

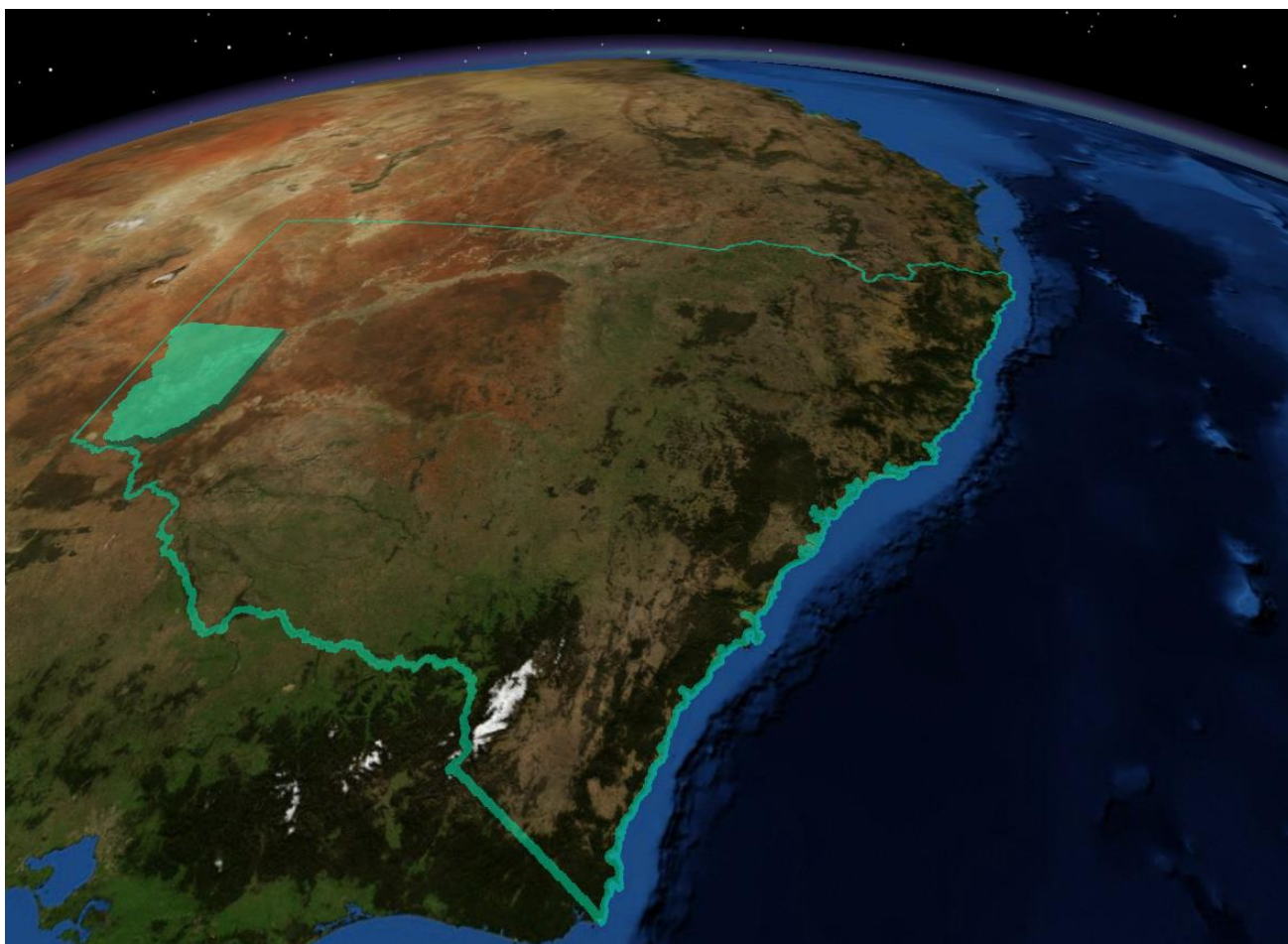


GENERAL PURPOSE WATER ACCOUNTING REPORT

## Lower Darling Catchment

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2018–19



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## Abbreviations

Abbreviation	Description
ARCGIS	mapping and spatial analysis platform for designing and managing solutions through the application of geographic knowledge
AWAS 1	Australian Water Accounting Standard 1
AWD	available water determination
CAIRO	computer-aided improvements to river operations
GPWAR	general purpose water accounting report
MDBA	Murray–Darling Basin Authority
ML	megalitres (1,000,000 litres)
ML/d	megalitres per day
SILO	climatic data provision system run by the Queensland government for the provision of both measured and modelled data

## Glossary

Term	Definition
allocation	the specific volume of water allocated to water allocation accounts in a given season, defined according to rules established in the relevant water plan
allocation assignments	the transfer of water between licence holder allocation accounts as a result of a trade agreement The assignment becomes part of the receiver's current year allocation account water.
allocation account	water account attached to an access licence used to track the balance of account water
available water determination (AWD)	the process by which water is made available for use and shared amongst water users who hold a water access licence It determines the volume of water that is to be added to an individual's licence allocation account.
Australian Water Accounting Standard (AWAS)	a national standard that prescribes the basis for preparing and presenting a general purpose water accounting report (GPWAR) It sets out requirements for the recognition, quantification, presentation and disclosure of items in a GPWAR.
back-calculation	a calculation approach using a mass balance to determine an unknown variable (used to calculate storage inflows based on balancing the change in storage volume where inflow is the only unknown)
basic rights	the non-licensed right to extract water to meet basic requirements for household purposes (non-commercial uses in and around the house and garden) and for watering of stock It is available for anyone who has access to river frontage on their property.
computer aided improvements to river operations (CAIRO)	a spreadsheet-based water balance model used for optimising river operations (orders and releases)
carryover	the volume or share component that may be reserved by a licence holder for use in the subsequent year
catchment	the areas of land that collect rainfall and contribute to surface water (streams, rivers, wetlands) or to ground-water A catchment is a natural drainage area, bounded by sloping ground, hills or mountains, from which water flows to a low point.
dead storage	the volume in storage that is generally considered unavailable for use (e.g. water level below release valves) due to access and often poor water quality
effective storage	the total volume of storage minus the dead storage component—the volume generally considered as useable
effluent	flow leaving a place or process Sewage effluent refers to the flow leaving a sewage treatment plant. An effluent stream is one which leaves the main river and does not return.
entity	a defined geographical area or zone within the accounting region Transactions and reports are produced for each entity.

Term	Definition
end of system	the last defined point in a catchment where water information can be measured and/or reported
environmental water	water allocated to support environmental outcomes and other public benefits Environmental water provisions recognise the environmental water requirements and are based on environmental, social and economic considerations, including existing user rights.
evaporation	the process by which water or another liquid becomes a gas Water from land areas, bodies of water, and all other moist surfaces is absorbed into the atmosphere as a vapour.
evapotranspiration	the process by which water is transmitted as a vapour to the atmosphere as the result of evaporation from any surface and transpiration from plants
extraction	the pumping or diverting of water from a river or aquifer by licensed users for a specific purpose (irrigation, stock, domestic, towns, etc.) The volume is measured at the point of extraction or diversion (river pump, diversion works, etc.).
general purpose water accounting report (GPWAR)	a report prepared according to the Australian Water Accounting Standard It comprises a number of components including a contextual statement, a statement of water assets and water liabilities, a statement of change in water assets and water liabilities, a statement of physical water flows, notes and disclosures, and an assurance and accountability statement.
General Security licence	a category of water access licence implemented under the <i>Water Management Act 2000</i> This forms the bulk of the water access licence entitlement volume in NSW and is a low-priority entitlement (i.e. it only receives water once essential and High Security entitlements are met in the available water determination process).
groundwater	Water location beneath the ground in soil pore spaces and in the fractures of rock formations
High Security licence	a category of water access licence implemented under the <i>Water Management Act 2000</i> It receives a higher priority than General Security licences but less priority than essential requirements in the available water determination process.
HYDSTRA database	a database used by NSW Department of Planning, Industry and Environment to store continuous, time-series data such as river flow, river height, and water quality
inflows	surface water runoff and deep drainage to groundwater (groundwater recharge) and transfers into the water system (both surface and groundwater) for a defined area
inter-valley trade	trade of licence holder allocation account water via allocation assignment from one catchment to another catchment (or state)
intra-valley trade	trade of licence holder allocation account water via allocation assignment within the same catchment
median	the middle point of a distribution, separating the highest half of a sample from the lowest half

Term	Definition
non-physical transaction	an accounting transaction representing a process that is not a component of the water cycle (e.g. an available water determination)
physical transaction	an accounting transaction representing a process of the water cycle (e.g. an extraction)
regulated river	a river system where flow is controlled via one or more major man-made structures such as dams and weirs For the purposes of the <i>Water Management Act 2000</i> , a regulated river is one that is declared by the minister to be a regulated river. Within a regulated river system, licence holders can order water against a held entitlement.
share component	an entitlement to water specified on the access licence, expressed as a unit share or, in the case of specific purpose licences (e.g. Local Water Utility, Major Water Utility and Domestic and Stock), a volume in megalitres The amount of water a licence holder is allocated as a result of an available water determination and the amount they can take in any year is based on their share component.
storage	a state-owned dam, weir or other structure that is used to regulate and manage river flows in the catchment and the water bodies impounded by these structures
storage reserve	proportion of water in a storage reserved in the resource assessment process for future essential or High Security requirements (e.g. town water)
storage volume	the total volume of water held in storage at a specified time
supplementary water	unregulated river flow available for extraction under a Supplementary Water licence
surface water	all water that occurs naturally above ground including rivers, lakes, reservoirs, creeks, wetlands and estuaries
tributary	a smaller river or stream that flows into a larger river or stream Usually a number of smaller tributaries merge to form a river.
ungauged catchment	a catchment without a flow gauge to accurately record stream flows Modelled estimates must be used to approximate the contribution of ungauged catchments to the main river.
water accounting	the systematic process of identifying, recognising, quantifying, reporting, assuring and publishing information about water, the rights or other claims to that water, and the obligations against that water
water assets	the physical water held in storage, as well as any claims to water that are expected to increase the future water resource (e.g. external water entering the system through inter-valley trading)
water liabilities	claims on the water assets of the water report entity including water that has been allocated to licence holder accounts or environmental accounts, but yet to be taken at the end of the reporting period
water sharing plan	a water management plan that defines the rules for sharing of water within a region under the <i>Water Management Act 2000</i>



## Director's foreword

This is the ninth annual release of the general purpose water accounting report (GPWAR) for the Lower Darling regulated river water source. It has been prepared for the accounting period 1 July 2018 to 30 June 2019 under the Australian Water Accounting Standard 1 (AWAS 1) (WASB, 2012).

The GPWAR provides stakeholders with a consolidated, comparable and publicly accessible set of water accounting information for the water source. The information presented is also used internally for a range of water planning functions and legislative reporting obligations.

Included in the GPWAR are:

- a contextual statement summarising the climatic conditions, water resources, environmental holdings, water trading market and water resource management in the water source for 2018–19
- a physical flow diagram, illustrating changes in storage volumes and the associated inflows and outflows
- water accounting statements presenting the opening and closing balances, and itemised changes to these balances for available water resources (water assets) and licenced allocation accounts (water liabilities)
- disclosure notes (linked to the figures within the water accounting statements) providing detailed information of accounting components including:
  - access licence account balances
  - planned and held environmental water account balances
  - a detailed available water determination report
  - temporary trading by licence category
  - supplementary announcements and usage by river reach
  - physical inflows and outflows to the system for the water year.

Detailed information on groundwater sources are excluded from the GPWAR.

Reporting datasets used in the GPWAR are available by sending an email request of your required information to [water.wams@dpi.nsw.gov.au](mailto:water.wams@dpi.nsw.gov.au)

As Director Water Analytics, NSW Department of Planning, Industry and Environment, I hereby declare:

- the information presented in these accounts is a faithful representation of the management and operation of the Lower Darling regulated river water source for the reporting period
- all data presented in this report is based on the best available information at the time of publication
- the Department of Planning, Industry and Environment has to the best of its ability prepared this GPWAR in accordance with the Australian Water Accounting Standard 1.



**Danielle Baker**  
Director Water Analytics  
NSW Department of Planning, Industry and Environment

## Contextual statement

The Lower Darling River is located in the semi-arid environment of south-western New South Wales. The 'Lower Darling' commonly refers to the portion of the Darling River that is regulated by releases from the Menindee Lakes Scheme, from the township of Menindee to its junction with the Murray River at Wentworth 530 km downstream.

The general topography of the catchment is flat, with elevations lower than 100 metres across most of the floodplain. Land use is dominated by grazing, with small areas of cropping carried out in the southern half of the catchment and on some of the region's lake beds.

Prior to construction of the Menindee Lakes Scheme the Lower Darling River was unregulated, and like the unregulated portion of the catchment above Menindee, it was subject to highly variable flow conditions. With completion of the scheme in 1960, the flow regime of the river has changed significantly. It has reduced monthly flow volumes, long periods of constant low flow and reduced frequency of small- to medium-sized flow events (Green *et al.* 1998).

You can find a detailed description of the catchment in the document *Water resources and management overview—Lower Darling Catchment*, which is available from the NSW Department of Planning, Industry and Environment website ([www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)).

## Accounting extent

### Surface water

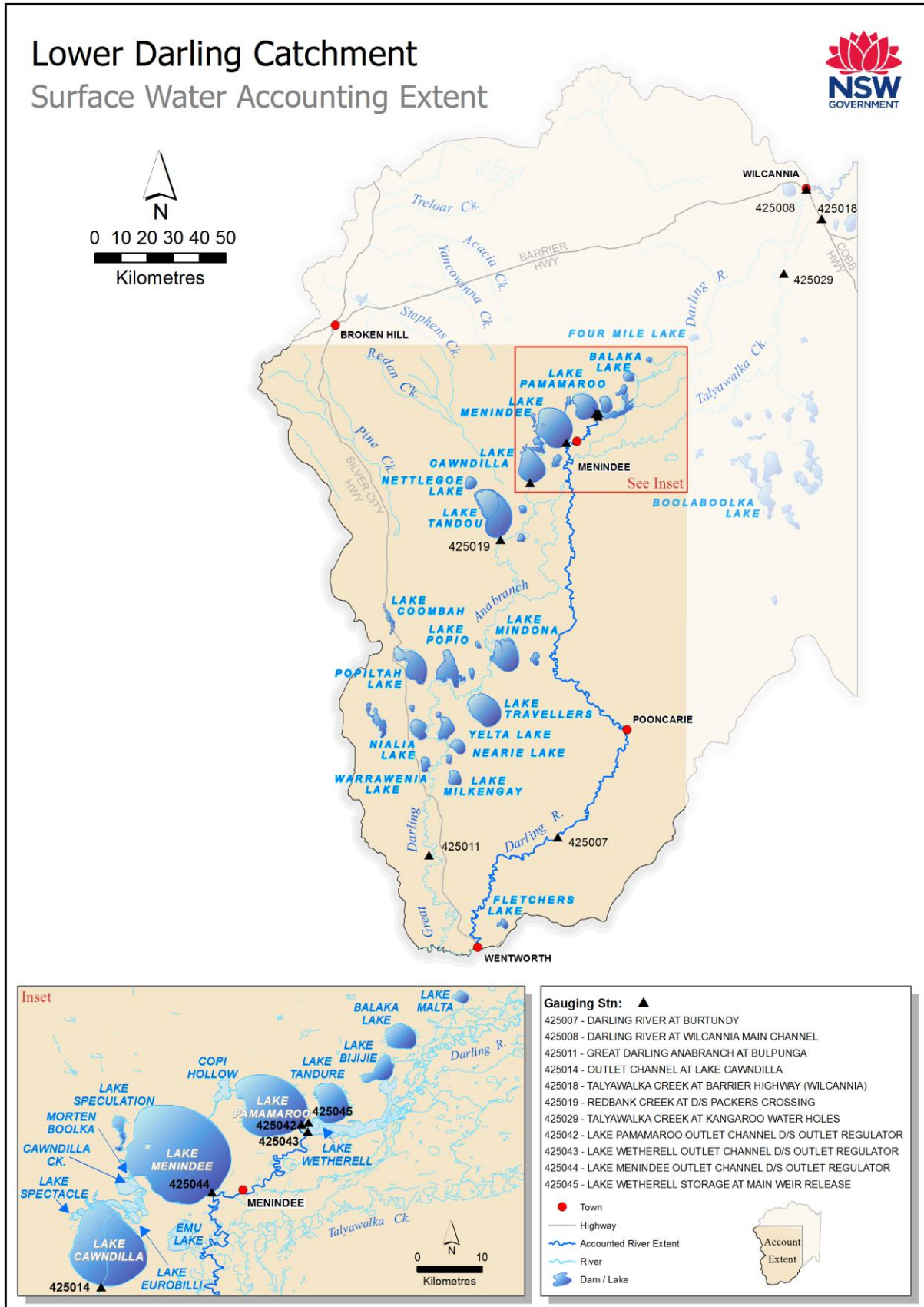
The accounted river extent is illustrated in Figure 1 and includes the Lower Darling Water Source managed under the Water Sharing Plan for the NSW Murray and Lower Darling Water Sources. It includes the Lower Darling regulated river system downstream of Menindee Lakes from the township of Menindee to its junction with the Murray River at Wentworth. As the flow data at Wentworth is both limited and backwater-affected by flow in the Murray River, the flow site on the Darling River at Burtundy was used as an alternative measure for the end of system flow.

While the Great Darling Anabranch is not included as part of this GPWAR, the flow leaving the defined entity that enters the Anabranch is accounted for in order to achieve a correct mass balance. Licenced usages on the Great Darling Anabranch are also provided in the Lower Darling 2018–19 physical flow diagram (in the water accounting statements section of this GPWAR). The only inflow that is considered to the Lower Darling river system is the return flow of Talyawalka Creek.

### Groundwater

No groundwater information has been included in this GPWAR. There is a lack of adequate modelling information on which to make an estimation that will be of acceptable accuracy.

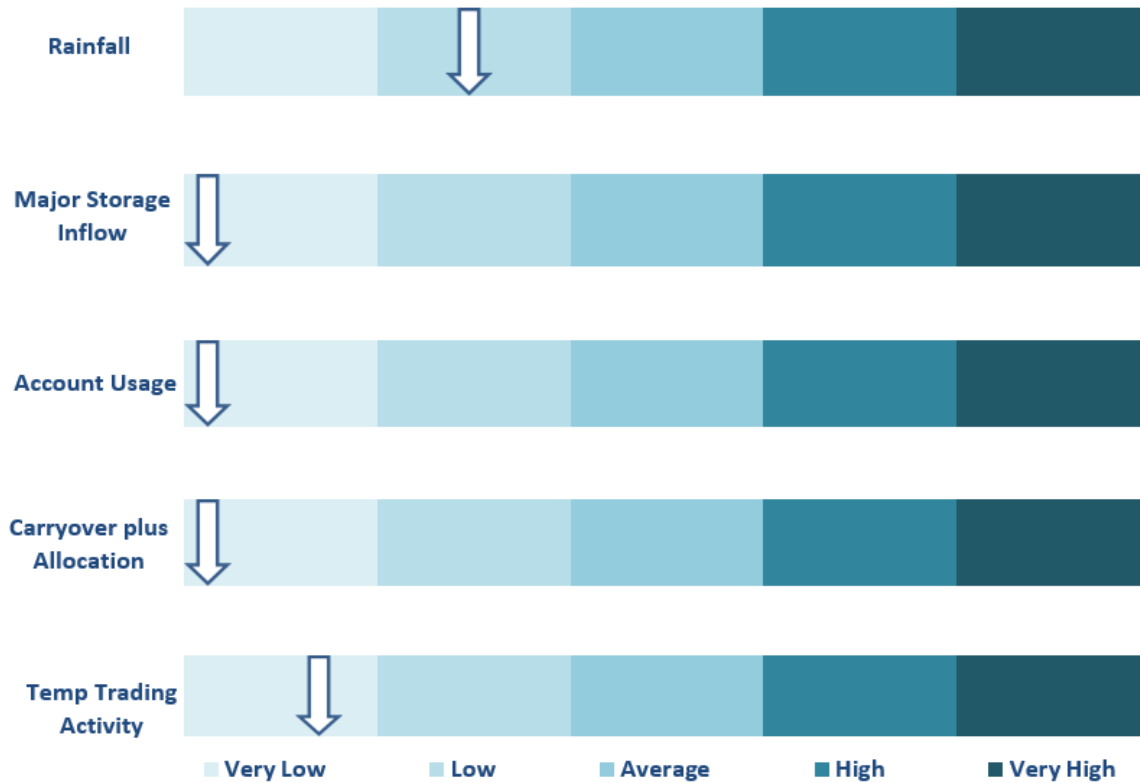
Figure 1: Surface water geographical extent of the accounts



## Snapshot

The key indicators for 2018–19 relative to other years under water sharing plan management conditions are presented in Figure 2. Major storage inflow, account usage and carryover plus allocation were all lowest on record. Temporary trading activity was very low.

**Figure 2: 2018–19 summary indicators**



## Climate

At Menindee (upper catchment), 210 mm of rainfall was recorded in the reporting period (Table 1). Comparatively this rainfall is:

- 97 % of the long term median rainfall (for this location)
- 29 % of the highest rainfall on record.
- The majority of rainfall fell in Oct 2018 (55 mm) and May 2019 (37 mm).

At Pooncarie (mid–lower catchment), 151 mm of rainfall was recorded. Comparatively this rainfall is:

- 62 % of the long term median rainfall (for this location)
- 20 % of the highest rainfall on record.
- The majority of rainfall fell in May 2019 (34 mm) and Nov 2018 (29 mm).

Significant above median rainfall fell in Oct, 2018 where rainfall exceeded the median monthly value at Menindee by 38 mm. In addition, above median rainfall fell in May, 2019 where rainfall exceeded the median monthly values by 21 mm and 22 mm at Menindee and Pooncarie respectively (Figure 3).

The 2018–19 spatial distribution of rainfall across the Lower Darling catchment is illustrated in Figure 4 and can be referenced against the mean historical annual rainfall distribution in Figure 5. Rainfall distribution was consistently lower than the comparative average conditions across the entire catchment area.

Figure 3: Monthly rainfall and historical monthly medians at Menindee and Pooncarie

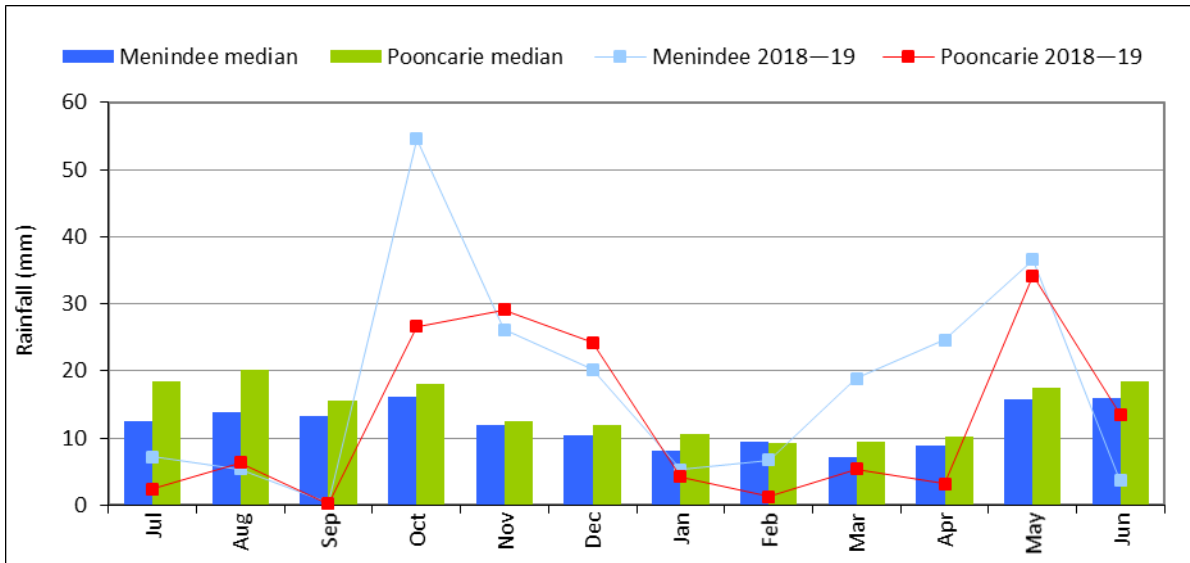
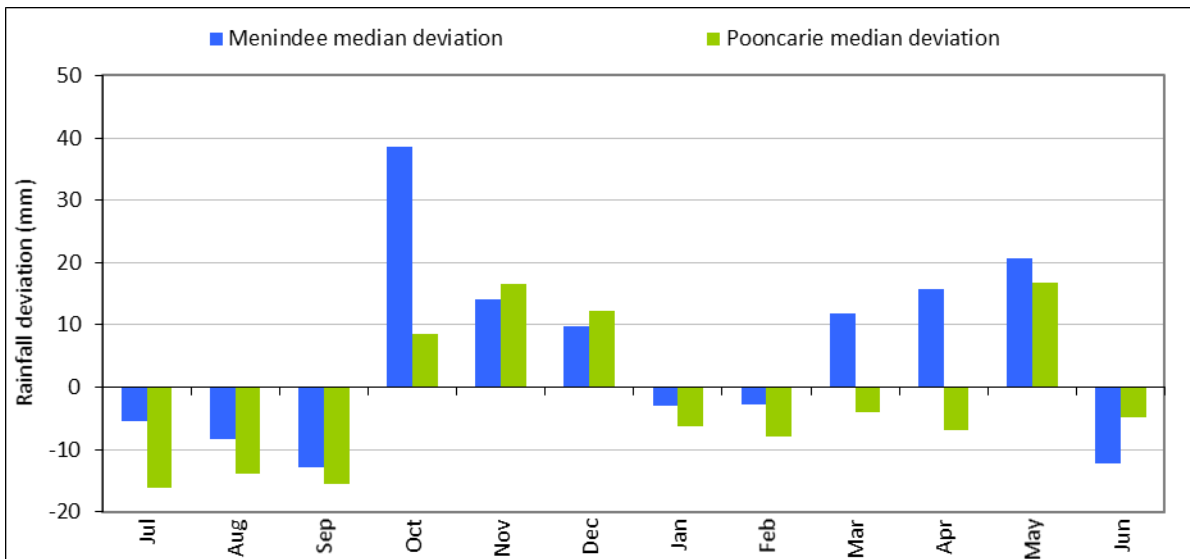


Figure 4: Monthly rainfall deviation from historical median at Menindee and Pooncarie



**Table 1: 2018 –19 monthly rainfall and historic monthly statistics at Menindee<sup>1</sup> – measurements in millimetres**

Menindee	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
<b>2018–19</b>	7.2	5.4	0.3	54.6	26.1	20.2	5.3	6.7	18.9	24.6	36.6	3.7	209.6
<b>Historical mean</b>	18.0	18.1	19.0	22.6	20.7	22.1	23.9	21.0	18.1	16.9	22.5	21.6	244.1
<b>Historical median</b>	12.6	13.8	13.2	16.1	12.0	10.4	8.2	9.4	7.1	8.8	15.9	15.9	215.5
<b>Historical lowest</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	62.2
<b>Historical highest</b>	113.5	67.6	143.7	113.2	163.5	197.5	231.7	157.1	165.6	152.0	107.2	111.7	732.3
<b>Year of highest<sup>2</sup></b>	1886	1901	2016	1938	1933	1887	1993	1950	1989	1974	1989	1923	1973–74

**Table 2: 2018 –19 monthly rainfall and historic monthly statistics at Pooncarie<sup>1</sup> – measurements in millimetres**

Pooncarie	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
<b>2018–19</b>	2.4	6.3	0.2	26.6	29.1	24.2	4.2	1.3	5.4	3.2	34.2	13.5	150.6
<b>Historical mean</b>	22.0	22.7	21.7	25.7	20.8	21.5	23.1	23.0	17.8	17.6	25.9	25.4	267.6
<b>Historical median</b>	18.5	20.2	15.7	18.0	12.5	11.9	10.6	9.2	9.4	10.2	17.5	18.4	244.8
<b>Historical lowest</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.4
<b>Historical highest</b>	81.6	92.1	114.8	142.4	109.8	200.6	162.0	193.0	178.8	157.5	151.6	130.9	763.5
<b>Year of highest<sup>2</sup></b>	1996	1901	2016	1973	2010	1962	2011	2000	1989	1974	1889	1923	2010–11

<sup>1</sup> Long-term statistics are derived from the Bureau of Meteorology—climate data online. The data presented is collected from the stations '47019—Menindee Post Office' and '47029—Pooncarie Mail Agency'. Historic statistics use data from 1876 to 2018 for Menindee and 1883 to 2018 for Pooncarie.

<sup>2</sup> Calendar year is used for monthly high, and water year for annual totals.



Figure 5: Darling River catchment 2018–19 total annual rainfall

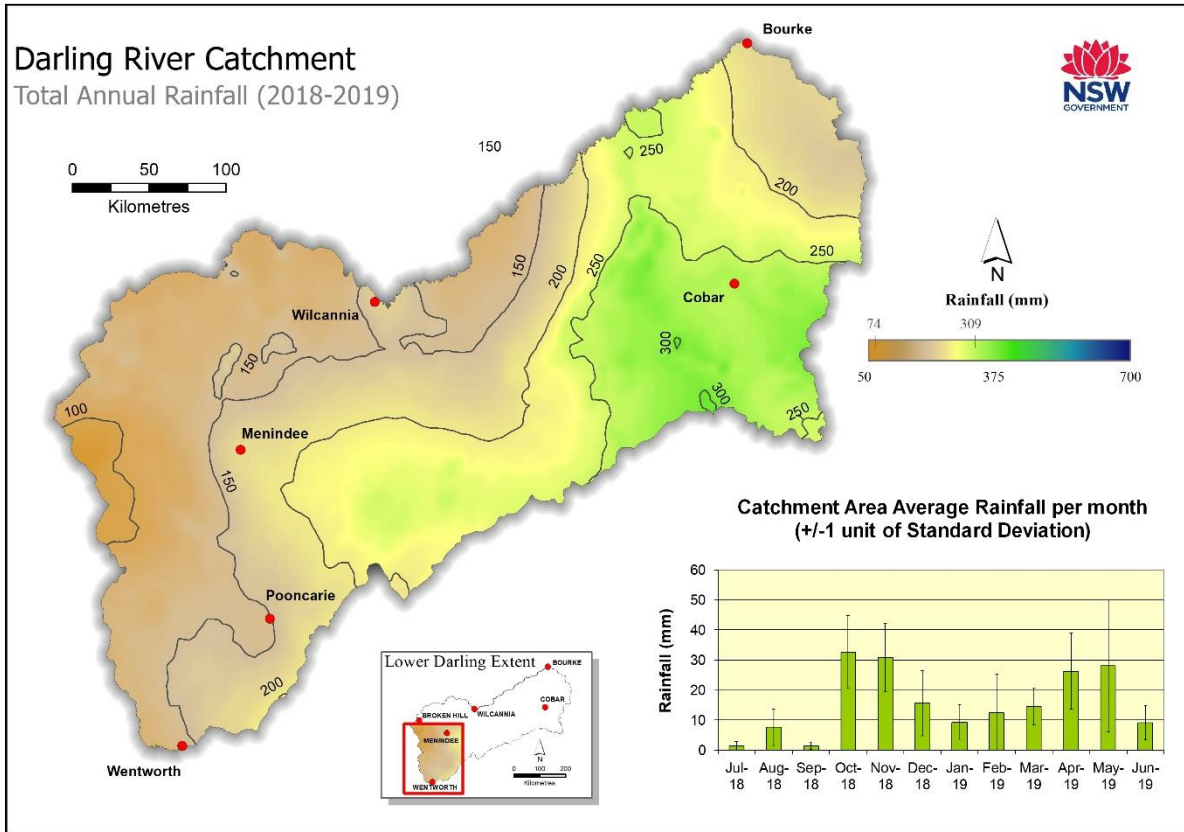
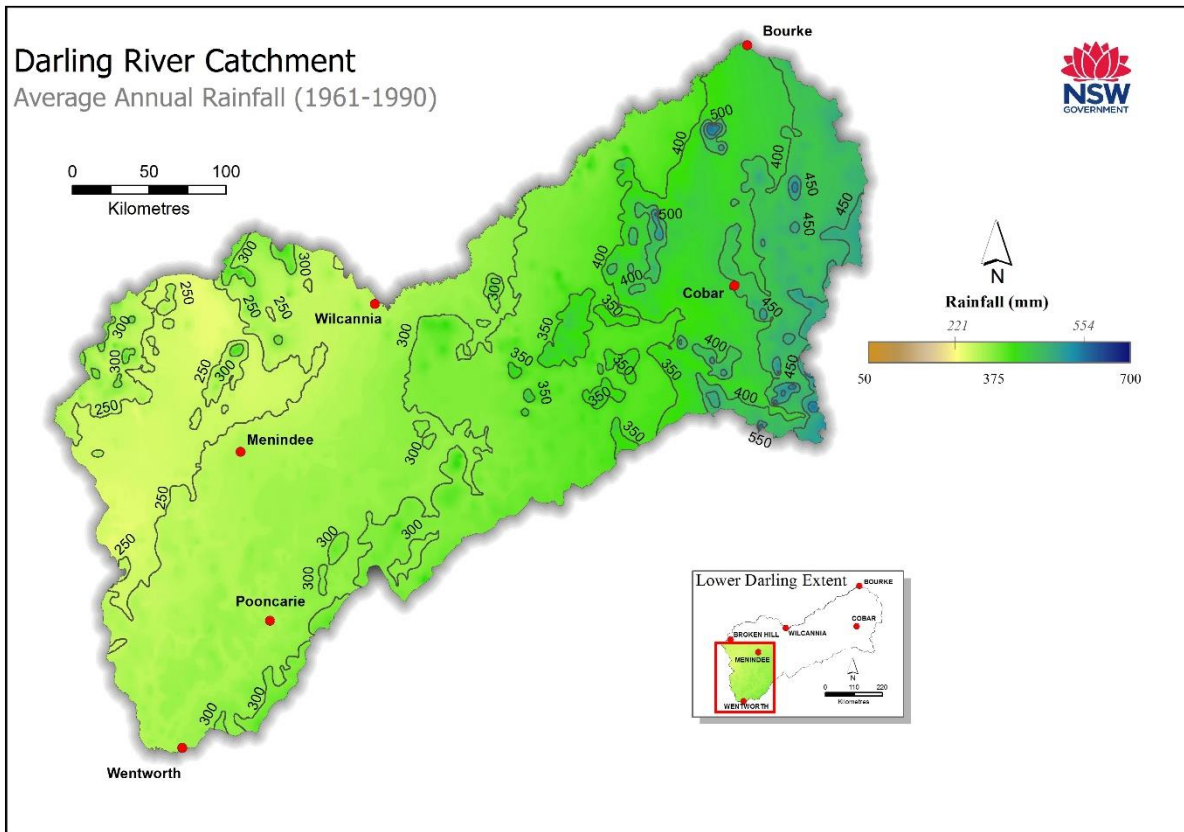


Figure 6: Darling River catchment average annual rainfall 1961–90



# Storage inflows and volume

## Inflows

The potential inflow to Menindee Lakes (indicated by flow recorded at the Darling River at Wilcannia) has historically varied significantly, cycling through prolonged periods of predominantly dry (1895–1950) and predominantly wet climatic regimes (1950–2000). Since 2000, the system has experienced both wet and prolonged dry periods (Figure 7). Currently, the trend is downward, indicating generally drier conditions compared to the long-term sequence.

For the reporting period flow, a total flow of 6,173 megalitres was recorded at Wilcannia (Figure 8), which is:

- 0% long-term average annual flow (1,859,428 megalitres)
- very low relative to the long-term data set exceeding 1 per cent of years in the dataset (1895-96 to 2018-19)
- the second consecutive year of below average flow.

The maximum mean daily flow rate for the reporting period was 277 megalitres, occurring on 17 June 2019 (Figure 9).

**Figure 7: Long-term total flow (ML/year) at Wilcannia cumulative deviation from mean**

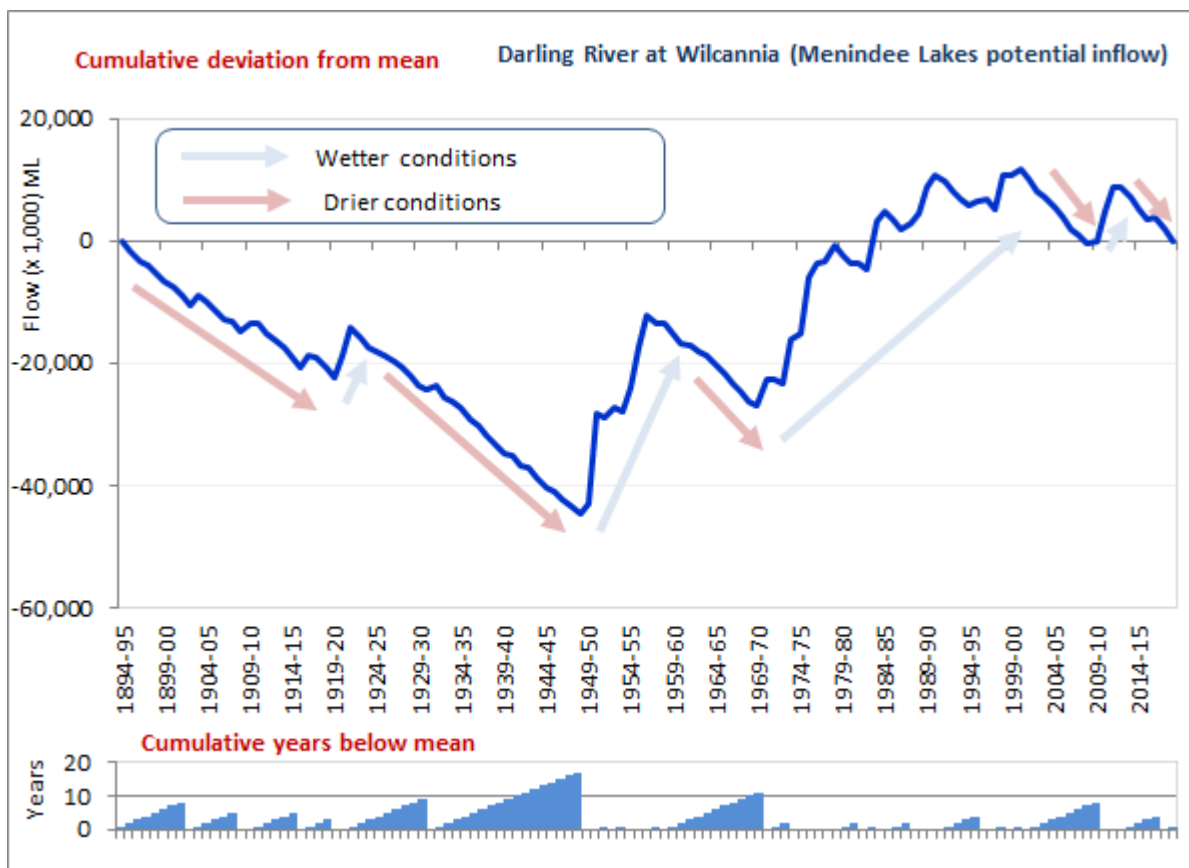




Figure 8: Long-term total flow (ML/year) at Wilcannia

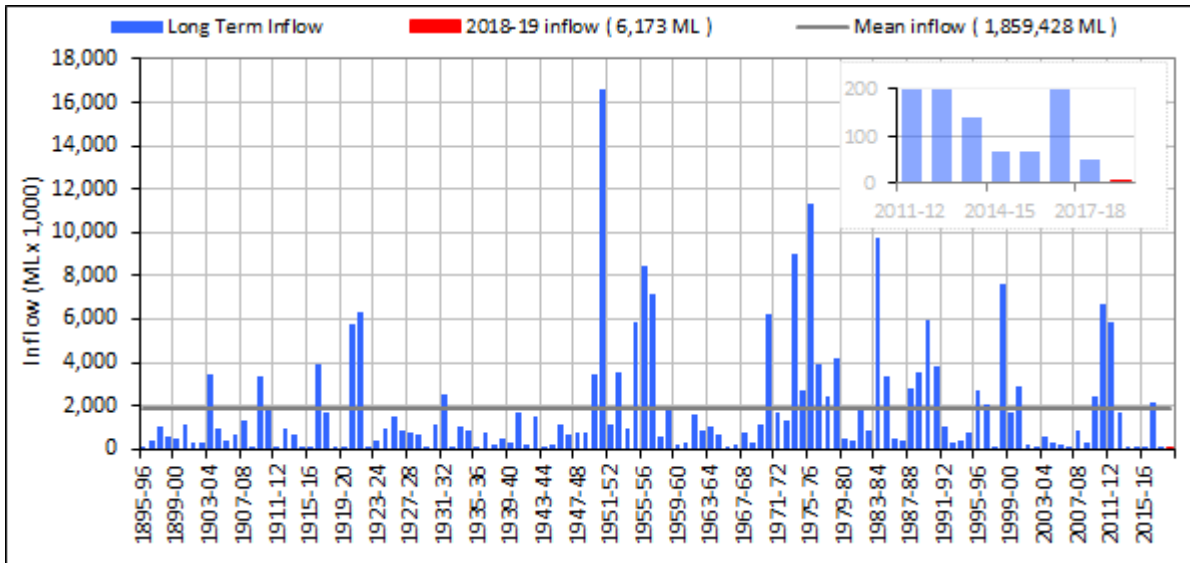
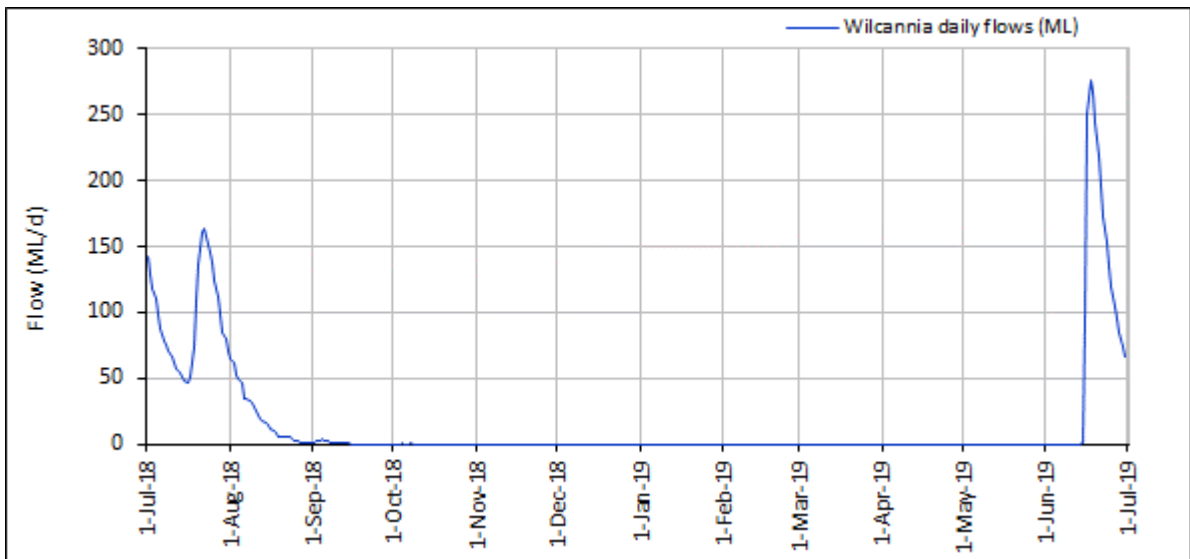


Figure 9: Total daily flow at Wilcannia (reporting period)



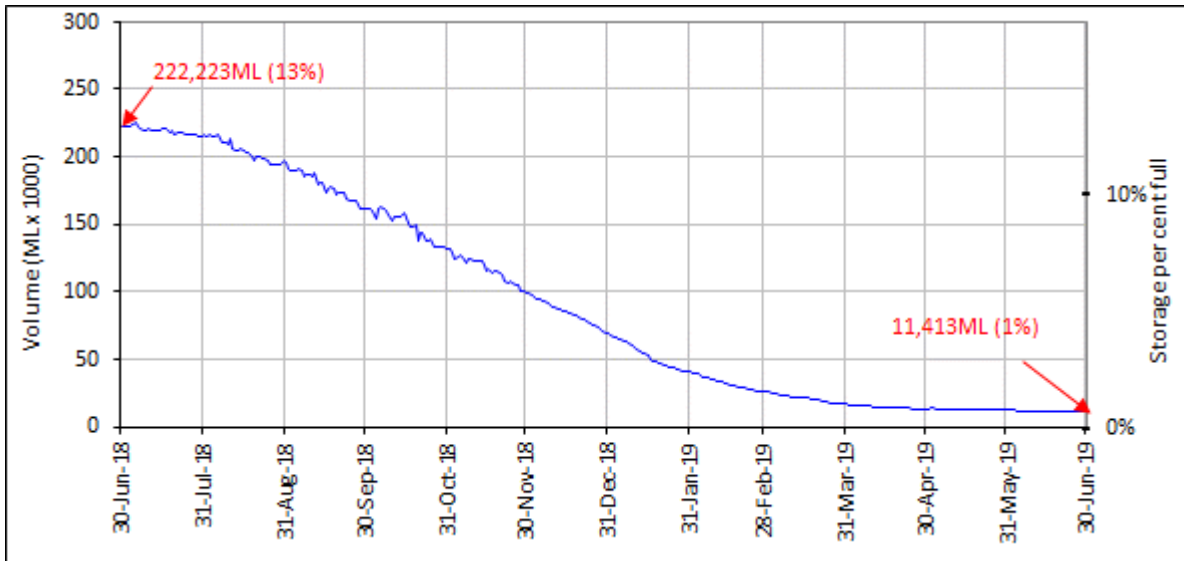
## Storage volume

For the reporting period, the combined Menindee Lakes volume:

- started the reporting period at 222,223 megalitres or 13% of full supply capacity (Figure 10)
- closed at 11,413 megalitres or 1% of full supply capacity, a decrease of 12% for the water year
- held a maximum volume of 224,623 megalitres on 5 July 2018.

For more details, including individual storage, refer to disclosure Note 7 of this GPWAR.

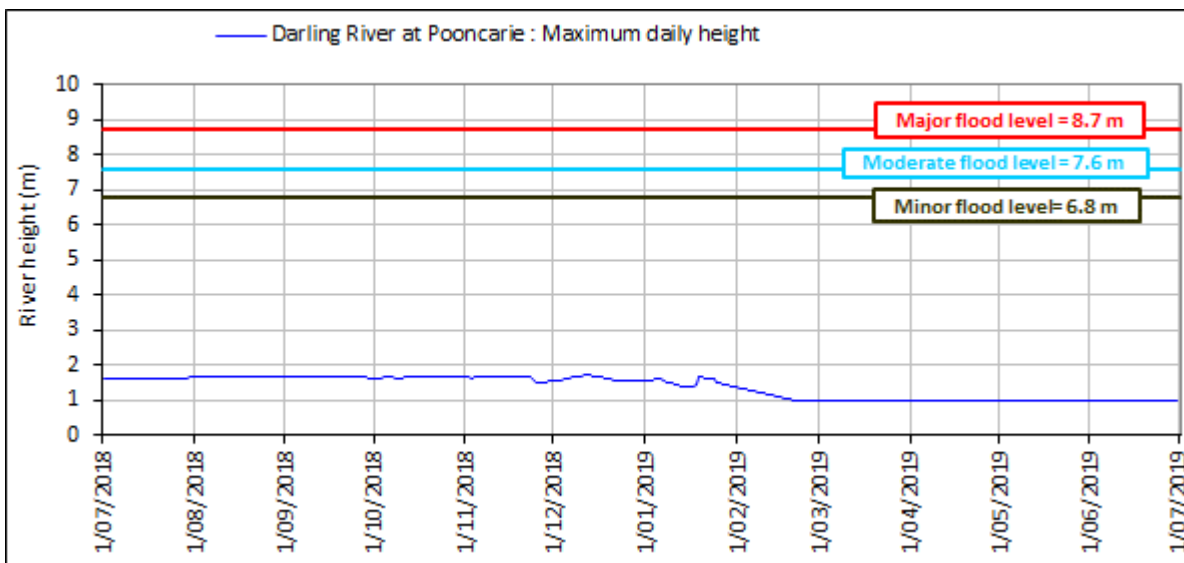
Figure 10: Menindee combined storage capacity volume and % full (reporting period)



## Major flow events

There were no major high flow events in the Lower Darling during 2018–19. The river height at Pooncarie remained below two metres for the entirety of the water year (Figure 11).

Figure 11: Darling River at Pooncarie river heights 2018–19



## Surface water resources and management

### Legislation

The Lower Darling regulated river water source was managed under the conditions set out in the *Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Sources 2016*<sup>3</sup>.

<sup>3</sup> The *Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Sources 2003* was replaced on 1 July 2016 by the *Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Sources 2016*. This plan is due for replacement in July 2026.

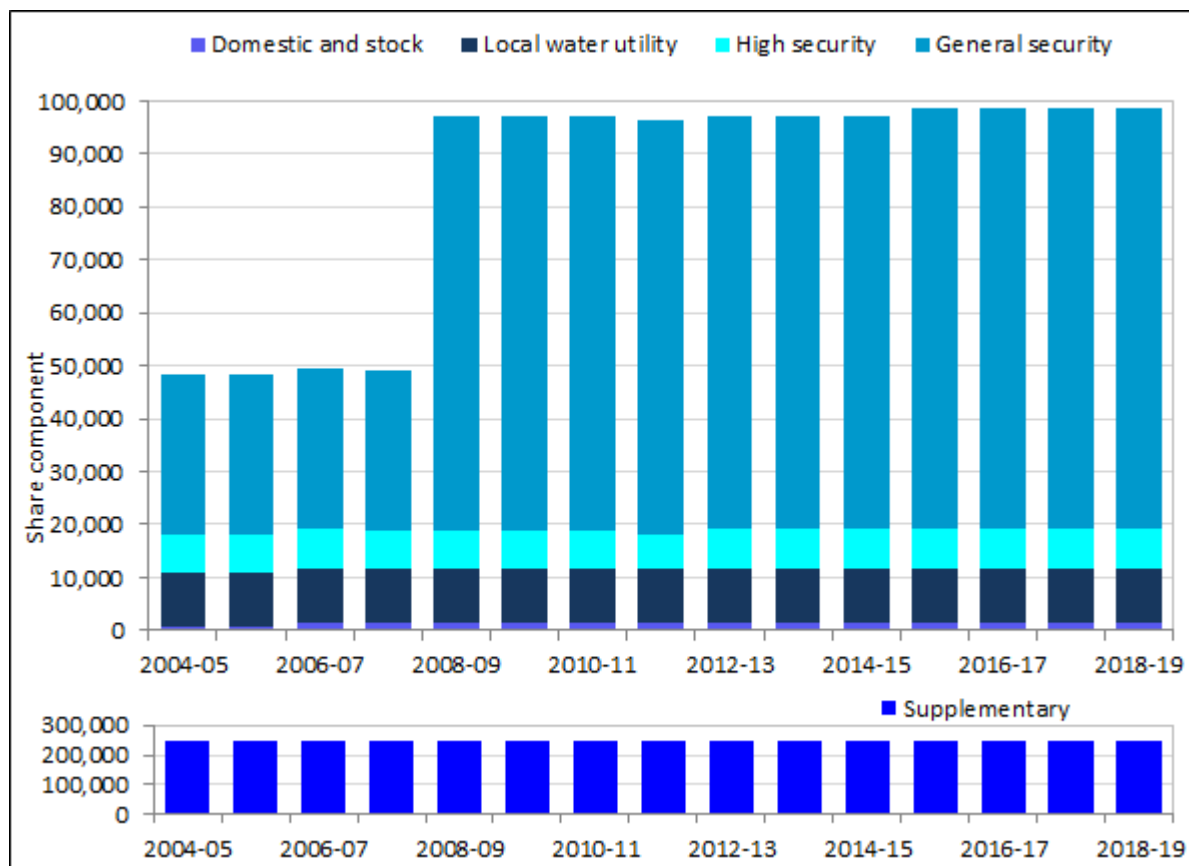
## Access rights

The total issued share component decreased by three shares<sup>4</sup> in the reporting period due to licences surrender, with a total of 348,781 shares on issue (Table 3). Total issued share component by category (under water sharing plan management) is presented Figure 12.

**Table 3: Issued share component on 30 June 2019**

Category	Issued share component
Domestic and Stock	335
Domestic and Stock [Domestic]	421
Domestic and Stock [Stock]	612
Local Water Utility	10,135
Regulated River (General Security)	79,507
Regulated River (High Security)	7,771
Supplementary Water	250,000
<b>Total</b>	<b>348,781</b>

**Figure 12: Issued share component since the commencement of the water sharing plan (excluding supplementary licences)<sup>5</sup>**



<sup>4</sup> Specific purpose licences are issued as a volume in megalitres. All access licence volumetric units are referred to as shares for the purpose of this report

<sup>5</sup> Increase in entitlement in 2008–09 due to the granting of an environmental licence equivalent to savings obtained through a channel piping program.

## Access licence account management

The licence allocation accounting rules applicable are summarised in Table 4. To mitigate against water resource shortfalls, General Security licence holders are eligible to carry over up to 0.5 megalitres per issued share (50% equivalent), plus, subject to approval, the volume of available (empty) on-farm storage on the property linked to the relevant access licence. Carryover volumes may restrict, however, the amount of water that may be credited to an account through the available water determination process (AWD plus carryover limit).

Access to high flow events without debit to the General Security holders' access licences may be available in years of below-optimum allocations (uncontrolled flow access) (Table 5).

**Table 4: Access licence accounting rules 2018–19**

Licence category	AWD plus carryover limit	Carryover limit	Annual use limit	Maximum AWD
Domestic and Stock	N/A	0%	N/A	100%
Domestic and Stock [Domestic]	N/A	0%	N/A	100%
Domestic and Stock [Stock]	N/A	0%	N/A	100%
Local Water Utility	N/A	0%	N/A	100%
Regulated River (General Security)	The maximum of 0.5 ML per share or 1 ML per share minus carryover	0.5 ML/share <sup>6</sup>	N/A	1 ML/share <sup>7</sup>
Regulated River (High Security)	N/A	0 ML/share	N/A	1 ML/share
Supplementary Water	N/A	0 ML/share	N/A	1 ML/share

**Table 5: Uncontrolled flow access provisions**

Licence category	AWD limit for access	Carryover plus AWD plus UCF usage limit
Regulated River (General Security)	0.6 ML/share	1.0 ML/share

## Extreme events stage and temporary water restrictions

The NSW Extreme Events Policy was released in October 2018 to provide a framework for managing extreme events in the major river systems of the NSW Murray-Darling Basin. This framework is based on a staged approach, providing a range of measures for water managers to implement as conditions deteriorate.

Temporary water restrictions are an example of the type of measures that can be implemented to manage a water shortage. These restrictions are issued under section 324 of the *Water Management Act 2000* and have been implemented in several river valleys in the current drought to preserve water for critical needs.

Table 1 outlines the conditions that may be associated with different stages of criticality for surface water quality. Further information is available at [www.industry.nsw.gov.au/water/what-we-do/legislation-policies/eep](http://www.industry.nsw.gov.au/water/what-we-do/legislation-policies/eep)

<sup>6</sup> Plus the volume of empty on-farm storage space specified associated with an approved work linked to the access licence. Evaporation reductions are applicable to carryover water.

<sup>7</sup> The maximum volume shall be the greater of 0.5 ML per share or 1 ML per share minus the volume of water carried into the year

**Table 6: Determination of stages of criticality for surface water quantity**

Stage	Stage description	Stage evidence base
1	Normal management	Can deliver all account water under normal river operations practices.
2	Emerging drought	Unable to deliver 100% of high priority account water and maximum expected use of General Security under normal river operations practices.
3	Severe drought	Only able to deliver restricted high priority demands and restricted remaining General Security account water.
4	Critical drought	Only able to deliver restricted town water supply, stock and domestic and other restricted high priority demands.

### Temporary water restrictions for the reporting period

A temporary restriction on water take was issued for the regulated river water source on 4 December 2018. Under this restriction the taking of water from any part of the Water Source is restricted to the taking of water for the following purposes only:

- town water supply
- domestic use
- stock watering
- irrigation of existing permanent plantings such as vineyards and orchards
- any other irrigation, but only using water taken from Copi Hollow, up to a maximum limit of 500 megalitres total starting at the commencement date of this order, and only where such water is taken under the authority of a Regulated River (High Security) access licence which authorises the holder to take water from the Water Source.

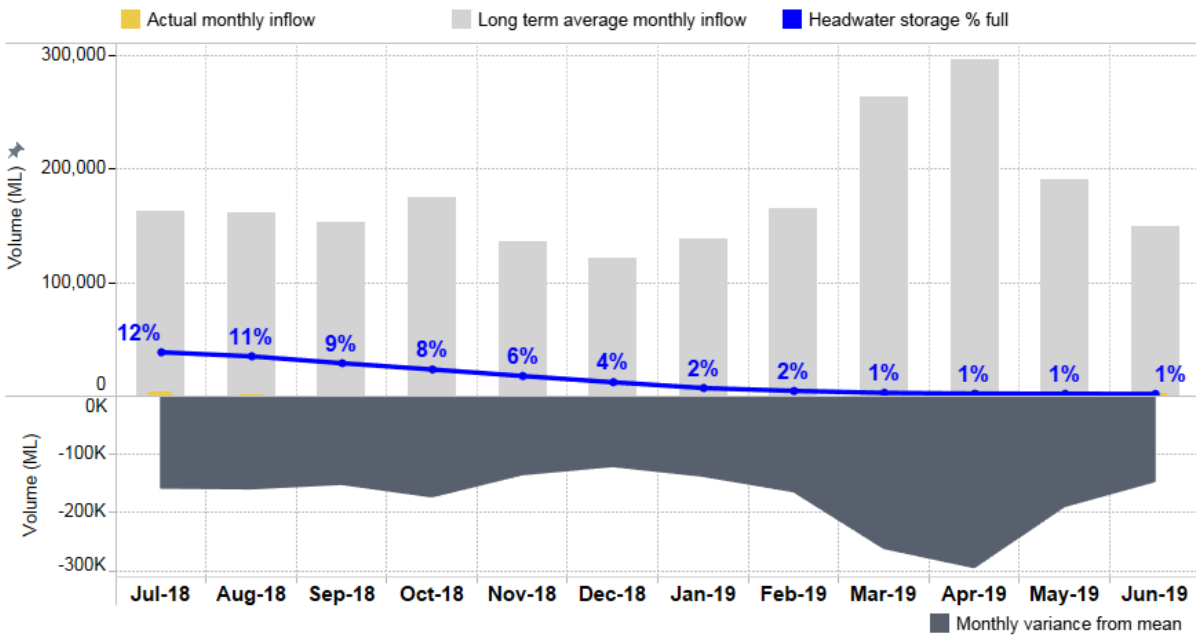
### Extreme events stage

- Following the release of the NSW Extreme Events Policy in October 2018, the Lower Darling regulated river was declared as being in Stage 3. This escalated to Stage 4 in December 2018.
- Inflows to the Lower Darling were the lowest on record (1970–2019), necessitating the construction of block bank regulators to preserve water in the river for critical needs. The historical two-year inflow sequence of major storage inflow to 30 June 2019 reached a deficit of 4,163,484 megalitres relative to long term average two-year inflow (Figure 13).
- A pipeline was constructed from the Murray River to supply town water supply for Broken Hill.

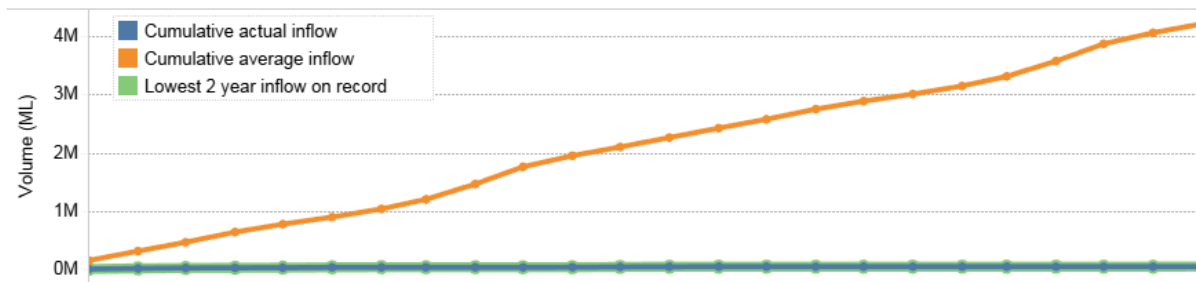
**Figure 13: Drought stage for the reporting period referenced with monthly headwater storage inflows, monthly storage inflow variance from mean and two year cumulative inflow sequence**

Drought stage	NA	NA	NA	3	3	4	4	4	4	4	4	4
---------------	----	----	----	---	---	---	---	---	---	---	---	---

**Storage Inflow and volumes - 1 July 2018 to 30 June 2019**



**2 year storage inflow - 1 July 2017 to 30 June 2019**



### System operation

- The total combined storage volume in the Menindee Lakes System remained below 640,000 megalitres for the entirety of the water year leaving operational responsibility of the lakes with NSW (WaterNSW)<sup>8</sup>. See Note 7 for further details.

### Water availability

- Domestic and Stock, Local Water Utility, High Security and Supplementary Water access licence holders received an opening available water determination (AWD) of 100%, the maximum volume allowable under the water sharing plan. No carryover provision is in place for these categories of licence.
- General Security access licence holders had a carryover volume of 12,213 megalitres into the reporting period, equating to 15% of total issued General Security share component. Restrictions on the use of this water are noted in the previous section.
- The opening (1 July 2018) AWD for General Security was zero megalitre per share. No further announcements were made for the year.

<sup>8</sup> Whenever water in the Menindee Lakes Storage falls below 480,000 megalitres, New South Wales may use the stored water as it requires until the volume next exceeds 640,000 megalitres [Clause 95 (1), *Water Act 2007* (Commonwealth)]

- A temporary restriction on the use of allocated water was activated on 4 December 2018 (refer to temporary water restrictions for details)
- Excluding supplementary access, and restrictions on use overall water availability for the reporting period was 31,489 megalitres the lowest under water sharing plan management conditions (Figure 14).
- Historical monthly water availability (carryover and available water determinations) under water sharing plan management conditions are presented for General Security and High Security access licences in Figure 15 and Figure 16 respectively.

Figure 14: Water availability (AWD plus carry over)<sup>9</sup>

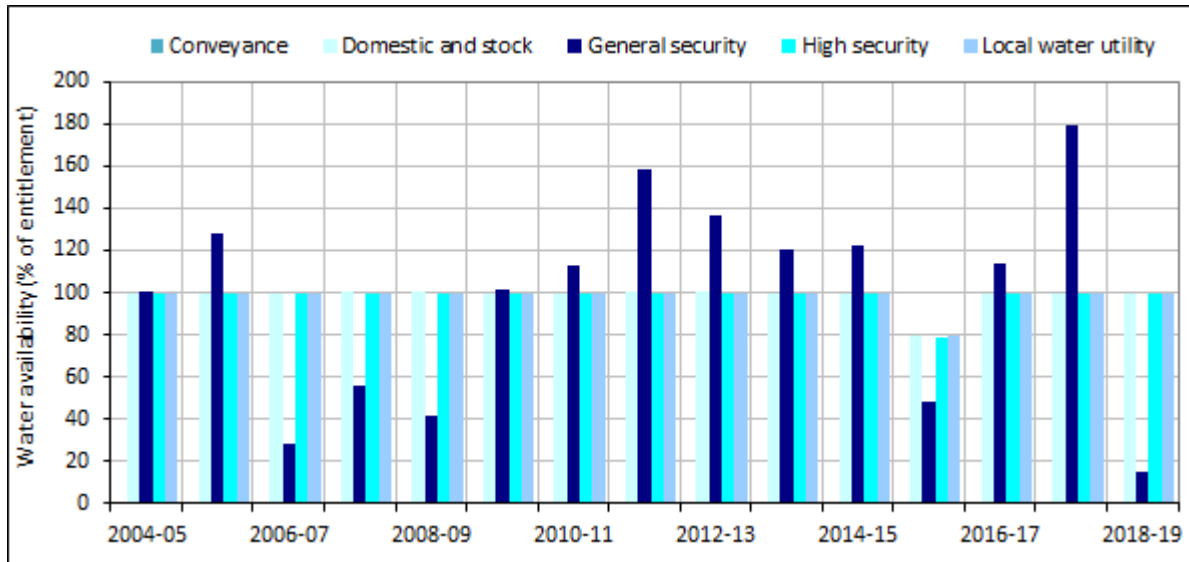
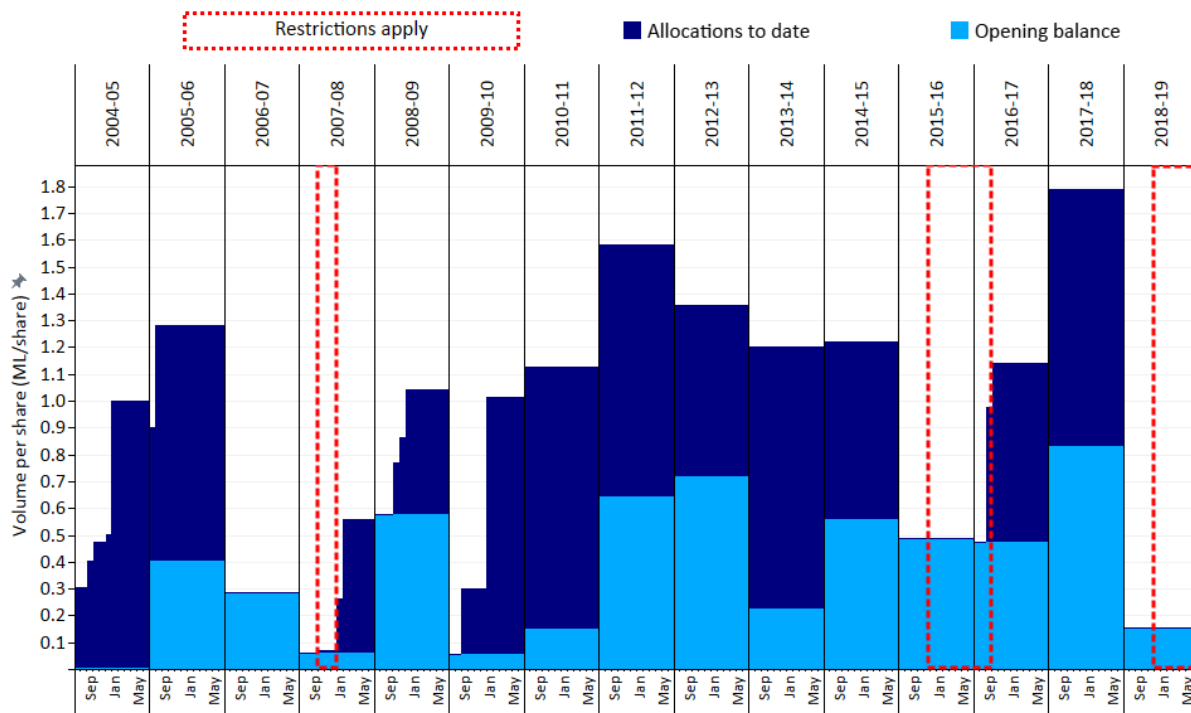
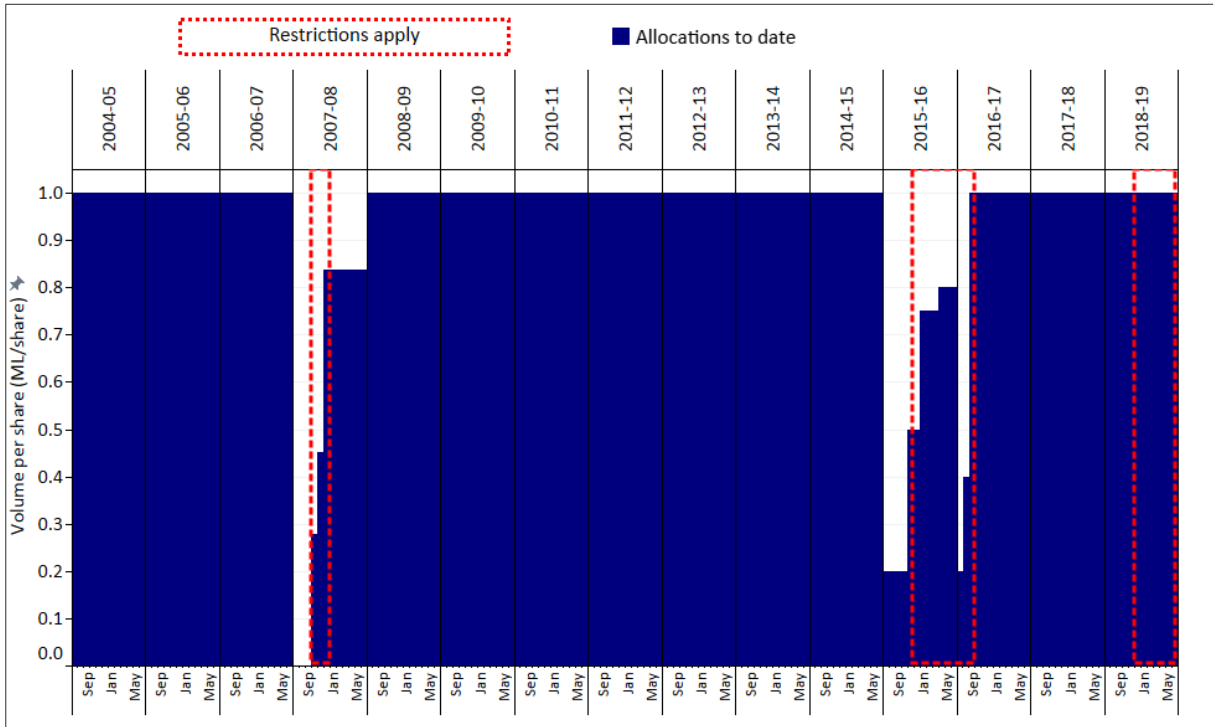


Figure 15: General Security progressive (monthly) carryover and available water determinations as a percentage of share component



<sup>9</sup> The AWD plus carryover for General Security licences in excess of 100% is a result of the water sharing plan rules that allow for carryover to include the on-farm storage capacities. An individual's maximum availability is the greater of 100% AWD or carryover plus 50% AWD. For more details, refer to water sharing plan.

**Figure 16: High Security progressive (monthly) carryover and available water determinations as a percentage of share component**

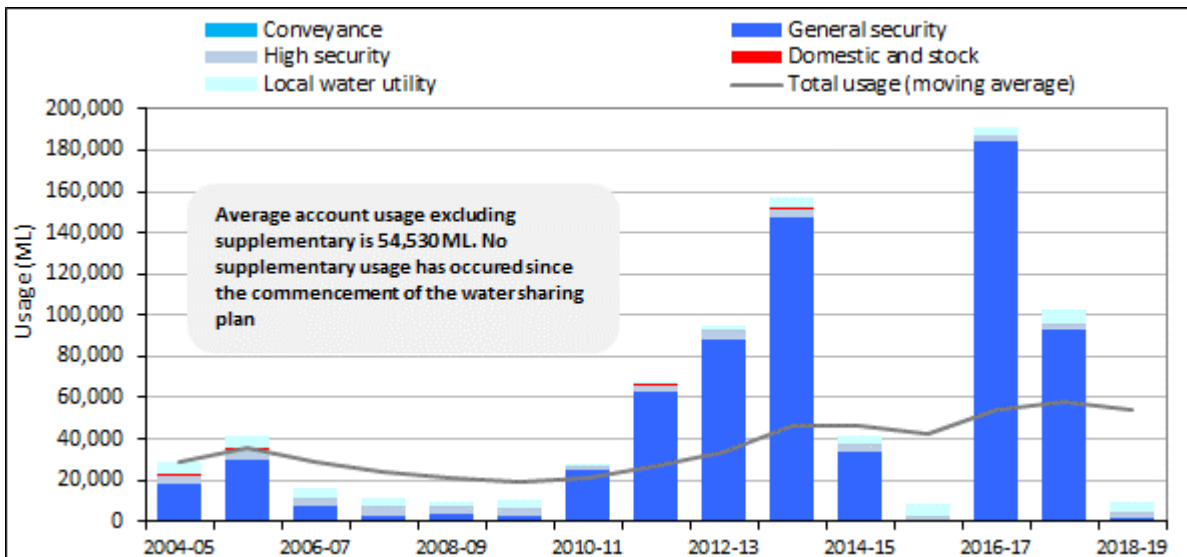


### Account usage

Account usage refers to the total volume of water debited against an access licence account. Extractions that do not debit the account (uncontrolled flow provisions) may be available and additional to account usage.

- Account usage from regulated supply totalled 9,344 megalitres for the reporting period, which was the third lowest under water sharing plan management conditions (2004–05 to 2018–19).
- No supplementary or uncontrolled flow usage has occurred under water sharing plan management conditions.
- Average usage (all categories of licence) is 54,530 megalitres (2004–05 to 2018–19)
- Refer to disclosure Note 3 for further usage details.

**Figure 17: Total annual usage vs moving average since commencement of water sharing plan**





## Utilisation and inactive share

We consider an access licence entitlement inactive if the holding does not use water or access the temporary trade market for the reporting period. Utilisation reflects the amount of water used from regulated supply (this excludes supplementary water) in a specific water year, relative to the maximum amount available for use in that year.

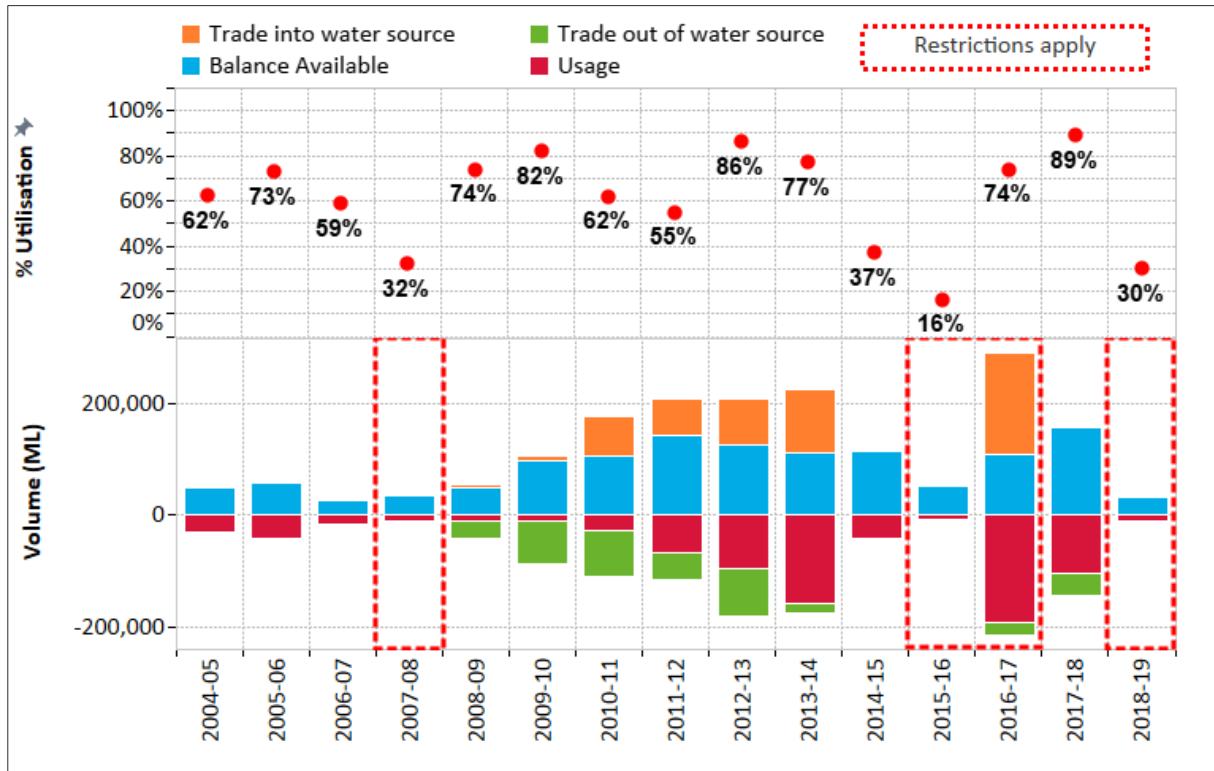
- 8% of General Security share component was inactive for the reporting period, an increase of 7% on the prior reporting period (Table 7).
- Considering all categories of access licences with regulated supply, 8% of the share component was inactive, an increase of 6% on the prior reporting period.
- No Supplementary Water access occurred in the reporting period
- Utilisation of account water from regulated supplies (that is excluding supplementary access), decreased by 59% to 30%, the lowest under water sharing plan management conditions and reflective of the low water availability and water use restrictions in place during the year (Figure 18).

**Table 7: NSW Lower Darling Regulated Water Source inactive licence summary**

Inactive licences	2017–18			2018–19			Change		
	#	Share	% share	#	Share	% share	#	Share	% share
Domestic and Stock	9	101	30%	22	151	45%	13	50	15%
Domestic and Stock [Domestic]	19	53	13%	63	199	47%	44	146	34%
Domestic and Stock [Stock]	1	8	1%	4	588	96%	3	580	95%
Local Water Utility	0	0	0%	0	0	0%	0	0	0%
General Security	20	1,053	1%	53	6,487	8%	33	5,434	7%
High Security	17	297	4%	17	315	4%	0	18	0%
<b>Total (regulated supply)</b>	<b>66</b>	<b>1,512</b>	<b>2%</b>	<b>159</b>	<b>7,740</b>	<b>8%</b>	<b>93</b>	<b>6,228</b>	<b>6%</b>
Supplementary Water	3	250,000	100%	3	250,000	100%	0	0	0%

**Figure 18: Percentage utilisation (water availability plus net trade in from external water sources against account usage and net trade out to external water sources)**

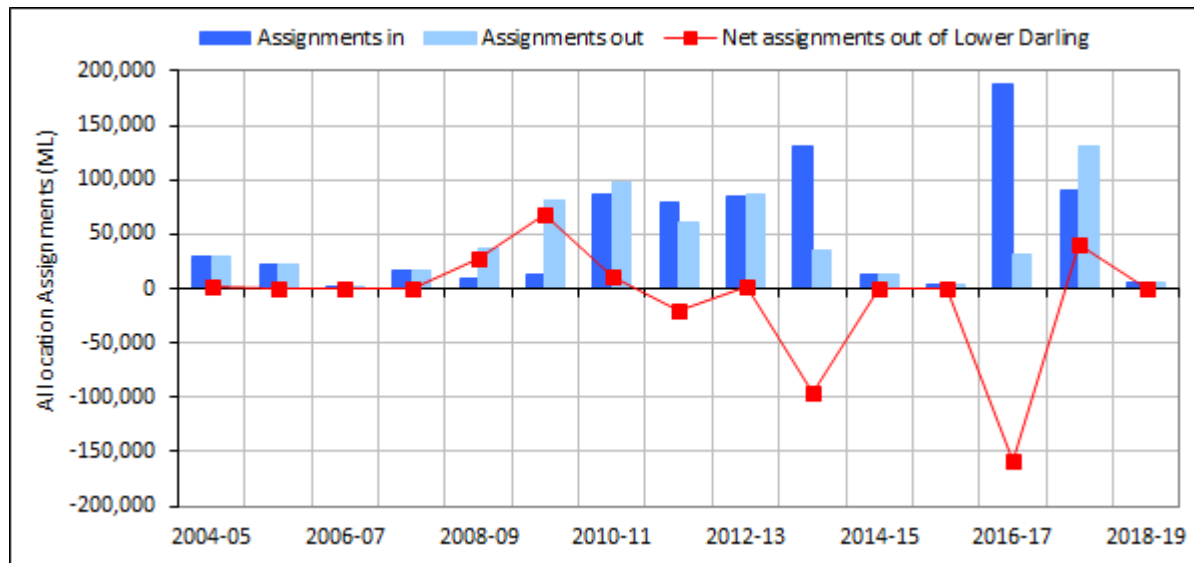
**Note: Excludes supplementary and account usage restrictions.**



### Allocation assignments (temporary trading)

The volume of water moved between accounts via allocation assignments was very low for the period reflective of low water availability and restrictions on the use of account water (Figure 19). No trades were processed to or from external water sources. Detailed information on temporary trading is available in Note 4 of this GPWAR.

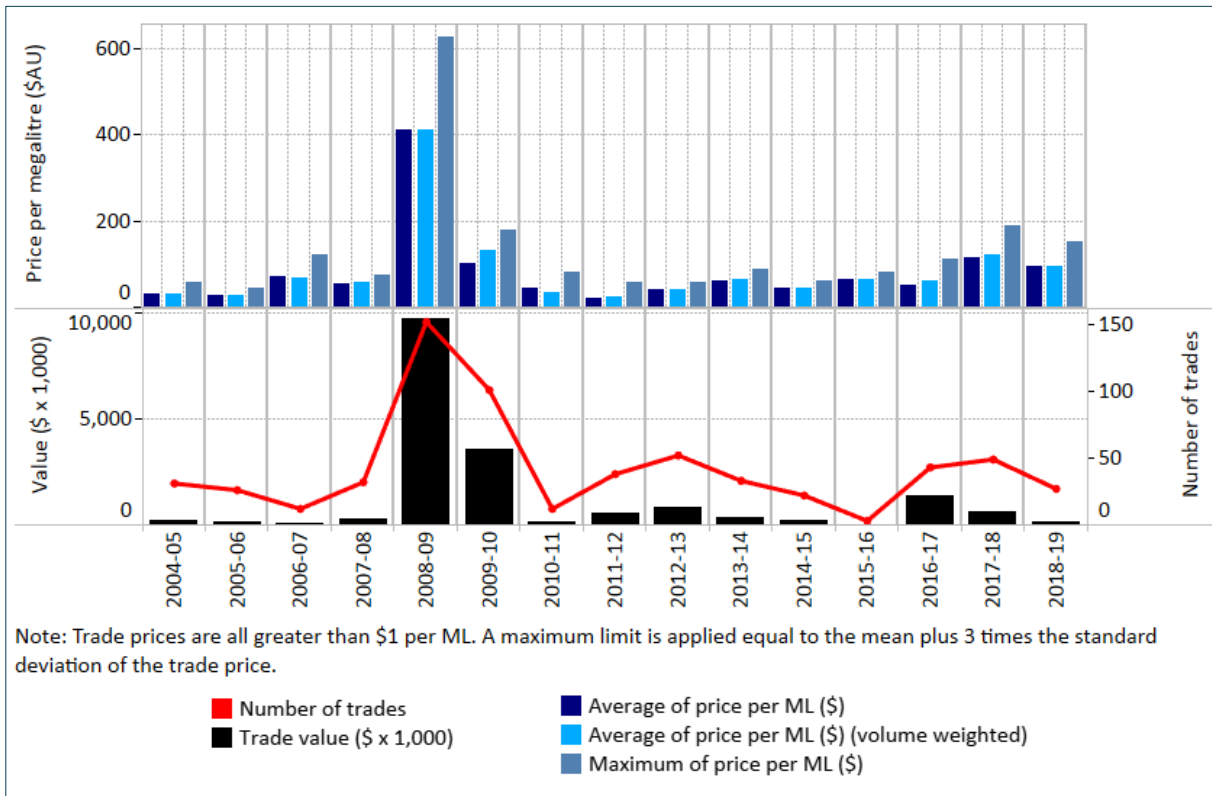
**Figure 19: Net trade out of the Lower Darling (excluding supplementary)**



### Commercial temporary trading statistics

- A total of 27 transactions were processed for commercial consideration<sup>10</sup> (Figure 20).
- The average price was \$93 per megalitre (weighted average \$95 per megalitre), down from \$114 per megalitre in the prior year.
- The maximum price paid for water was \$150 per megalitre.
- The total market value of temporary commercial trade was \$103,000, down 83% on the prior reporting period.

Figure 20: Allocation assignments commercial statistics



### Permanent trading

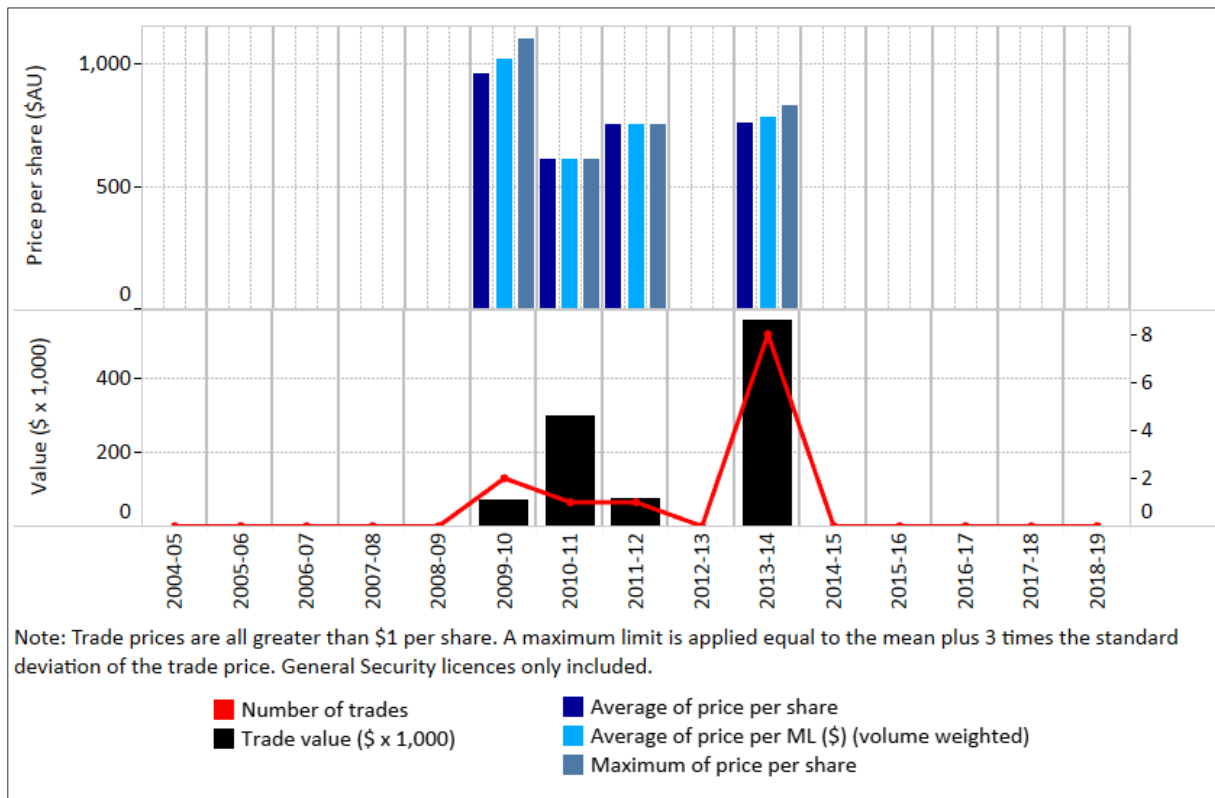
One share assignment was processed in the reporting period for commercial purposes. This transaction was for the exchange of 12 shares of High Security for \$1,800 per share. No General Security has been traded since 2013–14 (Figure 21). Overall the permanent trading market in the Lower Darling (relative to other water sources in the southern Murray Darling Basin) remains subdued (Figure 21 and Figure 22).

In addition to the share assignments, zero transfers<sup>11</sup> of licence holder occurred in 2018-19 for commercial purposes (Figure 23).

<sup>10</sup> Assumed as trades exchanged for a consideration of greater than \$1 per megalitres

<sup>11</sup> Transfers associated with a consideration greater than zero. The total for licence transfers was 664 shares via 11 transactions.

**Figure 21: Lower Darling permanent assignments of shares since the commencement of the water sharing plan—General Security**



**Figure 22: Lower Darling permanent assignments of shares since the commencement of the water sharing plan—High Security**

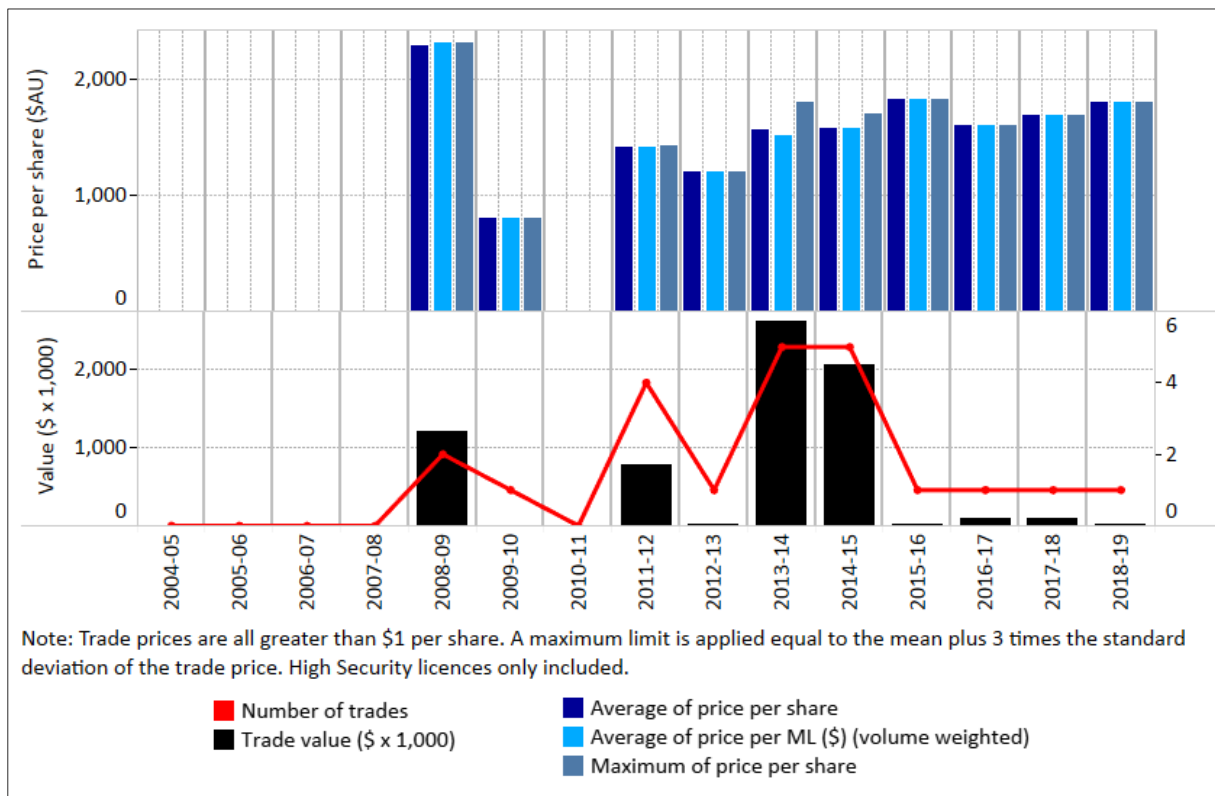
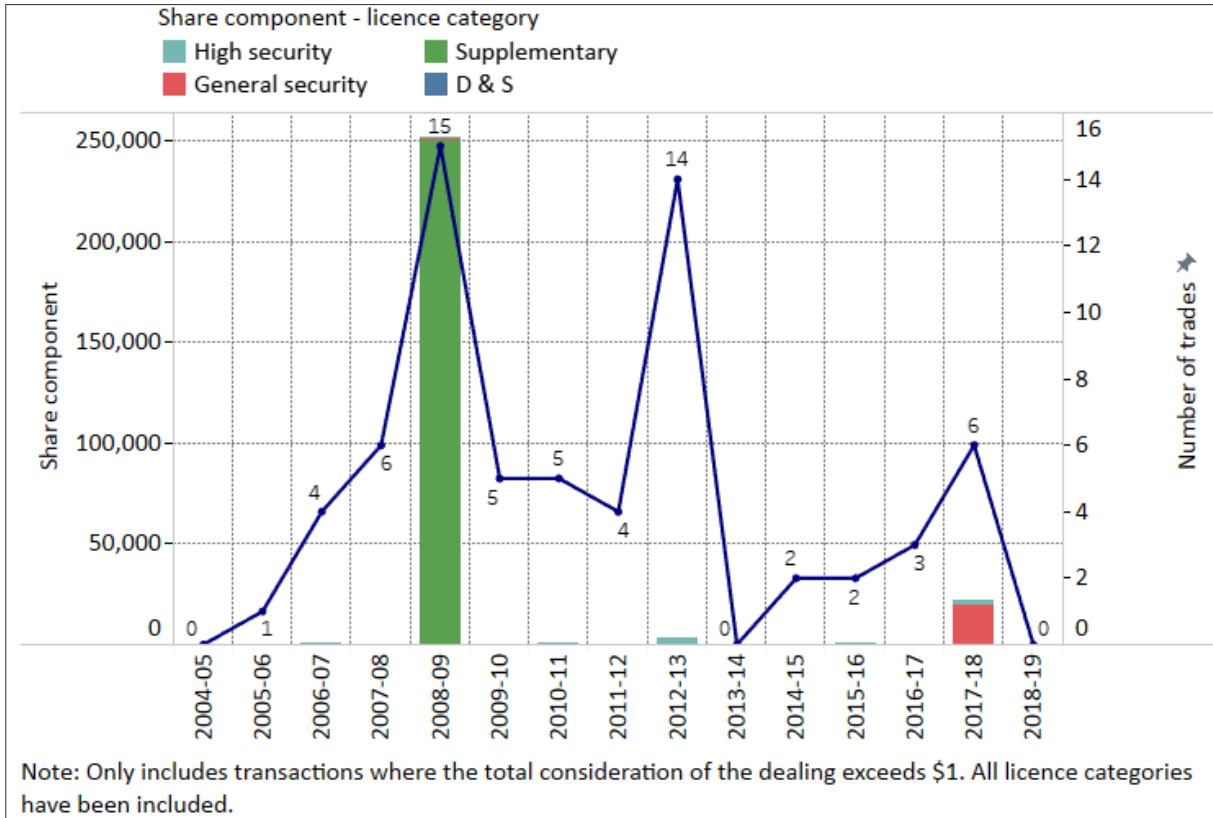


Figure 23: Change of licence holder



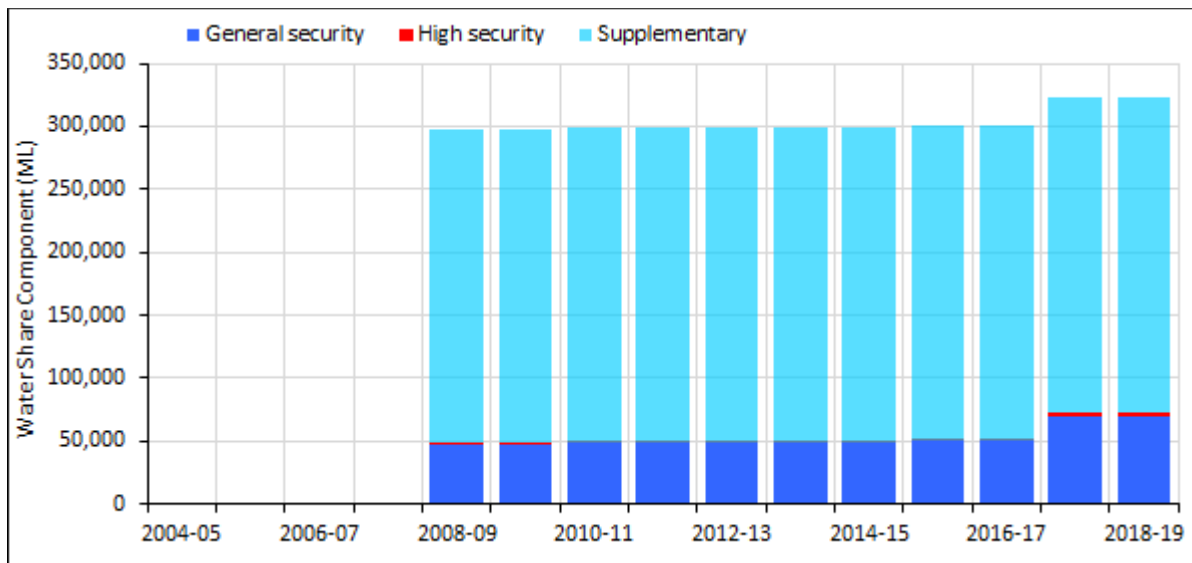
## Environmental water

There were no changes to the held environmental water portfolio in 2018–19. Total held environmental water share component as of 30 June 2019 was 322,939 shares, which includes a supplementary licence of 250,000 shares (Figure 24).

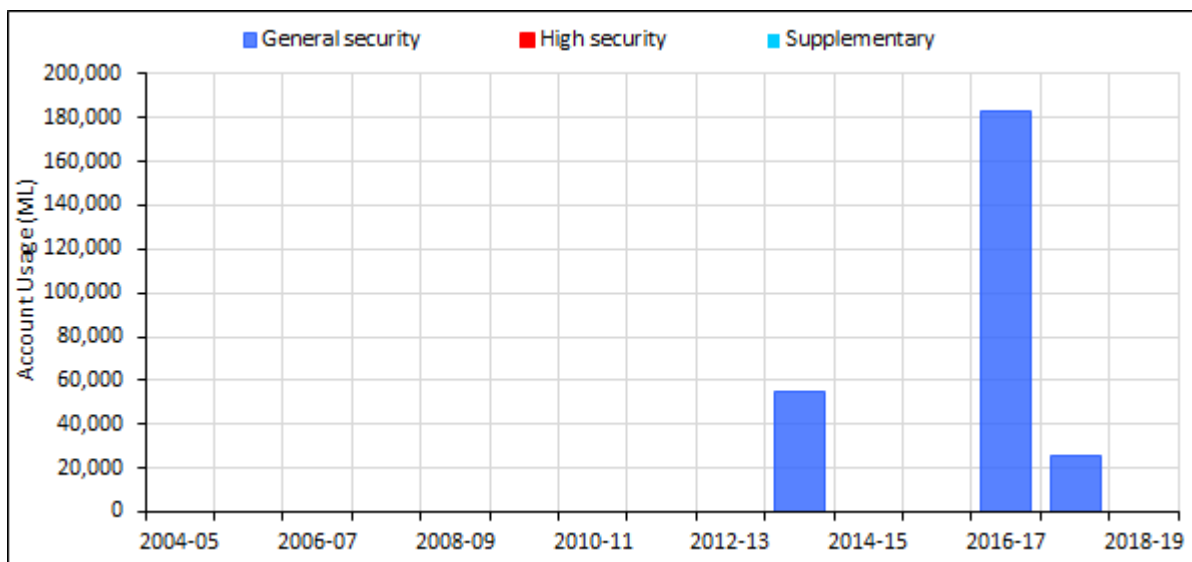
Zero megalitres usage was accounted against environmental water holdings (Figure 25).

Detailed information about environmental watering in NSW is available from the Energy, Environment and Science website ([www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)) and the Australian Department of the Environment & Energy ([www.environment.gov.au](http://www.environment.gov.au)). Further details about held environmental licence balances and trading are available in Note 5 of this document.

**Figure 24: Held environmental water share component in the Lower Darling since the commencement of the water sharing plan**



**Figure 25: Held environmental usage since commencement of the water sharing plan**



# Water Accounting Statements

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## Significant water accounting policies

We have prepared the water accounting statements in this GPWAR using an accrual basis of accounting. All figures are in megalitres (ML).

We have excluded the 'Statement of Physical Flows' for this GPWAR as we have presented all transactions in the statements 'Water Assets and Liabilities' and 'Changes in Water Assets and Water Liabilities'.

We have included a 'Physical Flow Diagram' that represents the physical movements of water to provide a clearer picture of this process.

For a detailed explanation of how to interpret the NSW Department of Planning, Industry and Environment water accounting statements, refer to *Interpreting New South Wales Office of Water General Purpose Water Accounting Reports*, which is available for download from the NSW Department of Planning, Industry and Environment website ([www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)).

## Quantification of data

### Data accuracy

We have gathered the data for water movement and management from a variety of sources and systems. The data ranges from observed values where we anticipate a high degree of accuracy through to modelled results and estimates where accuracy can be highly variable, depending on a range of factors. To improve accuracy and prevent misuse of the data in the accounts, we have added an accuracy assessment to all figures in the water accounting statements (Table 8).

**Table 8: Water account data accuracy estimates key**

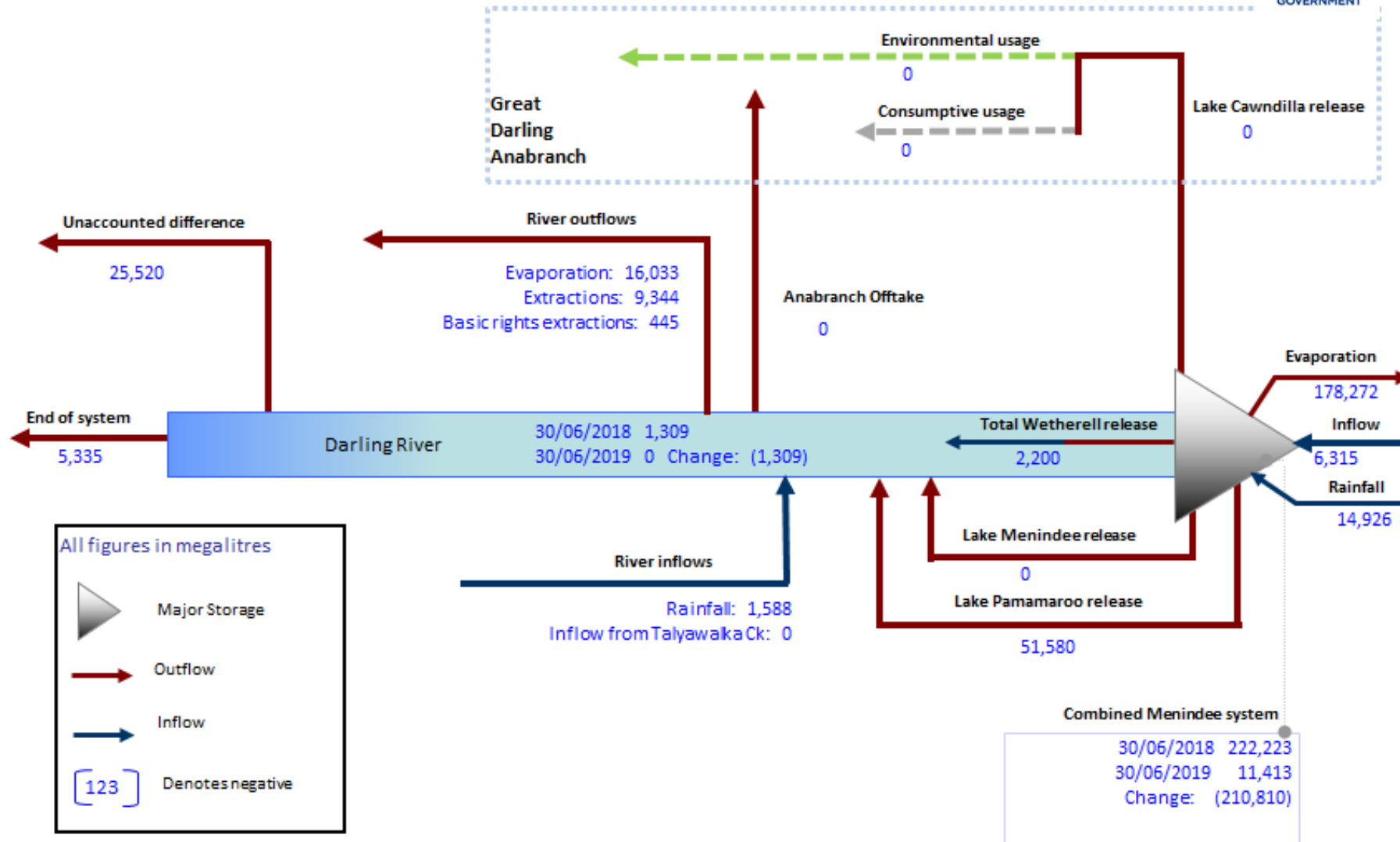
Accuracy	Description
A1 <sup>12</sup>	+/- 0% Data is determined rather than estimated or measured. Therefore, the number contains no inaccuracies.
A	+/- 10%
B	+/- 25%
C	+/- 50%
D	+/- 100%

<sup>12</sup> Non-physical administration items, such as available water determinations, trading and carryover volumes are assumed to have no inherent error for the purposes of this report. Items are reported as extracted from the NSW Department of Planning, Industry and Environment corporate database.





# Physical flows mass balance diagram (2018–19)



# Statement of water assets and liabilities

For the year ended 30 June 2019

In all tables (..) denotes a negative value.

## Surface water assets

1. Surface water storage	Accuracy	Notes	30-June-19	30-June-18
Combine Menindee System	A	7	11,413	222,223
River	B	8	0	1,309
<b>Total surface water storage (Asws)</b>			<b>11,413</b>	<b>223,532</b>
<i>Change in surface watersStorage</i>			<b>(212,119)</b>	<b>(548,673)</b>

## Surface water liabilities

2. Allocation account balance	Accuracy	Notes	30-June-19	30-June-18
Domestic and Stock	A1	1	(6)	0
Domestic and Stock [Domestic]	A1	1	0	0
Domestic and Stock [Stock]	A1	1	0	0
Local Water Utility	A1	1	0	0
General Security	A1	1	14,704	12,213
High Security	A1	1	(21)	(1)
<b>Total allocation account balance (Lsws)</b>			<b>14,677</b>	<b>12,212</b>
<i>Change in allocation account balance</i>			<b>2,464</b>	<b>(53,785)</b>

3. Environmental contingency account balance	Accuracy	Notes	30-June-19	30-June-18
ECA (Leca)	A1	6	0	0
<i>Change in environmental stimulus flow account balance</i>			0	0

## Surface water net changes

4. Net changes	30-June-19	30-June-18
<b>Net surface water assets (Asws – Lsws – Leca)</b>	<b>(3,264)</b>	<b>211,320</b>
<i>Change in net surface water assets</i>	<b>(214,583)</b>	<b>(494,888)</b>

# Statement of changes in water assets and liabilities

## 1 July 2018 to 30 June 2019 (1 of 3)

In all tables (..) denotes a negative value.

### 1. Changes in surface water storage (physical water balance)

Surface water storage increases	Accuracy	Notes	2018-19	2017-18
Combined Menindee System				
Inflow	A	9	6,315	52,960
Rainfall	B	10	14,926	29,266
River				
Rainfall	C	11	1,588	2,196
Inflow from releases (total)	A	13	53,780	153,030
Inflow from Talyawalka Creek	B	12	0	0
<b>Total surface water storage increases (Isws)</b>			<b>76,610</b>	<b>237,452</b>

Surface water storage decreases	Accuracy	Notes	2018-19	2017-18
Combined Menindee System				
Evaporation	B	10	178,272	395,841
Storage releases				
Lake Pamamaroo	A	13	51,580	86,920
Main Weir	A	13	0	0
Lake Wetherell	A	13	2,200	33,830
Lake Menindee	A	13	0	32,280
Storage release (Anabranh)				
Lake Cawndilla	A	13	0	79,825
Storage rating correction adjustment (decrease)			0	0
River				
Evaporation	C	11	16,033	20,021
Flows leaving system				
Anabranh offtake	B	17	0	0
End of system	A	14	5,335	91,351
Extractions from River	A	15	9,344	13,353
Basic Rights extractions (NSW)	C	16	445	445
<b>Total surface water storage decreases (Dsws)</b>			<b>263,209</b>	<b>753,866</b>
<b>Unaccounted volume (balancing item) (Usws)</b>	D	18	<b>25,520</b>	<b>32,259</b>

<b>Net surface water storage changes</b>			<b>2018-19</b>	<b>2017-18</b>
<b>Net surface water storage inflow (Isws – Dsws – Usws)</b>			<b>(212,119)</b>	<b>(548,673)</b>

# Statement of changes in water assets and liabilities

## 1 July 2018 to 30 June 2019 (2 of 2)

### 2. Changes in allocation accounts

Allocation account increases	Accuracy	Notes	2018-19	2017-18
Available water determinations	A1	2		
Domestic and Stock			335	335
Domestic and Stock [Domestic]			424	424
Domestic and Stock [Stock]			612	612
Local Water Utility			10,135	10,135
General Security			0	76,206
High Security			7,771	7,771
Supplementary demand			0	0
New licences	A1	1		
Internal trade – buyers	A1	4	5,157	89,540
Trade in from external	A1	4	0	326
Account corrections	A1	19	0	0
<b>Total allocation increases (Iaa)</b>			<b>24,434</b>	<b>185,348</b>

Allocation account decreases	Accuracy	Notes	2018-19	2017-18
Account usage	A1	3		
Domestic and Stock			120	127
Domestic and Stock [Domestic]			86	131
Domestic and Stock [Stock]			24	49
Local Water Utility			4,813	6,868
General Security			1,375	92,675
High Security			2,925	3,080
Supplementary Water			0	0
Account forfeiture	A1	1		
Domestic and Stock			220	207
Domestic and Stock [Domestic]			335	293
Domestic and Stock [Stock]			588	563
Local Water Utility			5,322	3,267
General Security			0	917
High Security			1,001	390
Licences cancelled	A1	1		
Internal trade – sellers	A1	4	5,157	89,540
Trade to external	A1	4	0	41,025
<b>Trade allocation account decreases (Daa)</b>			<b>21,969</b>	<b>239,133</b>

Net change in allocation accounts	2018-19	2017-18
<b>Net allocation account balance increase (Iaa – Daa)</b>	<b>2,464</b>	<b>(53,785)</b>

# Statement of changes in water assets and liabilities

1 July 2018 to 30 June 2019 (3 of 3)

## 3. Change in environmental contingency allowance (ECA)

Environmental contingency allowance increases	Accuracy	Notes	2018-19	2017-18
Account credit (Leca)	A1	6	0	30,000

Environmental contingency allowance decreases	Accuracy	Notes	2018-19	2017-18
Account usage	A1	6	0	0
End of year forfeit			0	30,000
<b>Total ECA decreases (Deca)</b>			<b>0</b>	<b>30,000</b>
<i>Net environmental stimulus flow account balance increase</i>			<b>0</b>	<b>0</b>

## 4. Overall changes

Surface water assets	2018-19	2017-18
Change in net surface water assets (Isws – Dsws – Usws – laa + Daa – leca + Deca)	<b>(214,583)</b>	<b>(494,888)</b>

# Note Disclosures

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## Reconciliation and future prospect descriptions

Lower Darling Catchment: Reconciliation of change in net water asset to net change in physical water storage	2018–19 ML	2017–18 ML
Change in net surface water assets	(214,583)	(494,888)
Non-physical adjustments		
Net change in allocation accounts	2,464	(53,785)
Net change in environmental stimulus flow account		0
Net change in physical surface water storage	(212,119)	(548,673)

Lower Darling Catchment: Reconciliation of closing water storage to total surface water assets	30-June-2019 ML	30-June-2018 ML
Closing water storage		
Surface Water Storage	11,413	223,532
Add non-physical surface water assets	0	0
Total surface water assets	11,413	223,532

## Water assets available to settle water liabilities and future commitments within 12 months of reporting date

Final datasets for reporting in the GPWAR, including meter readings by field staff, were not available in time to produce an informative 12-month forecast for report users.

In lieu of this, the links below give the latest water availability information for the Lower Darling regulated river water source. This includes carryovers and available water determinations at the time of reporting, along with probability information about the Lower Darling system's reliability.

### Latest water availability

You can find the latest information on water availability, including water allocation statements, water allocations summaries and the latest available water determinations, on the NSW Department of Planning, Industry and Environment webpage at [www.industry.nsw.gov.au/water/allocations-availability/allocations](http://www.industry.nsw.gov.au/water/allocations-availability/allocations)

You can also subscribe to receive the latest updates.

## Allocations



### How water is allocated

Water sharing plans are developed in consultation with the community to determine how much water can be extracted and set aside.



### Summary of current water allocations

A listing of current water allocation for major regulated rivers.



### Water allocation statements

Water allocation statements are issued to announce an increase in an allocation for a specific water source and licence category.



### Available water determinations

Available water determinations inform licensed water users how much water they can extract. They are issued on 1 July and periodically throughout the year.



### Outlook & forecasts

Read about how our yearly forecasting and outlook report for the southern basins.

## Latest storage volumes

See real-time information on storage volumes for the Menindee Lakes storage system at [realtimedata.waternsw.com.au](http://realtimedata.waternsw.com.au)



## Significant events since 2018-19

Continuing dry conditions have occurred in the catchment since the writing of this report (November 2019) with no significant system flows or storage inflows. Temporary water restrictions remain in place on the use of allocated water.

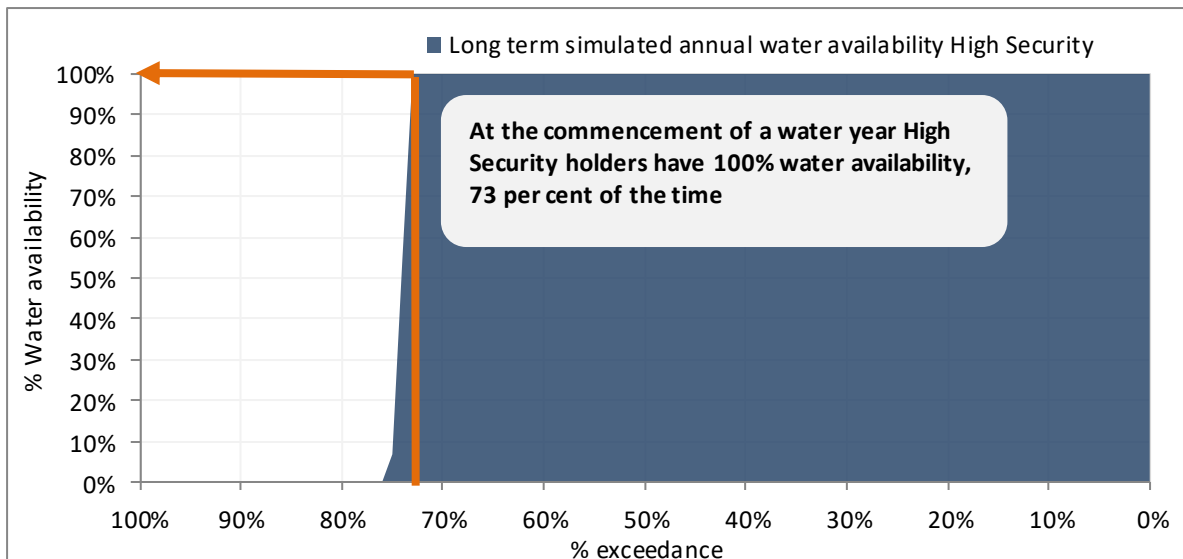
### System reliability

The Murray–Darling Basin Authority’s long-term planning model (BIGMOD) reflects water sharing plan management conditions in the Lower Darling. It provides indicative system reliability information for the commencement and closure of a watering season.<sup>13</sup>

In a given year, the simulation indicates High Security entitlements are likely to have full allocation maintained at 100% for 73% of the time (Figure 26). By the end of the water year, effective allocation improves to 100% for 96% of the time (Figure 27).

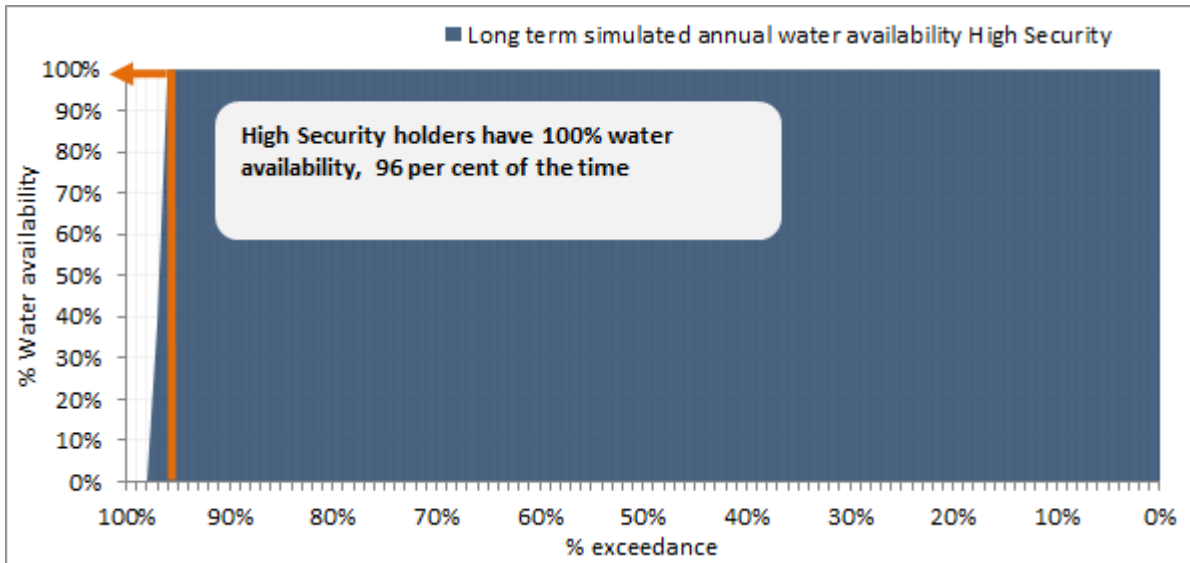
For General Security holders, long-term opening allocations reach 100% effective allocation 64% of the time (Figure 28). However, by the end of the water year, this significantly increases, with 100% of effective allocation achieved 93% of the time (Figure 29).

**Figure 26: Start of water year simulated availability for High Security licences**

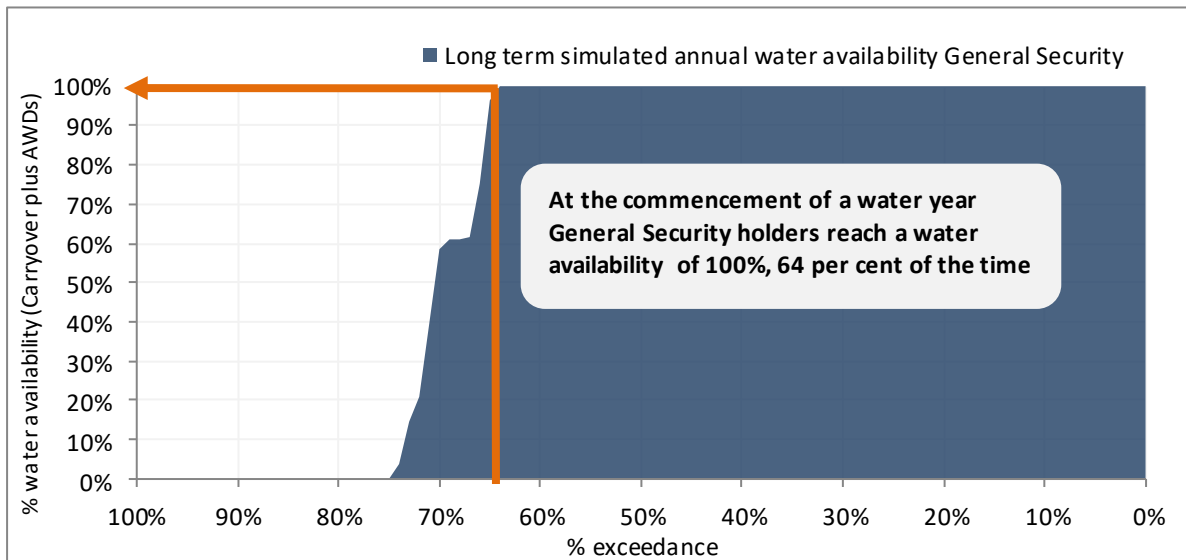


<sup>13</sup> The BIGMOD model simulation uses a water year of July to June. Simulation period 1 July 1895 to 30 June 2008

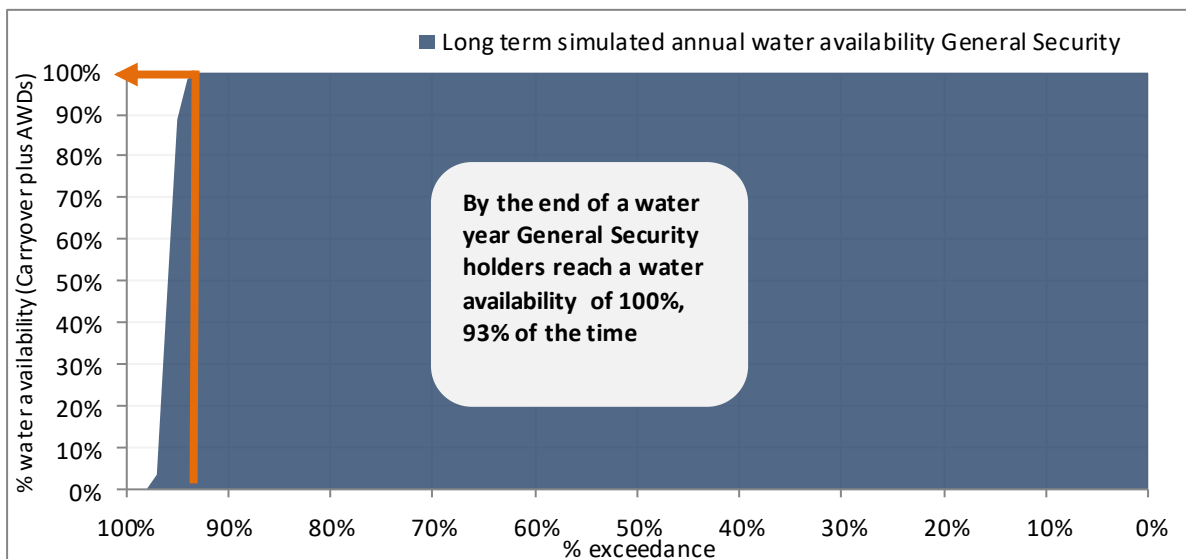
**Figure 27: End of water year simulated availability for High Security licences**



**Figure 28: Start of water year availability for General Security licences**



**Figure 29: Full water year availability for General Security licences**



## Carryovers and available water determinations since close of reporting period (2019-20)

**Table 9. Carryovers and available water determinations 2019–20 (as of February 2020)**

Date	Individual announcement	Share component	Allocation volume (ML)	Cumulative volume (ML)	Allocation volume (%)	Cumulative volume (%)	Balance available (ML)	Balance not available (ML)	Balance total (ML)	Balance available (%)	Balance total (%)
Domestic and Stock											
1-Jul-19	Opening	335			0.0%	0.0%	(6)	0	(6)	(1.7)%	(1.7)%
1-Jul-19	AWD 50.0 %	335	167	167	50.0%	50.0%	162	0	162	48.3%	48.3%
Domestic and Stock [Domestic]											
1-Jul-19	Opening	421			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 50.0 %	421	211	211	50.0%	50.0%	211	0	211	50.0%	50.0%
Domestic and Stock [Stock]											
1-Jul-19	Opening	612			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 50.0 %	612	306	306	50.0%	50.0%	306	0	306	50.0%	50.0%
Local Water Utility											
1-Jul-19	Opening	10,135			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 50.0 %	10,135	5,068	5,068	50.0%	50.0%	5,068	0	5,068	50.0%	50.0%
Regulated River (General Security)											
1-Jul-19	Opening	79,507			0.0%	0.0%	14,704	0	14,704	18.5%	18.5%
1-Jul-19	AWD 0.0 ML per Share	79,507	0	0	0.0%	0.0%	14,704	0	14,704	18.5%	18.5%
Regulated River (High Security)											
1-Jul-19	Opening	7,771			0.0%	0.0%	(21)	0	(21)	(0.3)%	(0.3)%
1-Jul-19	AWD 0.3 ML per Share	7,771	2,331	2,331	30.0%	30.0%	2,310	0	2,310	29.7%	29.7%
Supplementary Water											
1-Jul-19	Opening	250,000			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 1.0 ML per Share	250,000	250,000	250,000	100.0%	100.0%	250,000	0	250,000	100.0%	100.0%

## Detailed item notes

### Note 1—Allocation accounts

This note is a reference for the volume held in the allocation accounts at the time of reporting but is also relevant for the various processes that either increase or decrease an allocation account throughout the water year.

The volume of water that is in the licence allocation accounts at the time of reporting is a net balance for that licence category. It represents the water that can be carried forward to the next water year, as dictated by the carryover rules in place for that year or required under the water sharing plan.

Water that is in the accounts at the end of a water year but is not permitted to be carried over is forfeited and has been represented as a decrease in water liability.

The accounting is done by licence category and is therefore inclusive of licences held by environmental holders (these are also detailed separately in Note 5).

Supplementary account water has not been represented as a liability in the accounts, as the liability is contingent on river conditions at any time.

#### Data type

Derived from measured data

#### Policy

- *Water Management Act 2000*
- *Water Sharing Plan for the NSW Murray and Lower Darling Regulated River Water Source 2016*
- Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

#### Data accuracy

A1—Estimated in the range +/- 0%

#### Providing agency

NSW Department of Planning, Industry and Environment

#### Data source

- Water Accounting System

#### Methodology

The carryover volume of water in the allocation account for each licence category is determined once all transactions and end-of-year forfeit rules have been applied. This is a list of typical transactions that can apply to an allocation account:

- available water determinations (AWD) (detailed in Note 2)
- licenced usage (detailed in Note 3)
- forfeiture due to:
  - carryover rules
  - account spillage as a result of AWD
  - licence conversions or cancellations
  - allocation account limits
- trade of allocation water between accounts (detailed in Note 4).

## Additional information

Table 11 provides a balanced summary of the water allocation accounts for each category of access licence. Below (Table 10) is a description of each of the table components.

**Table 10: Explanatory information for allocation account summary**

Heading		Description
<b>Licence category</b>		Licence category, as defined in the <i>Water Management Act 2000</i> , issued in the water source
<b>Share</b>		This is the total amount of entitlement in the specific licence category.
<b>Opening</b>		The volume of water that has been carried forward from the previous year's allocation account
<b>AWD</b>		Total available water determination—The total annual volume of water added to the allocation account as a result of allocation assessments.
<b>Licences</b>	New	Increase in account water as a result of issuing new access licences
	Cancelled	Decrease in account water as a result of licence cancellation
<b>Assignments</b>	In	Increase in account water as a result of temporary trade in
	Out	Decrease in account water as a result of temporary trade out
<b>Account usage</b>		Volume of water that is extracted or diverted from the river and is accountable against the relevant licence category
<b>During-year forfeit</b>		Account water forfeited throughout the year as a result of the accounting rules specified in the water sharing plan. Water may be forfeited water because account limits are reached, or because of conversions between licence categories and various types of other licence dealings.
<b>End-of-year balance</b>	Available	That part of the account balance that is available to be taken at the conclusion of the water year
	Non-Available	That part of the account balance that is not available to be taken at the conclusion of the water year
<b>End-of-year forfeit</b>		Account water that is forfeited at the end of the water year as a result of carryover rules that restrict the carry forward volume
<b>Carry forward</b>		This represents the account water that is permitted to be carried forward into the next water year, as determined by the carryover rules.

Table 11: Allocation account balance summary for the Lower Darling regulated river 2018–19

Licence category	Share 30 June 2019	Opening balance	AWD	Licences		Assignments		Account usage	During- year forfeit	End-of-year balance		End-of- year forfeit	Carry forward
				New	Cancelled	In	Out			Available	Non- Available		
Domestic and Stock	335	0	335	0	0	0	0	120	0	215	0	220	(6)
Domestic and Stock [Domestic]	421	0	424	0	3	0	0	86	0	335	0	335	0
Domestic and Stock [Stock]	612	0	612	0	0	0	0	24	0	588	0	588	0
Local Water Utility	10,135	0	10,135	0	0	0	0	4,813	0	5,322	0	5,322	0
General Security	79,507	12,213	0	0	0	4,137	271	1,375	0	14,704	0	0	14,704
High Security	7,771	(1)	7,771	0	0	1,020	4,886	2,925	0	980	0	1,001	(21)
Supplementary Water	250,000	0	250,000	0	0	0	0	0	0	250,000	0	250,000	0

## Note 2—Available water determination (AWD)

This is the process by which the regulated surface water asset available for use within the regulated system is determined and shared. It determines the volume of water that we add to an individual's licence allocation account. Announcements of allocations are made on a seasonal basis—usually corresponding with the financial year—and are updated on a regular basis, or following significant inflow events.

### Data type

Derived from measured data

### Policy

- *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016*
  - Part 7—Limits to the availability of water
  - Division 2—Available Water Determinations.

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

A1—Nil inaccuracy +/- 0%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- Water Accounting System
- Available Water Determination Register: [waterregister.waternsw.com.au](http://waterregister.waternsw.com.au)

### Methodology

The AWD procedure itself is generally divided into two sections: the available water asset, and system commitments. Once system commitments have been met, the available water asset is then available for distribution to the access licence categories in order of priority (Table 12). The volume of the announced allocation is expressed as the percentage share component of the licence.

**Table 12: Priority of access licence categories**

Licence category	AWD priority
GS	Low
High Security	High
Conveyance	Low
Domestic and Stock <sup>1</sup>	Very high
Local Water Utility	Very high

<sup>1</sup> Domestic and Stock is further broken down into three sub categories: Domestic and Stock, Domestic and Stock (Domestic) and Domestic and Stock (Stock). For the purposes of this report and the general purpose water account they were all treated as Domestic and Stock.

**Available water asset:** This is calculated by summing the water currently available in storage, future (minimum) inflows to the system, and additional volumes due to recessions of inflows from the current levels to the minimum inflow levels. Also taken into consideration is the reduction of the total inflows to the system for those that arrive too late in the season to be useful.

**System commitments:** This is an assessment of the existing commitments that have to be delivered from the available water asset in either the current or future years. Key components include:

- **essential supplies** such as town water supplies, stock and domestic requirements, industrial use and permanent plantings (for example, orchards, vineyards) and environmental allowances
- **undelivered account water**, which is the water already in accounts that is yet to be provided
- **end-of-system flow requirement**, which is an estimate of the flow that passes through the system as a result of its operation
- **losses**, which are estimated as the amount of water that will be lost by the system either through evaporation or in the process of delivering the water via transmission losses.

The AWD for supplementary licence accounts is a separate process and is not dependent on the water asset available. It is made once at the start of the year. Unless there is a management change due to the growth in use, the strategy is maintained at the maximum value prescribed in the plan—generally 100% of the share component. Therefore, it is not considered a liability on the system and is only considered an extraction that reduces the water asset.

### Additional information

Table 14 contains the allocation summary report for the reporting period. Table 13 is contains notes to help interpret the report.



**Table 13: Explanatory information for allocation announcement table**

Report heading	Description
Opening	Remaining allocation account balances at the conclusion of the previous season that is allowed to be carried forward to this season
Individual announcement	Actual announcement made to each licence category
Share component (entitlement)	Sum of the licensed volume of water within the licence category on the announcement date
Allocation announced volume	Volume of water credited to accounts within a licence category as a result of the announcement made
Allocation cumulative announced volume	Cumulative total of the announced volumes for the water year and licence category
Allocation announced volume % of share	This is the announced volume expressed as a percentage of the entitlement applicable on the particular date
Allocation cumulative announced volume % of share	This is the cumulative total % (of total entitlement) that has been issued on the announcement date (inclusive)
Account balance available	Sum of water available in allocation accounts that has been made available to be taken during the season
Account balance not available	Water allocated that is not accessible now
Account balance total	Total balance of accounts (available plus not available)
Account balance available % of share	Account balance available expressed as a percentage of share component
Account balance total % of share	Account balance expressed as a percentage of share component
Supplementary water	Water that is not a stored source of water and is only made available if an uncontrolled flow event occurs

Table 14: Allocation announcements for Lower Darling regulated river water source 2018–19

Date	Individual announcement	Share component	Allocation volume (ML)	Cumulative volume (ML)	Allocation volume (%)	Cumulative volume (%)	Balance available (ML)	Balance not available (ML)	Balance total (ML)	Balance available (%)	Balance total (%)
Domestic and Stock											
1-Jul-18	Opening	335			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	335	335	335	100.0%	100.0%	335	0	335	100.0%	100.0%
Domestic and Stock [Domestic]											
1-Jul-18	Opening	424			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	424	424	424	100.0%	100.0%	424	0	424	100.0%	100.0%
Domestic and Stock [Stock]											
1-Jul-18	Opening	612			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	612	612	612	100.0%	100.0%	612	0	612	100.0%	100.0%
Local Water Utility											
1-Jul-18	Opening	10,135			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	10,135	10,135	10,135	100.0%	100.0%	10,135	0	10,135	100.0%	100.0%
Regulated River (General Security)											
1-Jul-18	Opening	79,507			0.0%	0.0%	12,213	0	12,213	15.4%	15.4%
1-Jul-18	AWD 0.0 ML per Share	79,507	0	0	0.0%	0.0%	12,213	0	12,213	15.4%	15.4%
Regulated River (High Security)											
1-Jul-18	Opening	7,771			0.0%	0.0%	(1)	0	(1)	0.0%	0.0%
1-Jul-18	AWD 1.0 ML per Share	7,771	7,771	7,771	100.0%	100.0%	7,771	0	7,771	100.0%	100.0%
Supplementary Water											
1-Jul-18	Opening	250,000			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 1.0 ML per Share	250,000	250,000	250,000	100.0%	100.0%	250,000	0	250,000	100.0%	100.0%

## Note 3—Allocation account usage

This is the volume of water that is extracted, diverted or measured as usage and is accountable against an access licence.

### Data type

Measured/administration data

### Policy

Not applicable

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- Water Accounting System

### Methodology

Usage information is determined by either on-farm meters that measure extraction, gauges on diversion works or orders/releases when the volume cannot be effectively metered, such as an environmental watering event.

Meter readings are collected for individual licence holders at intervals during the year and converted via a calibration factor to a volume of water extracted. Water diverted from the river is measured by recording the height at either the gauge or weir with the volume diverted being derived by passing these heights through a rating table. However, with multiple categories of access licences being extracted through the same pumps, additional information and methodologies are needed to separate use under the various licence categories. Below is a description of these:

- Based on periods of announcement—during periods of supplementary water announcements, extractions can be debited against the Supplementary Water licences
- Usage is based on water orders—users place orders for water against an access licence and usages are debited against accounts in proportion to the orders placed
- Licence category apportionment—if no water orders are available, water extracted is apportioned against categories of access licence in order of priority, as set out in the next table. The ranking is based on the nature and rules of each of the licence categories.

Table 15 shows the order in which extractions are apportioned to access licence categories, starting at priority 1. This is a generic list where not all categories will necessarily appear in this GPWAR. There are also various sub-categories of licence associated with some of these.

Account usages for the reporting period are illustrated in Table 16.

**Table 15: Licence category metered usage apportionment table**

Priority	Surface water
1	Supplementary
2	Uncontrolled Flow
3	Domestic and stock
4	Regulated River (High Security)
5	Regulated River (GS)
6	Conveyance
7	Local Water Utility
8	Major Water Utility

**Table 16: Account usage summary for reporting period**

Licence category	Account usage (ML)
Domestic and Stock	120
Domestic and Stock [Domestic]	86
Domestic and Stock [Stock]	24
Local Water Utility	4,813
Regulated River (GS)	1,375
Regulated River (High Security)	2,925
Supplementary Water	0
<b>Total</b>	<b>9,343</b>

## Note 4—Temporary trading/allocation assignments

This represents the temporary trading (allocation assignments) of water either between allocation accounts within the regulated Lower Darling system (internal trading), or trading between the southern connected valleys or the Murray–Darling Basin (external). External allocation assignments may be between another water source within NSW or another state.

### Data type

Administration

### Policy

*Water Sharing Plan for the NSW Murray and Lower Darling Regulated River Water Sources 2016*

- Part 10 Access licence dealing rules
  - Clause 61 Assignment of water allocations dealings

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

- Murray–Darling Basin Agreement Protocol 2010
  - Schedule D—Permissible Transfers between Trading Zones
    - Part 6—Restrictions on transfers

Available at [www.legislation.gov.au](http://www.legislation.gov.au)

### Data accuracy

A1—Nil inaccuracy +/- 0%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- Water Accounting System

### Methodology

The net internal trade for each licence category is zero for a water year. In order to display the trade information within the statements, an internal trade is represented as both a water liability decrease (seller of water) and the equivalent water liability increase (buyer of water).

External trading is represented by either increasing (trading into the Lower Darling from an external water source) or decreasing (trading from the Lower Darling to an external water source) the associated licence category liability.

### Additional information

Table 17 presents the temporary trading figures between licence categories for the Lower Darling. All figures represent a volume in megalitres.

**Table 17: Lower Darling regulated river temporary trade summary 2018-19**

From water source	From category	To water source	To category	Total
Lower Darling	General Security	Lower Darling	General Security	228
Lower Darling	General Security	Lower Darling	High Security	43
Lower Darling	High Security	Lower Darling	General Security	3,909
Lower Darling	High Security	Lower Darling	High Security	977
<b>Total allocation assignment volume</b>				<b>5,157</b>

## Note 5—Held environmental water

This represents environmental water that is held as part of a licensed volumetric entitlement. These licences are held within the same licence categories as all other water access licences, hence they are subject to the same operating rules:

- available water determinations (AWD) for their share of the entitlement to be added to accounts
- carryover rules, hence the forfeiting of unused water that cannot be carried over
- provide water orders prior to use.

These licences are used to provide environmental benefit and outcomes to the catchment by either providing water to, or supplementing the water requirements of, specific environmental events or incidents.

### Data type

Measured

### Policy

- *Water Management Act 2000*
- Water Sharing Plan for the NSW Murray and Lower Darling Regulated River Water Sources 2016

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- Water Accounting System
- Available Water Determination Register: [waterregister.waternsw.com.au](http://waterregister.waternsw.com.au)

### Methodology

The water held for the environment represents a volume of water in corresponding allocation accounts. This allocation account represents the sum of the remaining volume of held environmental water at the conclusion of the water year once all transactions and forfeit rules have been applied to the accounts. These environmental balances are at the licence category level and represent the water that can be carried forward for use in the next year. Below is list of typical transactions that can apply to an environmental allocation account:

AWD (including pro rata of AWD for new licences)

- Licensed extractions
- Forfeiture due to:
  - carryover rules
  - account spillage as a result of AWD
  - licence conversions
  - excess orders (where water order debiting is in place)

- Licence conversion
- Trade of allocation water between accounts.

In addition, the trade and purchase of environmental water is tracked to capture the movement of environmental entitlement both in number and volume.

### Additional information

Table 19 summarises held environmental water for the reporting period.

Table 18 describes each balance component of the Table 19 summary.

Table 20 shows the change in environmental water holdings since the last reporting period.

**Table 18: Explanatory information for held environmental allocation account summary**

Heading		Description
<b>Share</b>		This is the total volume of entitlement in the specific licence category.
<b>Opening</b>		The volume of water that has been carried forward from the previous year's allocation account
<b>AWD</b>		The total annual volume of water added to the allocation account as a result of allocation assessments
<b>Licences</b>	<b>New</b>	Increase in account water as a result of issuing new access licences
	<b>Cancelled</b>	Decrease in account water as a result of licence cancellation
<b>Assignments</b>	<b>In</b>	Increase in account water as a result of temporary trade in
	<b>Out</b>	Decrease in account water as a result of temporary trade out
<b>Account usage</b>		Volume of water that is extracted or diverted from the river under controlled river conditions and is accountable against the licence
<b>During-year forfeit</b>		This is a decrease in the available account balance due to mid-year forfeits that may be triggered by things such as licence subdivisions or other dealings.
<b>End-of-year balance</b>	<b>Available</b>	That part of the account balance that is available to be taken at the conclusion of the water year
	<b>Non-available</b>	That part of the account balance that is not available to be taken at the conclusion of the water year
<b>End-of-year forfeit</b>		Account water that is forfeited at the end of the water year as a result of carryover rules that restrict the carry forward volume
<b>Carry forward</b>		This represents the account water that is permitted to be carried forward into the next water year, as determined by the carryover rules.



**Table 19: Lower Darling environmental account summary**

Category	Share	Opening balance	AWD	Licences		Assignments		Account usage	During-year forfeit	End-of-year balance		End-of-year forfeit	Carry forward
				New	Cancelled	In	Out			Available	Non-Available		
General Security	69,364	10,061	0	0	0	3,575	0	0	0	13,636	0	0	13,636
High Security	3,575	0	3,575	0	0	0	3,575	0	0	0	0	0	0
Supplementary Water	250,000	0	250,000	0	0	0	0	0	0	250,000	0	250,000	0

**Table 20: Change in held environmental water**

Category	Share 30 June 2018	Share 30 June 2019	Share Difference	No. Licences 30 June 2018	No. Licences 30 June 2019	No. Licence Difference
General Security	69,364	69,364	0	6	6	0
High Security	3,575	3,575	0	4	4	0
Supplementary Water	250,000	250,000	0	3	3	0

## Note 6—Environmental provisions

There a number of planned environmental provisions for the Lower Darling catchment implemented under the water sharing plan, with the aim of enhancing environmental benefits.

A long-term extraction limit is set that ensures the growth in diversions is contained and the requirements set out under schedule F of the Murray–Darling Basin agreement are maintained. If long-term average annual diversions exceed this limit, provisions are in place to reduce the available water determinations until the average diversions are bought back under the required limit.

The plan also states the requirement for a Lower Darling Environmental Contingency Allowance (Lower Darling ECA). The volume of water credited at any time shall be zero if the volume stored in Menindee Lakes is below 480,000 megalitres, or if it has not risen above 640,000 megalitres since it last fell below 480,000 megalitres. Otherwise, after allowing for NSW licensed requirements, the account will be maintained at 30,000 megalitres, minus any usage that has occurred in that water year. The water is available to support management of blue-green algae and other associated water quality issues in the Lower Darling.

The plan also makes provisions for held environmental water, which has been previously detailed in Note 5 of this GPWAR.

### Data type

Measured/Administration

### Policy

- *Water Sharing Plan for the NSW Murray and Lower Darling Regulated River Water Sources 2016*
  - Part 4 Planned Environmental Water Provisions

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

A1—Nil inaccuracy +/- 0%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

Not Applicable

### Methodology

Not applicable

### Additional Information

The accounting history for the environmental contingency allowance is in Table 21.

**Table 21: Summary of ECA account balance (figures in ML)<sup>15</sup>**

Water year	Opening balance	Water credited	Usage	Balance End-of-year
2010–11	0	30,000	0	30,000
2011–12	0	30,000	0	30,000
2012–13	0	30,000	0	30,000
2013–14	0	30,000	0	30,000
2014–15	0	0	0	0
2015–16	0	0	0	0
2016–17	0	30,000	0	30,000
2017–18	0	30,000	0	30,000
2018–19	0	0	0	0

<sup>15</sup> Figures amended from 2014–15 publication

## Note 7—Surface water storage—combined Menindee system

This is the combined physical volume of water stored in Lake Menindee, Lake Pamamaroo, Lake Wetherell and Lake Cawndilla at the date of reporting. The volumes provided represent the total volume of water in the storage, including dead storage, which is the volume of water that can't be accessed under normal operating conditions (for example, volume below low-level outlet). We assume that the dead storage can be accessed if required via alternative access methods (for example, syphons).

The responsibility of operating Menindee Lakes is shared between WaterNSW and the Murray– Darling Basin Authority (MDBA). WaterNSW takes control of operations when the storage volume falls below 480,000 megalitres until such time as it rises above 640,000 megalitres. At that point it will be operated by the MDBA (until it falls back below 480,000 megalitres).

### Data type

Derived from measured data

### Policy

Not applicable

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- NSW Department of Planning, Industry and Environment—HYDSTRA

### Methodology

Storage volumes are calculated by processing a gauged storage elevation through a rating table that converts it to a volume. Table 22 provides a breakdown of the storage capacities, dead storages and the percentage of storage change for the reporting period. Figure 30 to Figure 33 provide the daily storage volumes and percentages for the reporting period.

**Table 22: Capacity and dead storage summary table**

Storage	Capacity (ML)	Dead storage (ML)	Volume 30 June 2018 (ML)	Volume 30 June 2019 (ML)	2018–19 Volume % change
Lake Menindee	629,488	71,190	0	0	0.0%
Lake Pamamaroo	277,725	31,730	129,592	28	(46.7)%
Lake Wetherell	192,621	11,800	57,067	11,385	(23.7)%
Lake Cawndilla	631,052	100,970	35,564	0	(5.6)%
<b>Combined Lakes</b>	<b>1,730,886</b>	<b>215,690</b>	<b>222,223</b>	<b>11,413</b>	<b>(12.2)%</b>

Figure 30: Lake Wetherell storage level and effective full storage capacity 2018–19

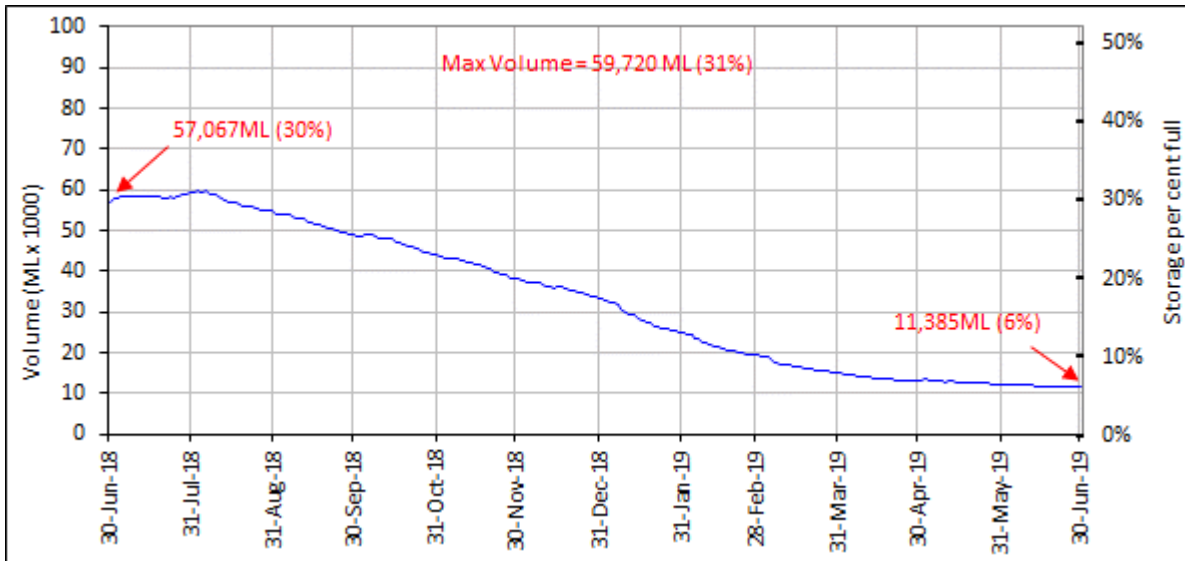


Figure 31: Lake Pamamaroo storage level and effective full storage capacity 2018–19

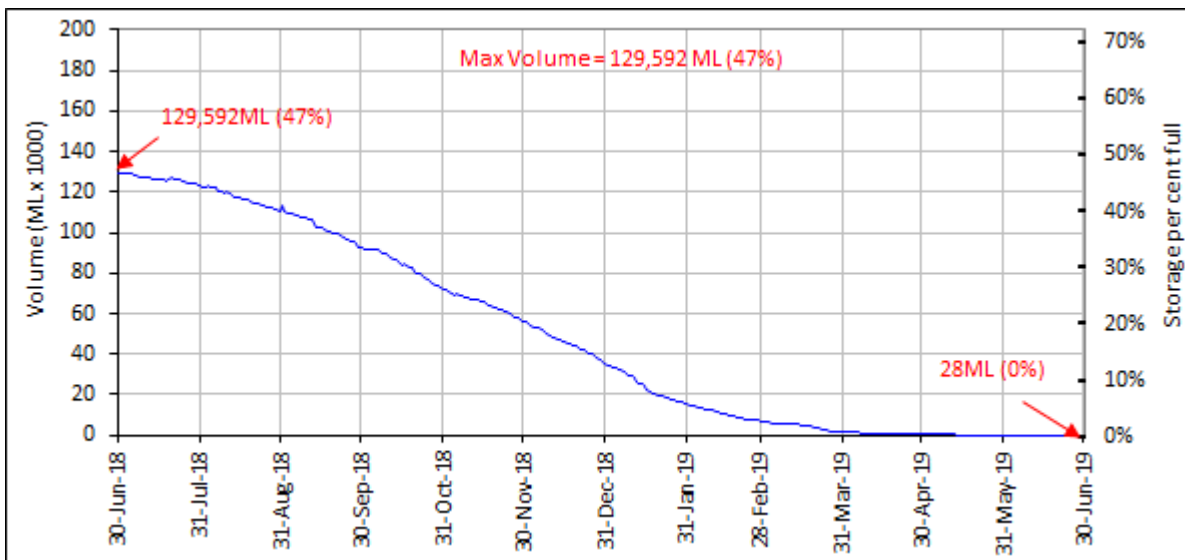


Figure 32: Lake Menindee storage level and effective full storage capacity 2018–19

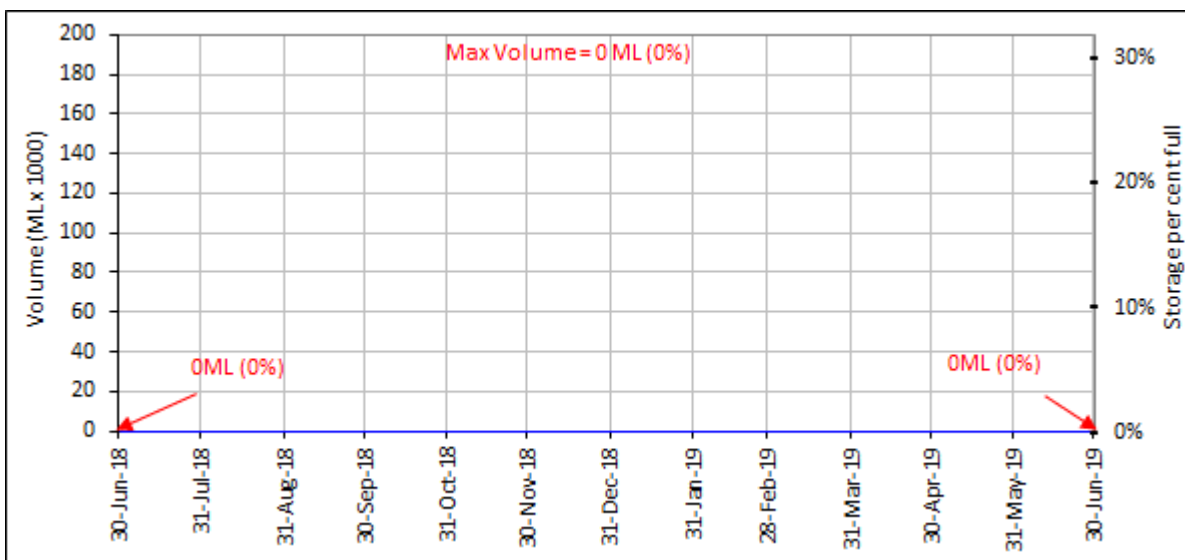
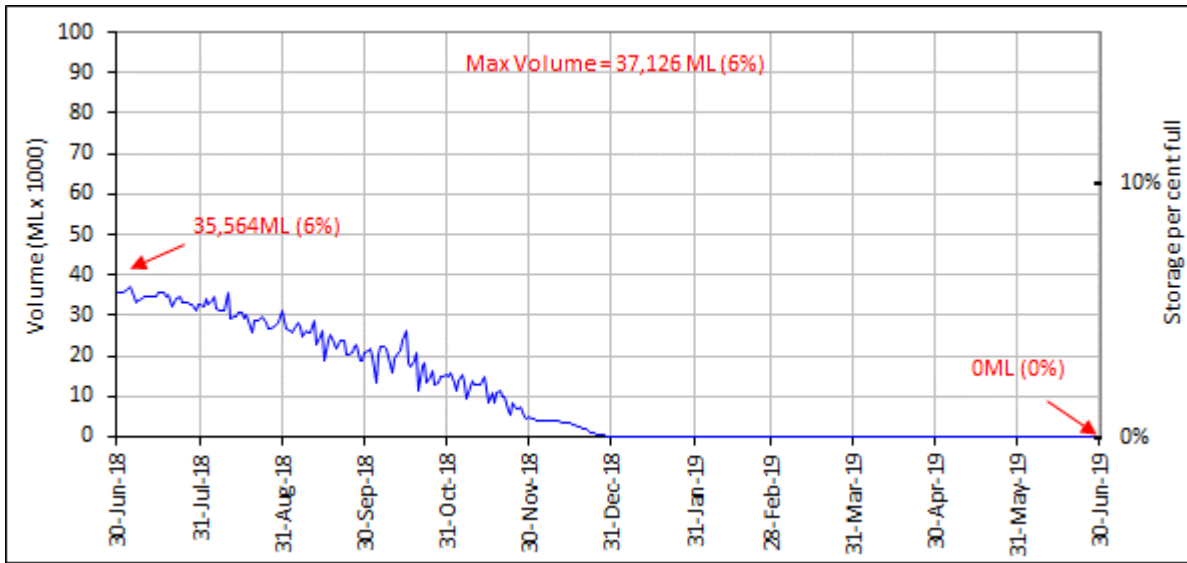


Figure 33: Lake Cawndilla storage level and effective full storage capacity 2018–19



## Note 8—River channel storage

The volume of water stored in the river channel on the day of reporting.

### Policy

Not applicable

### Data type

Derived from measured data

### Data accuracy

B—Estimated in the range +/- 25%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data sources

- HYDSTRA
- CAIRO

### Methodology

For each river section S(n):

$$V = Q \times T$$

The river channel storage will be equal to the sum of all river section volumes.

$$\text{River channel storage} = \sum S(n) V$$

**Table 23: Summary of river storage calculation components**

Symbol	Variable	Data Source	Unit
Q	Average flow in the river section. Calculated by averaging the daily flows at the upstream and downstream river gauges.	HYDSTRA	ML/d
V	Volume in each river section.	Calculated	ML
T	Average travel time for a parcel of water to travel through the river section.	CAIRO	Days

Assumptions and approximations:

- Travel times are estimated to the nearest day.
- Daily flow change between gauging sites is assumed to be linear. Volume in the final reach between Burtundy and Wentworth is estimated as 90% of the flow at Burtundy.

## Note 9—Storage inflow—Combined Menindee system

Storage inflow refers to the volume of water flowing into the major headwater storages, the combined Menindee system.

### Policy

Not applicable

### Data type

Derived from measured data

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data sources

- HYDSTRA
- WaterNSW—Menindee Lakes Storage Monthly Sheets

### Methodology

The inflows are obtained by the reconciliation of the inflow obtained from a mass balance approach (based on balancing the change in storage volume) where inflow is the only unknown with the inflow obtained as the output of a model for upstream of Menindee Lakes, starting at Wilcannia.

The calculation of the mass balance inflow figure was derived by carrying out an annual balance across the combined Menindee Storages from daily data. This inflow was calculated according to the equation below.

$$I = \Delta S + Se + O + E - R$$

As the model is deemed the most reliable accurate source of inflow the mass balance inflow is then adjusted to match the modelled inflow. As the calculation of the evaporation for the lakes is unreliable, this parameter of the mass balance is used as the means by the inflow is matched to the model (pan factors for the Menindee Lakes are varied until a match is achieved).

**Table 24: Components for back-calculation of inflow**

Symbol	Variable	Unit
I	Inflow	ML/year
$\Delta S$	Combined Menindee change in storage volume	ML
O	Combined Menindee Outflow (see Note 13 for more detail)	ML/year
Se	Seepage	ML/year
R	Combined Menindee rainfall (see Note 10 for more detail)	ML/year
E	Combined Menindee evaporation (see Note 10 for more detail)	ML/year

Assumptions and approximations:

- Seepage was assumed to be zero.



## Note 10—Storage evaporation and storage rainfall

This refers to the combined volumetric effective on Lake Wetherell, Lake Pamamaroo, Lake Menindee and Lake Cawndilla that is either lost as a result of evaporation, or gained as a result of rainfall.

### Data type

Derived from measured data

### Policy

Not applicable

### Data accuracy

B—Estimated in the range +/- 25%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- HYDSTRA
- WaterNSW—Menindee Lakes Storage Monthly Sheets

### Methodology

The calculation of the effect of rainfall and evaporation is carried out by using the following formulas.

$$\text{Rainfall Volume (ML)} = \text{Rainfall (mm)} \times \text{Area (Ha)} / 100$$

$$\text{Evaporation Volume (ML)} = \text{Pan Evaporation (mm)} \times \text{Pan Factor} \times \text{Area (Ha)} / 100$$

These formulas were applied on a daily time step with daily evaporation and rainfall data applied across the combined Menindee Storage surface area. A seasonally varied pan factor was also applied across the combined Menindee Storage as detailed in Table 25. The range of these pan factors were derived after reviewing information in an internal report prepared by J. Hayes and G. Wright titled 'Menindee Lakes – Review of Evaporation Estimates'. However, with a model being adopted to establish the Menindee storage inflow, the factors were varied to enable the evaporation to balance the storage to the modelled inflow.

**Table 25: Pan factors utilised for calculation**

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1.6	1.6	1.6	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.6	1.6

## Note 11—River evaporation and river rainfall

This refers to the volume of water effective on the accounted river reach that is either lost as a result of evaporation, or gained as a result of rainfall.

### Data type

Derived from measured data

### Policy

Not applicable

### Data accuracy

C—Estimated in the range +/- 50%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- HYDSTRA
- ARCGIS
- QLD Department of Natural Resources: SILO

### Methodology

The volume applied for evaporation and rainfall on the regulated river is achieved by first calculating a daily time-series of river area. This is achieved by breaking the river up into reaches and utilising the cross-sections recorded at river gauging locations to determine the average width of the river with a given daily flow. River length is then determined between two gauging locations using ARCGIS and as such an area for each reach can be defined.

$$\text{Area (m}^2\text{)} = \text{Average W (m)} \times \text{L (m)}$$

In the formula, W is the daily width determined from the gauging cross sections and L is the length as determined through ARCGIS analysis.

With daily area determined, various climate stations are then selected based on their proximity to each river reach. Rainfall and evaporation data is then extracted from SILO and applied to the area time-series to achieve a volume in megalitres which is then aggregated to an annual figure.

#### Rainfall:

$$\sum_{i=1}^n V_i = \left( \frac{R_i \times A_i}{10^6} \right)$$

#### Evaporation:

$$\sum_{i=1}^n V_i = \left( \frac{ETO_i \times K_c \times A_i}{10^6} \right)$$

**Table 26: Components for storage evaporation and rainfall**

Symbol	Variable	Unit
V	Volume	ML/year
R	Rainfall	mm/day
A	Surface area - derived from height to surface areas lookup curve	m <sup>2</sup>
ETO	reference evapotranspiration from SILO	mm/day
Kc	Crop coefficient for open water (1.05)	-

## Note 12—Talyawalka Creek Inflow

This represents the inflow into the Lower Darling regulated river from Talyawalka Creek (downstream of the Menindee lakes storages). This inflow estimate has been obtained from modelled data as no gauged data is available.

### Policy

Not applicable

### Data type

Measured data

### Data accuracy

B—Estimated in the range +/- 25%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data sources

- Spreadsheet model

### Methodology

The flows are obtained by running a model for upstream of Menindee Lakes, starting at Wilcannia. The model estimates a flow leaving Talyawalka Creek at Railway Bridge and also the return flow entering the Darling River downstream of the Lakes, which is the volume that is assumed as Lower Darling inflow in this GPWAR.

### Additional information

**Table 27: Summary of Talyawalka Creek at Railway Bridge inflow**

Water year	Volume (ML)
2015–16	2,108
2016–17	0
2017–18	0
2018–19	0

## Note 13—Dam releases, river inflow from dam releases

The volume of water released from Lakes Wetherell, Pamamaroo, Menindee, Cawndilla:

In the accounting process for Lakes Wetherell, Pamamaroo and Menindee, this release is represented as both a decrease in asset (of the dams) and an equal increase in asset (of the river).

For Lake Cawndilla, the release that goes to the Great Darling Anabranh is considered as a decrease in outflow only (the anabranh is not included in the GPWAR).

### Policy

Not applicable

### Data type

Measured data

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data sources

- HYDSTRA

### Methodology

The flows are obtained by measuring river heights at a gauging station downstream of the dam wall, and then passing these heights through a rating table that converts them to a daily flow volume. The releases have been represented in the Statement of Changes in Water Assets and Water Liabilities as both a decrease in water asset (water leaving the dam) and an equal volume of increase in water asset (water released increasing the volume of the river). It would have been also possible to account this as a transfer in asset whereby the volumes would not appear in the statements.

### Additional information

**Table 28: Summary of releases for reporting period**

Storage	Release (ML)	Increase to River Asset (ML)
Lake Cawndilla <sup>16</sup>	0	N/A
Lake Pamamaroo	51,580	53,780
Lake Wetherell— Outlet	2,200	
Lake Wetherell—Main Weir	0	
Lake Menindee	0	

<sup>16</sup> Lake Cawndilla release does not contribute to the accounted river extent of this water account

## Note 14—End of system flow

This refers to flow that leaves the entity and does not return to the entity. The line item excludes water leaving the defined accounting extent for replenishment purposes, or water leaving the defined extent for environment purposes supplied from allocated licenced environmental water (these have been accounted for in separate line items). While the end of system for this GPWAR is considered to be Wentworth, there is no appropriate data available at this site and therefore the data from Burtundy has been used as a substitute.

### Data type

Derived from measured data

### Policy

Not applicable

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- HYDSTRA

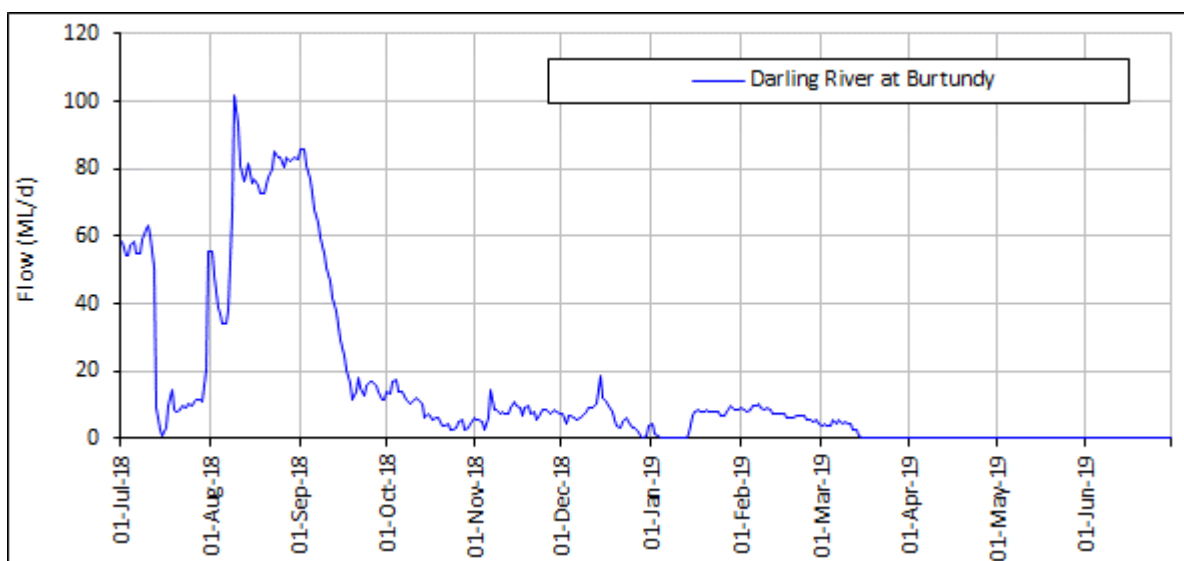
### Methodology

The end-of-system flow is calculated by adding the flows at the specified end of system gauging stations and then subtracting the proportion of this outflow that can be attributed to either replenishment flow, or held environmental water. The following table summarises the calculation used to assess the end-of-system flow for the Darling River reporting entity.

**Table 29: End-of-system flow summary table**

System	Gauging Station	Volume (ML)
Lower Darling	425007   Darling River at Burtundy	5,335

**Figure 34: End-of-system flow for Darling River 2018–19**



## Note 15—Extractions from River

This is the actual volume of water directly pumped or diverted from the Lower Darling regulated river by licence holders.

Occasionally (generally in the case of environmental water), volumes are ordered against a licence account for in-stream benefits or to pass through end-of-system target points. Additionally, water is used outside of the accounted river extent (that is from the Great Darling Anabranh). As such, the volume reported to be physically extracted from the accounted river is not equal to the amount of water debited against accounts for usage, which has been described in Note 3. The figure stated for extractions from river excludes basic rights extractions, which is reported as a separate line item and detailed in Note 16.

### Data type

Measured data

### Policy

Not applicable

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- Water Accounting System

### Methodology

The extraction from the river is considered to be the total volume metered and debited to the allocation accounts minus any water that can be identified as being used within the system, ordered to be passed through the system, or taken from the Great Darling Anabranh.

#### Figure 35: Reconciliation of extraction from river to account usage for reporting period

Item	Volume (ML)
Extractions from River	9,344
Instream usage (not diverted)	0
Licensed water ordered to leave system	0
Environmental use—Great Darling Anabranh	0
Consumptive use—Great Darling Anabranh	0
<b>Licence Account usage</b>	<b>9,344</b>

## Note 16—Basic rights

This is the non-licensed right to extract water to meet basic requirements for household purposes (non-commercial uses in and around the house and garden) and for watering of stock. It is available for anyone who has access to river frontage on their property.

This water cannot be used for irrigating crops or garden produce that will be sold or bartered, for washing down machinery sheds or for intensive livestock operations.

In times of limited supply, there may be restrictions on taking water for domestic and stock use.

### Data type

Estimated

### Policy

- *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016*
  - Part 5 Requirements for water
    - Division 2 Requirements for water basic landholder rights
      - Clause 18 Domestic and Stock Rights

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

C—Estimated in the range +/- 50%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016*

### Methodology

The estimation of Domestic and Stock rights uses a series of estimates for water usage, stocking rates, population and property shape based on local knowledge to calculate riparian (stock and domestic) requirements in megalitres per year. The annual extraction for Domestic and Stock rights in the water accounts is assumed to be the estimated figure stated in the *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016* (445 megalitres).



## Note 17—Unregulated Effluent to Great Darling Anabranh

This figure is water that leaves the main Darling River, in high flow events, via an effluent offtake approximately half way between Menindee and Pooncarie.

### Data type

Calculated from measured data

### Policy

N/A

### Data accuracy

B—Estimated in the range +/- 25%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

- HYDSTRA

### Methodology

Information from field observations indicates that once flow in the Darling River exceeds approximately 16,000 megalitres, water will begin to flow out the effluent. This volume was estimated by taking the difference between the outflow from Lake Cawndilla and the gauge on the Great Darling Anabranh at Wycot (425013), during periods where the flow at the Darling River at Great Anabranh Offtake exceeds 16,000 megalitres (that is, there is no data available measuring the direct offtake, but the effluent enters the anabranh between Lake Cawndilla and the Wycot gauge).

For 2018–19 these conditions did not eventuate therefore, no flow was accounted as being diverted at the Darling River at Great Anabranh Offtake.

## Note 18—Unaccounted difference

In theory, if all the processes of a water balance could be accurately accounted for, the unaccounted difference would be zero. In reality, because of the large uncertainties in many of the volumes presented in the accounts, the various sources from which the data has been obtained and the fact that not all processes of the water cycle have been accounted, the statements are not balanced at the end of the accounting process.

In order to balance the accounts a final balancing entry is required, and this is termed the unaccounted difference. Increased investment in the monitoring of the water balance (infrastructure), and improved estimation techniques (also highly dependent on the former) would reduce the relative significance of this accounting component. Information to date indicates adopted methods cumulatively result in over quantification of inflow in dry to medium years, under quantification in wet years (Table 30).

### Data type

Not applicable

### Policy

Not applicable

### Data accuracy

D—Estimated in the range +/- 100%

### Providing agency

Not applicable

### Data source

Not applicable

### Methodology

For surface water, the unaccounted difference is equal to the amount required to obtain the correct volume in river at the end of the reporting period, after all the known physical inflows and outflows have been accounted. The double-entry accounting process attempted to represent the physical movement of water by creating a river asset. The opening and closing balance of the river volume was estimated according to Note 8.

Surface water unaccounted difference

$$UD = Rs - Rc + RI - Ro$$

Where:

UD = Unaccounted difference for Surface Water

Rs = Opening river volume estimate

Rc = Closing river volume estimate

Ro = Physical outflows from the river (e.g. extractions)

RI = Physical inflows to the river (e.g. runoff, dam releases)

### Additional information

The unaccounted difference for the reporting year and previous reporting years is provided in Table 30. Additionally, the volume as a percentage of inflow is presented to provide some perspective of magnitude. As can be seen in drier years, the proportion of unaccounted volume increases, potentially highlighting the omission of groundwater exchange and other loss processes within this GPWAR.

**Table 30: Unaccounted difference summary**

Water Year	Unaccounted Volume	System inflow <sup>17</sup>	Proportion of system inflow <sup>18</sup>
2013–14	(42,488)	235,939	(18.0)%
2014–15	13,667	70,890	19.2%
2015–16	5,052	28,957	17.4%
2016–17	(6,042)	518,753	(0.01)%
2017–18	32,259	154,226	20.9 %
2018–19	25,520	55,368	46.1%

<sup>17</sup> Releases passing Menindee lakes system plus rainfall on regulated Darling River plus inflow from Talyawalka Creek

<sup>18</sup> Negative indicates more system inflow required to achieve mass balance

## Note 19—Account corrections

This is a line item that is used to correct opening balances for the reporting period of water assets or water liabilities. The double entry accounting being applied is a continuous process whereby the closing balance of one year is the opening balance for the following year.

Occasionally corrections will be required for a variety of reasons including:

- errors identified in prior year reporting
- data changes since prior year reporting
- better estimates at hand since prior year reporting.

An account correction is different to the unaccounted difference transaction which is a physical volume added or subtracted from the river asset balance to successfully achieve mass balance after all the known processes have been accounted for.

### Data type

Calculated

### Accuracy

A1—Nil inaccuracy +/- 0 %

### Providing agency

NSW Department of Planning, Industry and Environment.

### Data source

Not applicable

### Methodology

A journal entry is placed in the comparative year to ensure correct opening balances are achieved in the reporting year.

### Additional information

No account adjustments were applied for this water account

## References

- Green D., Shaikh M., Maini N., Cross H. and Slaven J. 1998, *Assessment of environmental flow needs for the Lower Darling River*. Report to the Murray–Darling Basin Commission by the Department of Land and Water Conservation, Centre for Natural Resources, July 1998.
- WASB 2012, Australian Water Accounting Standard 1 Preparation and Presentation of General Purpose Water Accounting Reports (AWAS 1), Bureau of Meteorology