability reports, e-newsletters, etc.) at [waternsw.com.au/subscribe](http://waternsw.com.au/subscribe).