GENERAL PURPOSE WATER ACCOUNTING REPORT

Lower Darling Catchment

2020–21

Published by NSW Department of Planning and Environment

dpie.nsw.gov.au

Title: General Purpose Water Accounting Report | Lower Darling Catchment

Year: 2020–21

ISSN: 2652-4953

Department reference number: PUB22/339

More information

This report may be cited as NSW Department of Planning and Environment (2022) ***General Purpose Water Accounting Report 2020–21: Lower Darling Catchment***, NSW Department of Planning and Environment.

Acknowledgements

Produced by the water analytics group, NSW Department of Planning and Environment—Water group

Contents

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 dataA

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 groundwater 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 *Water Management Act 2000* 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 *Water Management Act 2000* 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 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 *Water Management Act 2000*, 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 *Water Management Act 2000*

Acknowledgement of country

NSW acknowledges Aboriginal people as Australia's First Peoples practicing the oldest living culture on earth and as the Traditional Owners and Custodians of the lands and waters on which we rely.

We acknowledge the people of the Danggali and Barkindji Nations hold the land and waters of the New South Wales Lower Darling River catchment area being of spiritual, cultural, customary and economic importance.

We recognise the intrinsic connection of Traditional Owners to Country and acknowledge their contribution to the management of the New South Wales Lower Darling River catchment landscape and natural resources.

Director's foreword

This is the eleventh 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 2020 to 30 June 2021 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 2020–21
- 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

As Director Water Analytics, NSW Department of Planning 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 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 and Environment

Contextual statement

The Lower Darling River is 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 and Environment website (www.industry.nsw.gov.au/water).

Accounting extent

Surface water

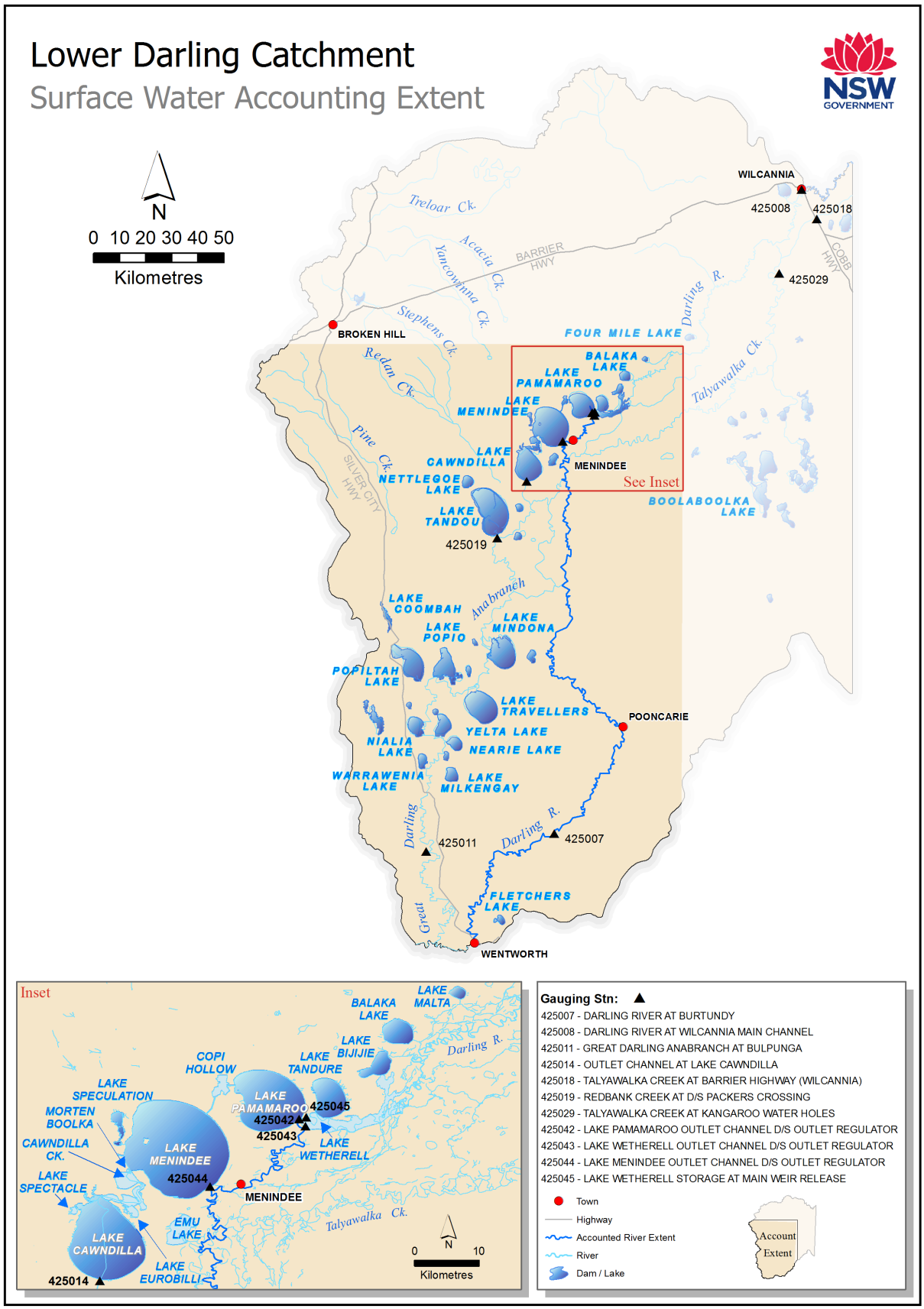
The accounted river extent is illustrated in Figure 1 and includes the Lower Darling Water Source managed under the Water Sharing Plan for the NSW Murray and Lower Darling Water Sources. It includes the Lower Darling regulated river system downstream of Menindee Lakes from the township of Menindee to 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 2020–21 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.

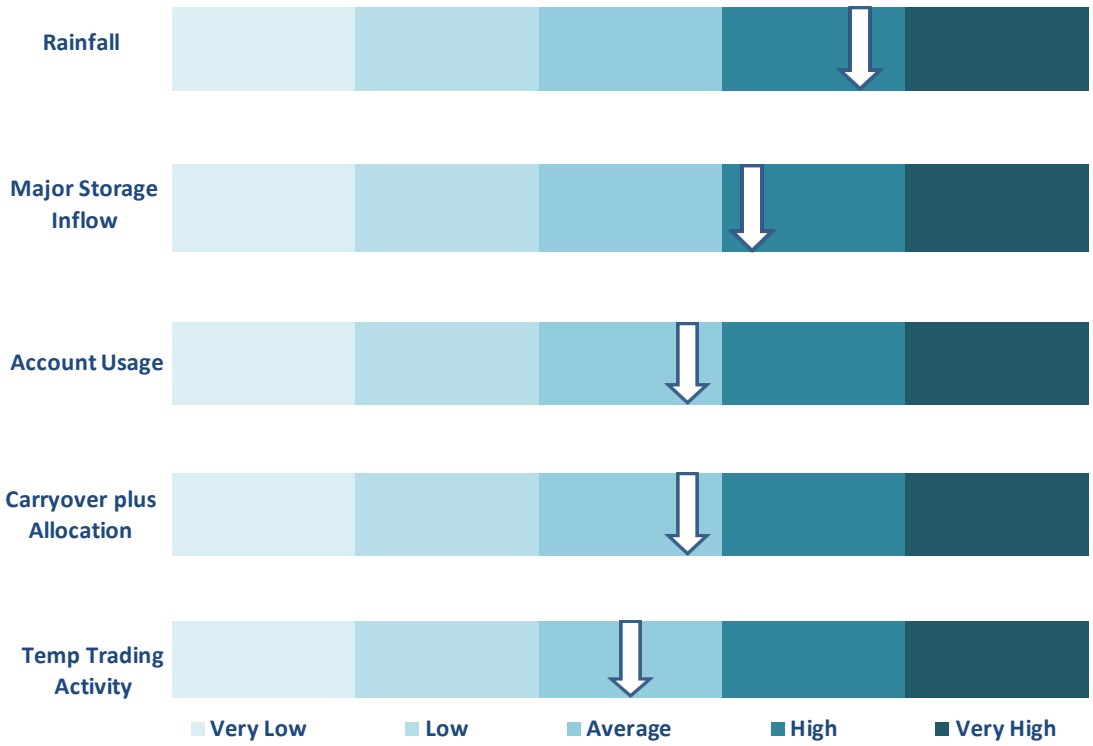
Figure 1: Surface water geographical extent of the accounts



Snapshot

The key indicators for 2020–21 relative to other years under water sharing plan management conditions are presented in Figure 2. Rainfall and Major storage inflow were high in comparison with the other years. Account usage, and effective allocation (carryover plus allocation) and temporary trading were at average levels.

Figure 2: 2020–21 summary indicators



Climate

At Menindee (upper catchment), 278 mm of rainfall was recorded in the reporting period (Table 1). Comparatively this rainfall is:

- 129 % of the long-term median rainfall (for this location)
- 38 % of the highest rainfall on record.

The majority of rainfall fell in January 2021 (51 mm) and October 2020 (49 mm) (Figure 3).

At Pooncarie (mid–lower catchment), 283 mm of rainfall was recorded (Table 2). Comparatively this rainfall is:

- 116 % of the long-term median rainfall (for this location)
- 37 % of the highest rainfall on record.

The majority of rainfall fell in October 2020 (102 mm) and August 2020 (41 mm) (Figure 3).

The 2020–21 spatial distribution of rainfall across the Lower Darling catchment is illustrated in Figure 5 and can be referenced against the mean historical annual rainfall distribution in Figure 6. Rainfall distribution was consistently higher than the comparative average conditions across the entire catchment area.

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

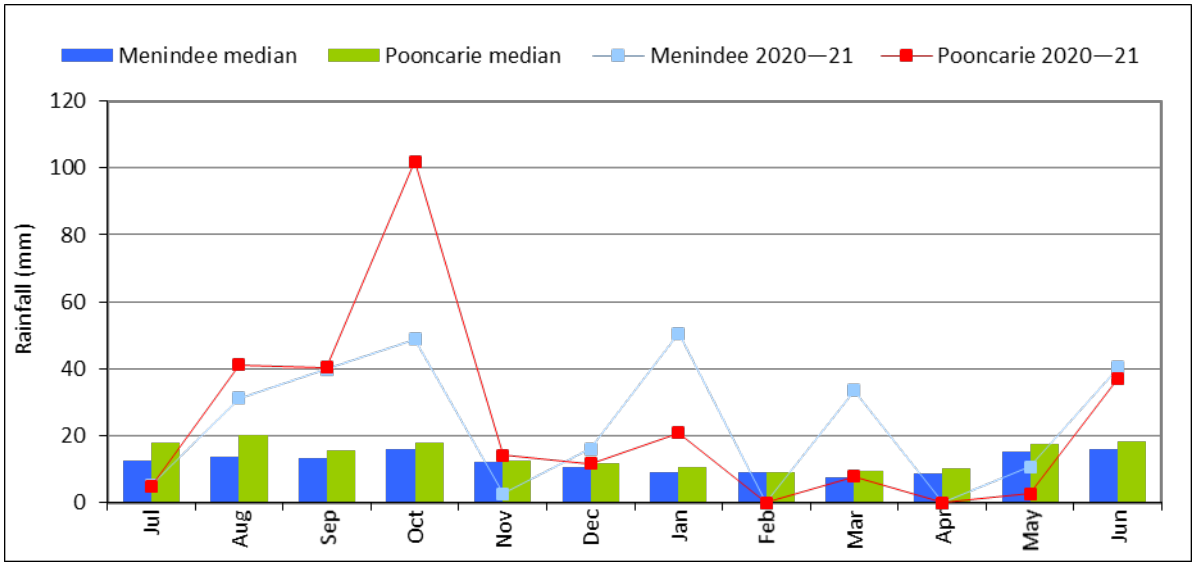


Figure 4: Monthly rainfall deviation from historical median at Menindee and Pooncarie

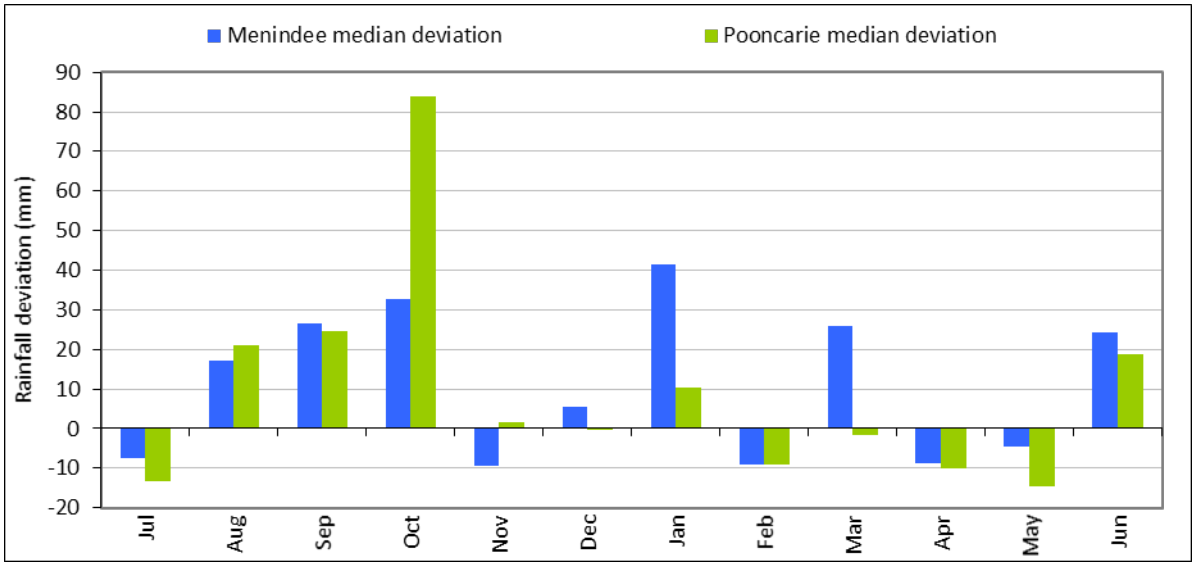


Table 1: 2020–21 monthly rainfall and historic monthly statistics at Menindee[1] – measurements in millimetres

Menindee	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
2020–21	**5.1**	**31.1**	**39.9**	**48.8**	**2.6**	**16.0**	**50.5**	**0.0**	**33.4**	**0.0**	**10.6**	**40.3**	**278.3**
Historical mean	17.9	18.1	19.0	22.6	20.5	21.9	24.0	20.7	18.4	17.0	22.3	21.6	243.5
Historical median	12.6	13.8	13.2	16.1	12.0	10.4	8.9	9.1	7.4	8.8	15.3	15.9	215.5
Historical lowest	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
Historical highest	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
Year of highest[2]	1886	1901	2016	1938	1933	1887	1993	1950	1989	1974	1989	1923	1973-1974

Table 2: 2019 –20 monthly rainfall and historic monthly statistics at Pooncarie[1] – measurements in millimetres

Pooncarie	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
2020–21	**4.8**	**41.2**	**40.4**	**102.0**	**14.2**	**11.6**	**20.9**	**0.0**	**7.7**	**0.0**	**2.6**	**37.1**	**282.5**
Historical mean	21.7	22.7	21.7	26.1	20.7	21.3	22.9	22.7	17.7	17.9	25.6	25.4	266.0
Historical median	18.0	20.2	15.7	18.0	12.5	11.7	10.6	9.2	9.4	10.2	17.3	18.4	243.9
Historical lowest	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
Historical highest	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
Year of highest[2]	1996	1901	2016	1973	2010	1962	2011	2000	1989	1974	1889	1923	2010-2011

[1] 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 2021 for Menindee and 1883 to 2021 for Pooncarie.
[2] Calendar year is used for monthly high, and water year for annual totals.

Figure 5: Darling River catchment 2020–21 total annual rainfall

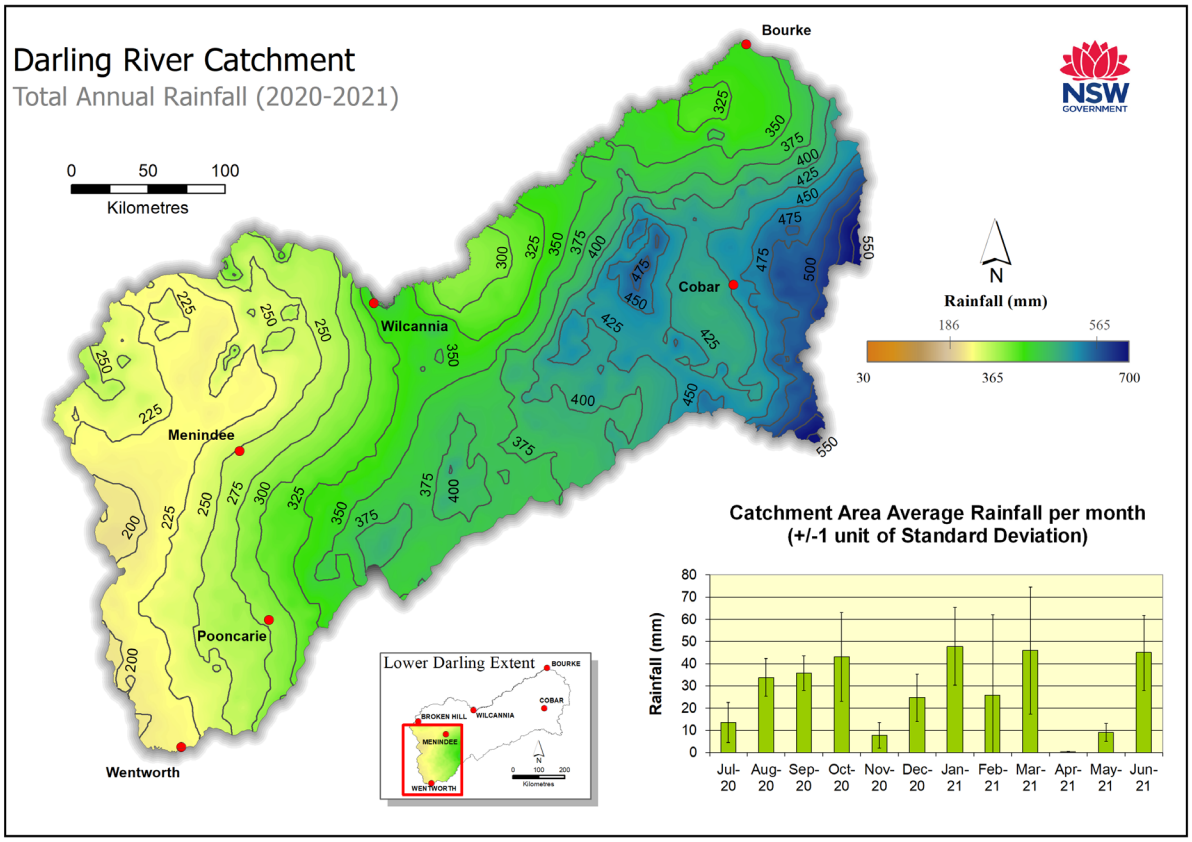
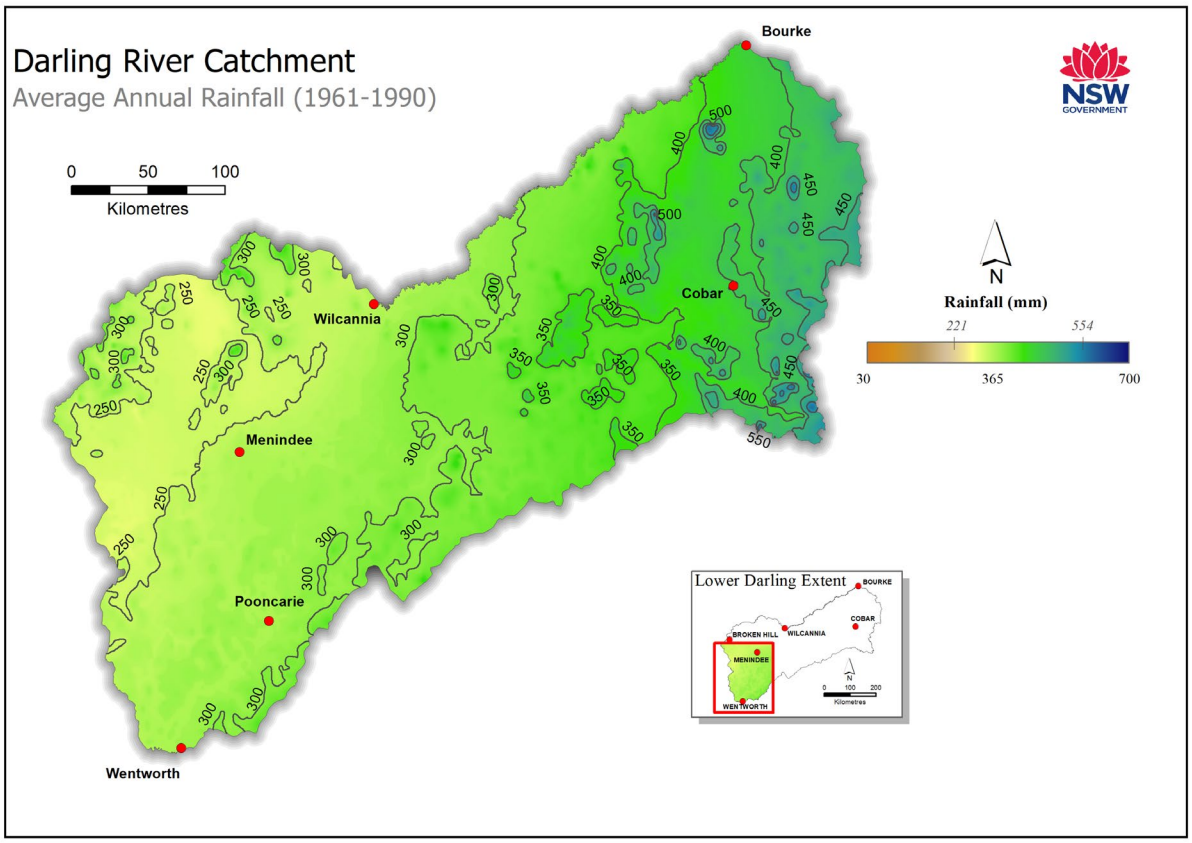


Figure 6: Darling River catchment average annual rainfall 1961–90



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). Over the last 20 years the trend has been generally drier conditions, with 2 distinct periods separated by a shorter sequence of wet conditions between 2009 and 2012. Annual inflows are highly variable relative to the mean.

For the reporting period flow, a total flow of 1,192,720 megalitres was recorded at Wilcannia (Figure 8), which is:

- 65% long-term average annual flow (1,844,697 megalitres)
- high relative to the long-term data set exceeding 63 per cent of years in the dataset (1895–96 to 2020–21)
- the fourth consecutive year of below average flow.

The maximum mean daily flow rate for the reporting period was 27,061 megalitres, occurring on 18 May 2021 (Figure 9).

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

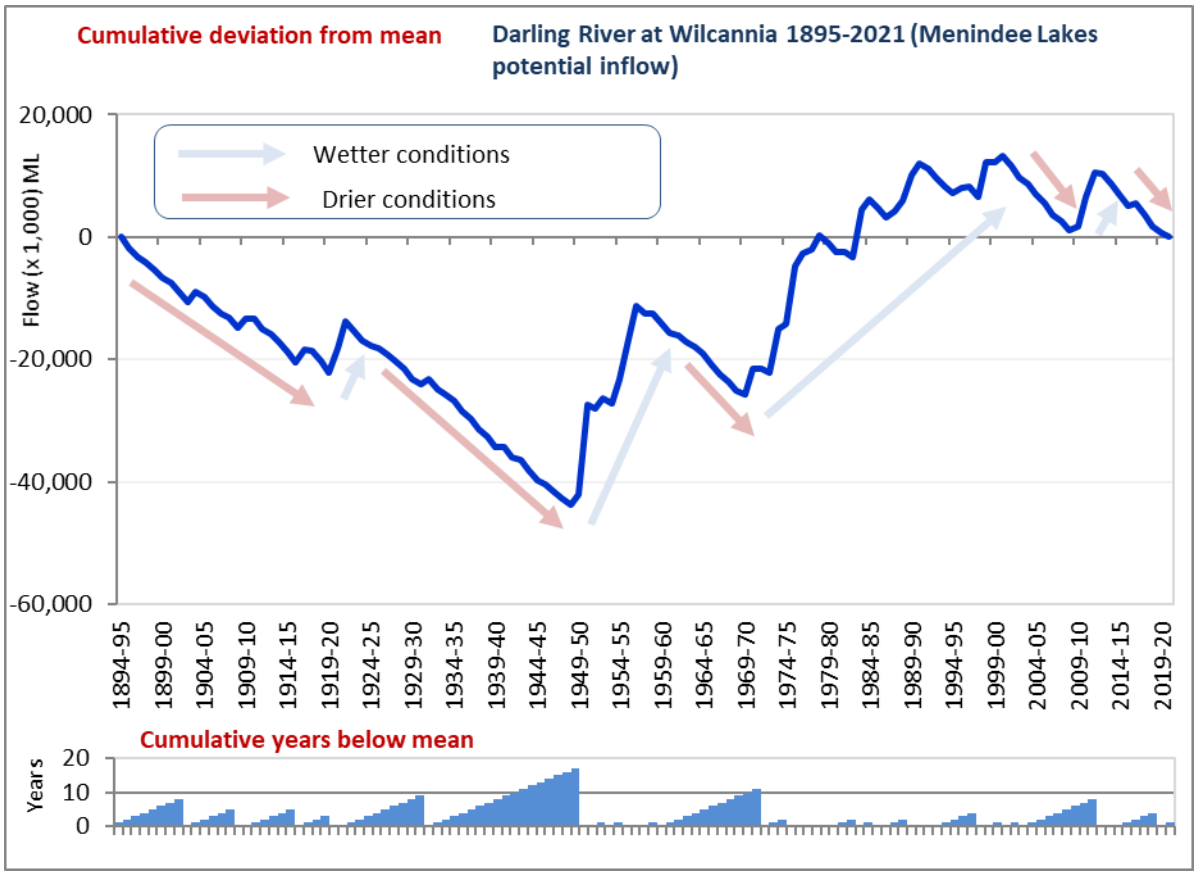


Figure 8: Long-term total flow (ML/year) at Wilcannia

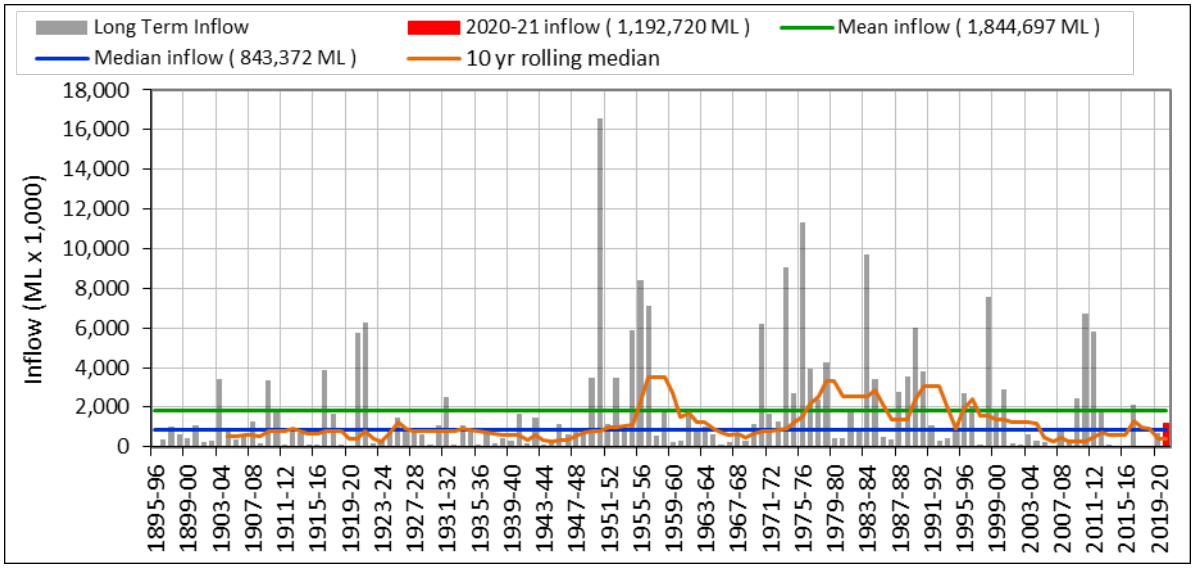
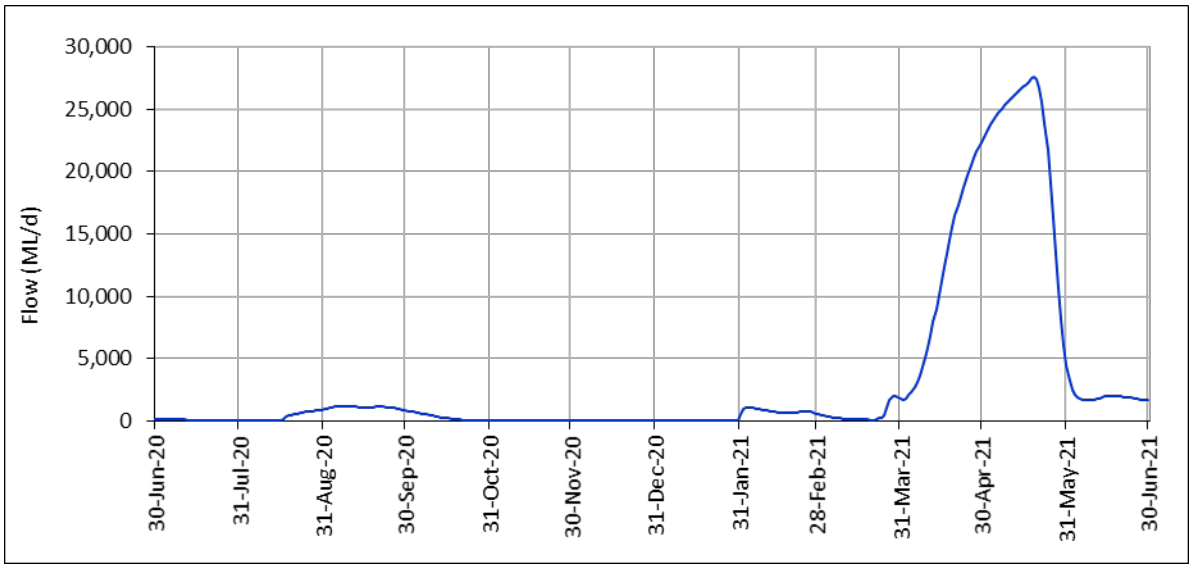


Figure 9: Total daily flow at Wilcannia (reporting period)



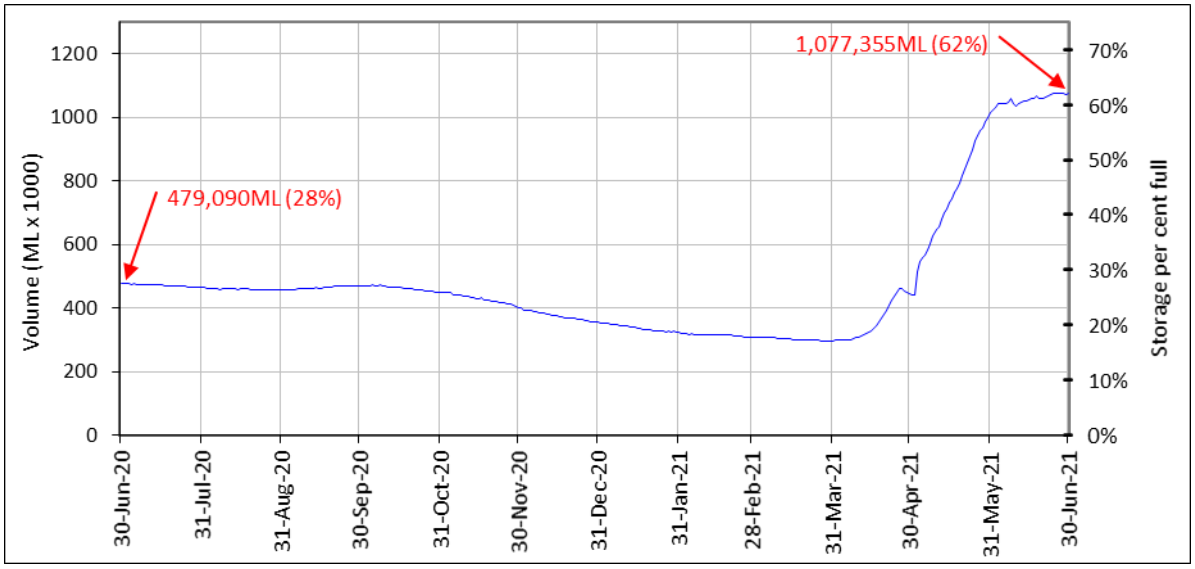
Storage volume

For the reporting period, the combined Menindee Lakes volume:

- started the reporting period at 479,090 megalitres or 28% of full supply capacity (Figure 10)
- closed at 1,077,355 megalitres or 62% of full supply capacity, an increase of 34% for the water year
- held a maximum volume of 1,077,355 megalitres on 30 July 2021.

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

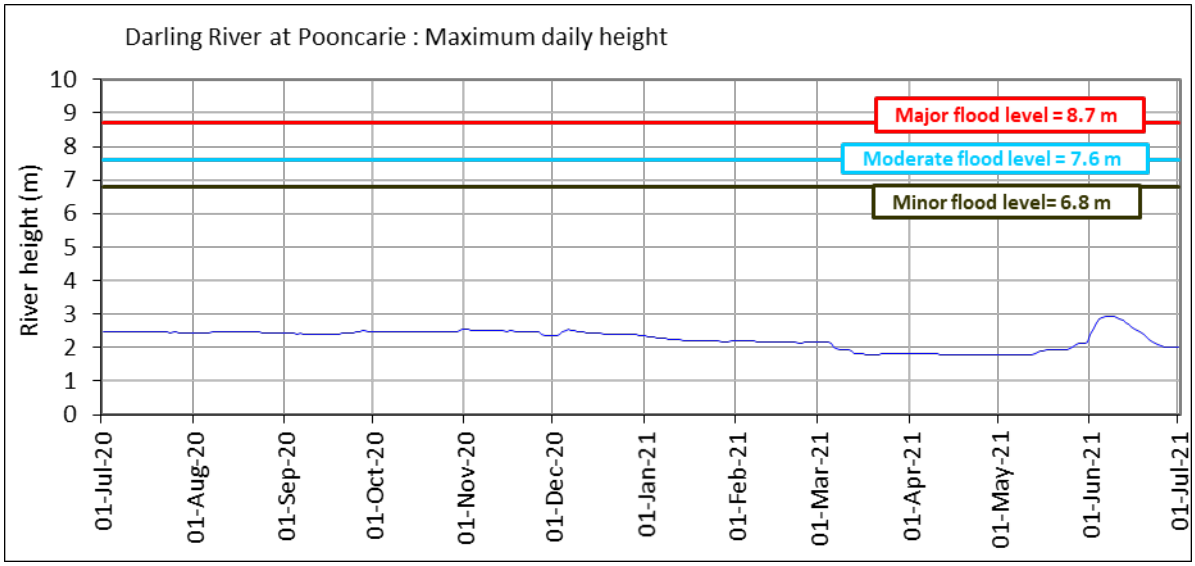
Figure 10: Menindee combined storage capacity volume and % full (reporting period)



Major flow events

There were no major high flow events in the Lower Darling during 2020–21. The river height at Pooncarie remained below 3 metres for the entirety of the water year (Figure 11).

Figure 11: Darling River at Pooncarie river heights 2020–21



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*[3].

[3] 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 licence account management

The licence allocation accounting rules applicable are summarised in Table 3. 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 4).

Table 3: Access licence accounting rules 2020–21

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[4]	N/A	1 ML/share[5]
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 4: 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 droughts to preserve water for critical needs.

Table 5 outlines the conditions that may be associated with different stages of criticality for surface water quantity. Further information is available at www.industry.nsw.gov.au/water/what-we-do/legislation-policies/eep

[4] 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.
[5] The maximum volume shall be the greater of 0.5 megalitres per share or 1 megalitres per share minus the volume of water carried into the year

Table 5: 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.

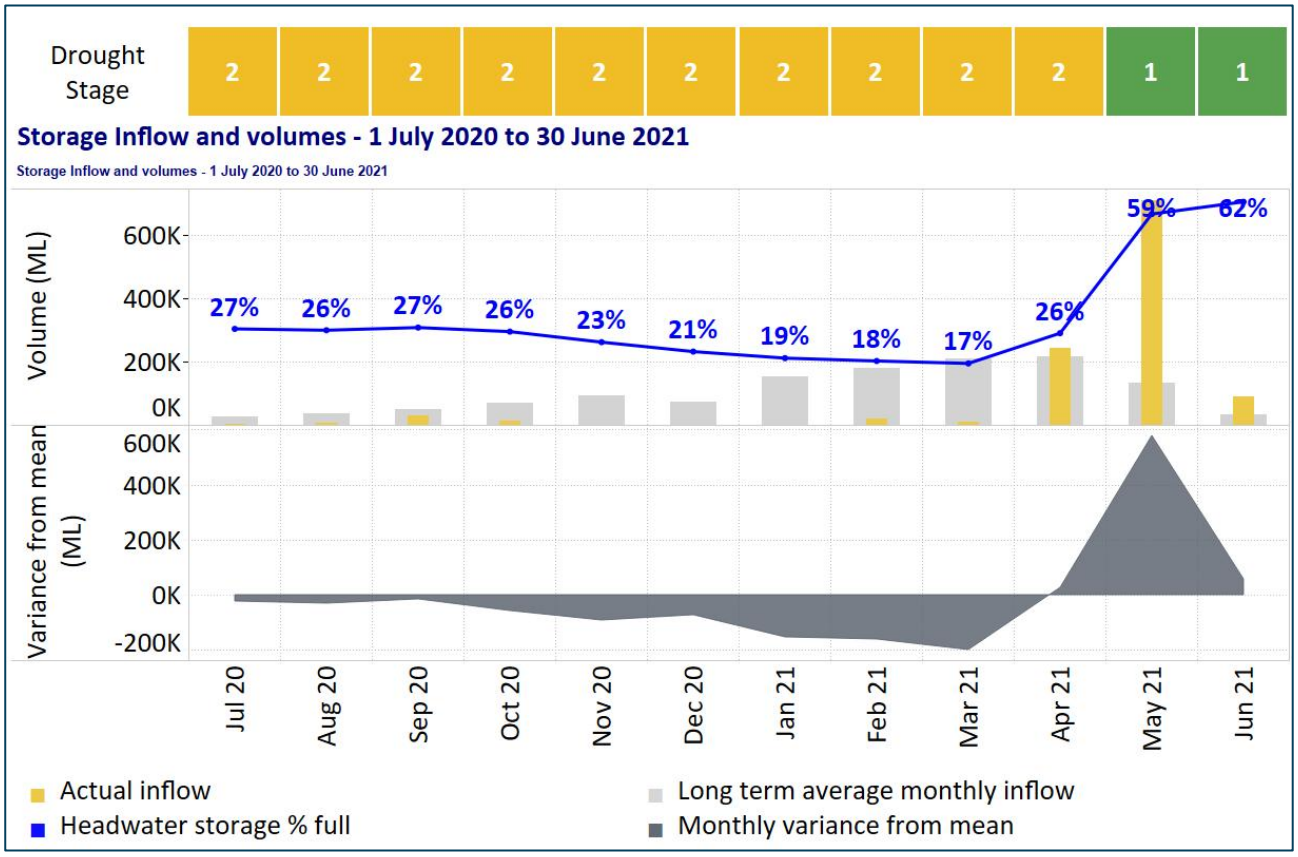
Extreme events stage

- At the commencement of the 2020/21 water year, the Lower Darling was in Stage 2 recovering following the earlier inflows from March 2020 which saw the Lakes improve from almost empty in 2019 to around 30% by July 2020. High security users received a 100% allocation and general security a 30% allocation.
- With further high inflows in April 2021, the Lakes returned to Stage 1 Normal management and general security allocation was increased to 100%.
- By the end of June 2021, the Lakes were holding over 1,000 GL.

Drought measures

- No drought restrictions were required during 2020/21 in the Lower Darling.
- In April 2021, for the first time since 2016, water was diverted into the 2 lower Lakes – Lakes Menindee and Cawndilla.
- The Lakes reached 640 GL in May 2021, the volume at which water can be ordered by the MDBA for the Murray. A release totalling 60 GL occurred in June 2021 over a few weeks to meet Murray requirement (Figure 12).

Figure 12: Drought stage for the reporting period referenced with monthly headwater storage inflows, and monthly storage inflow variance from mean



Access rights

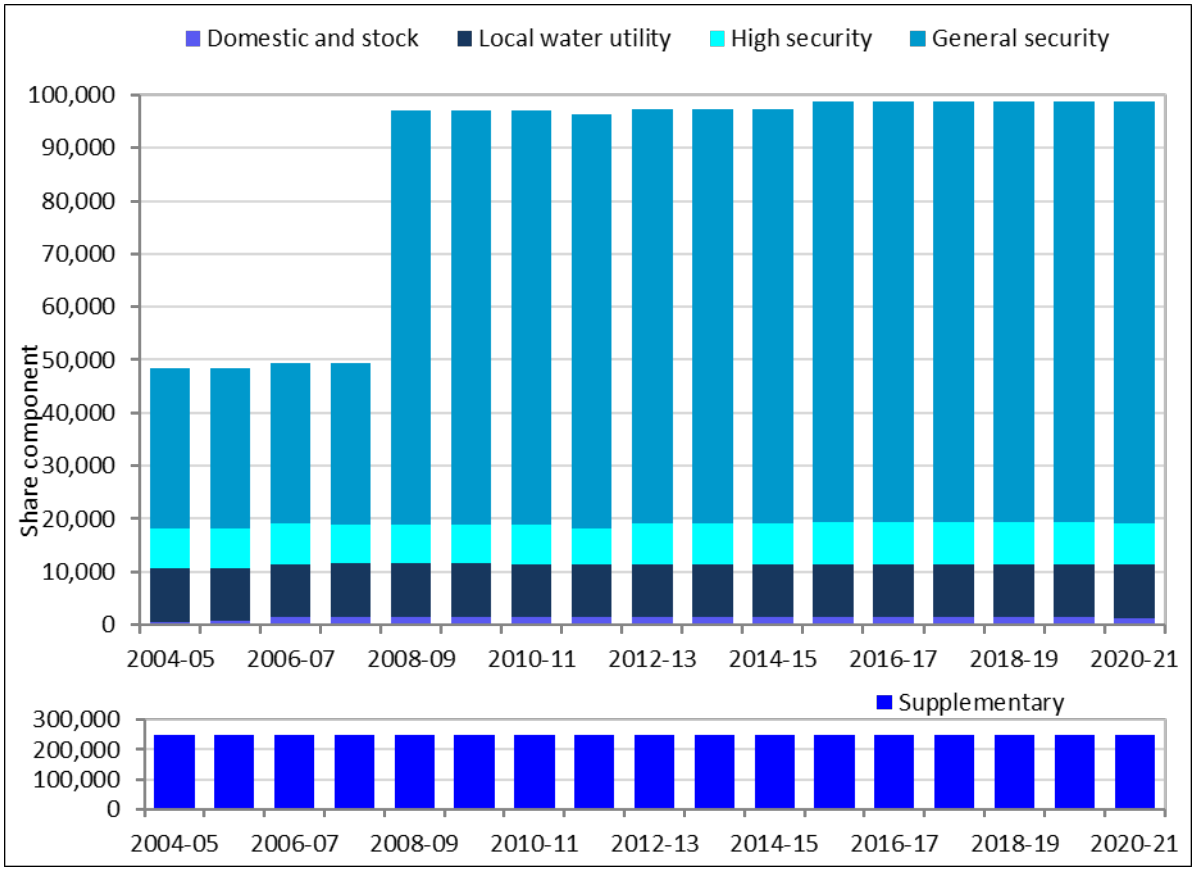
The total issued share component decreased by 27 shares from the previous reporting period, with a total of 348,754 shares on issue (Table 6). The total issued share component by category (under water sharing plan management) is presented in Figure 13.

Table 6: Issued share component on 30 June 2021

Category	Issued share component[6]
Domestic and Stock	311
Domestic and Stock [Domestic]	418
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
Total	**348,754**

[6] 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

Figure 13: Issued share component since the commencement of the water sharing plan (excluding supplementary licences)[7]



System operation

The total combined storage volume in the Menindee Lakes System exceeded 640,000 megalitres in 2020–21, transferring operational responsibility to the Murray Darling Basin Authority. See Note 7 for further details.

Allocation account summary

A summary illustration of the accounting for General Security and High Security access licence categories in the Lower Darling is provided in Figure 14 and Figure 15 respectively. Detailed information on the water accounts for all categories of licence issued are provided in Note 1 of this report.

[7] Increase in entitlement in 2008–09 due to the granting of an environmental licence equivalent to savings obtained through a channel piping program.

Figure 14: Annual water account summary Lower Darling General Security

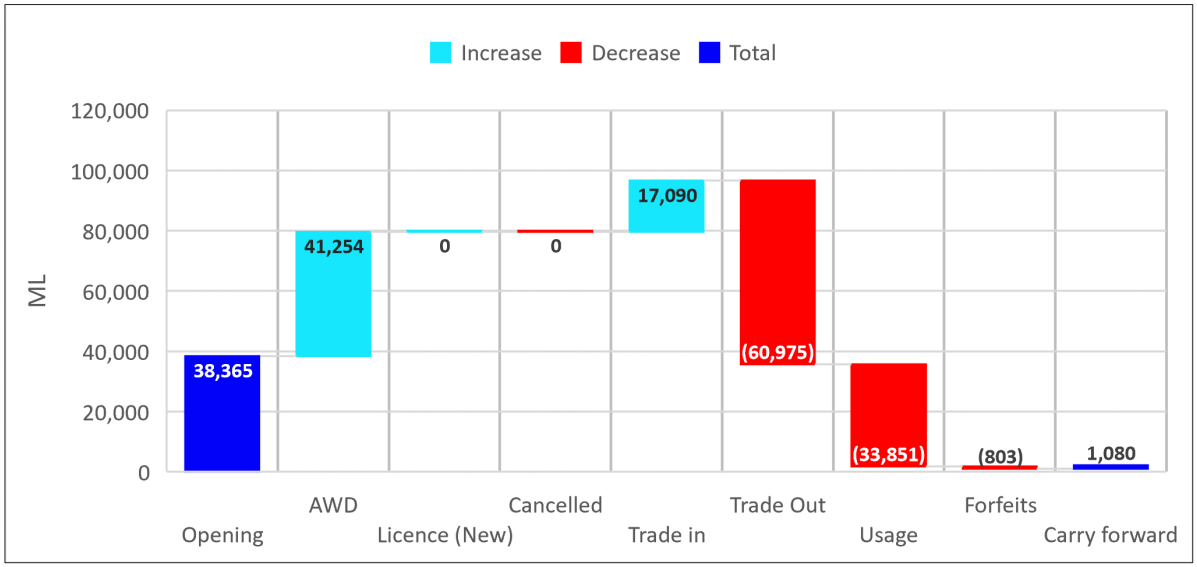
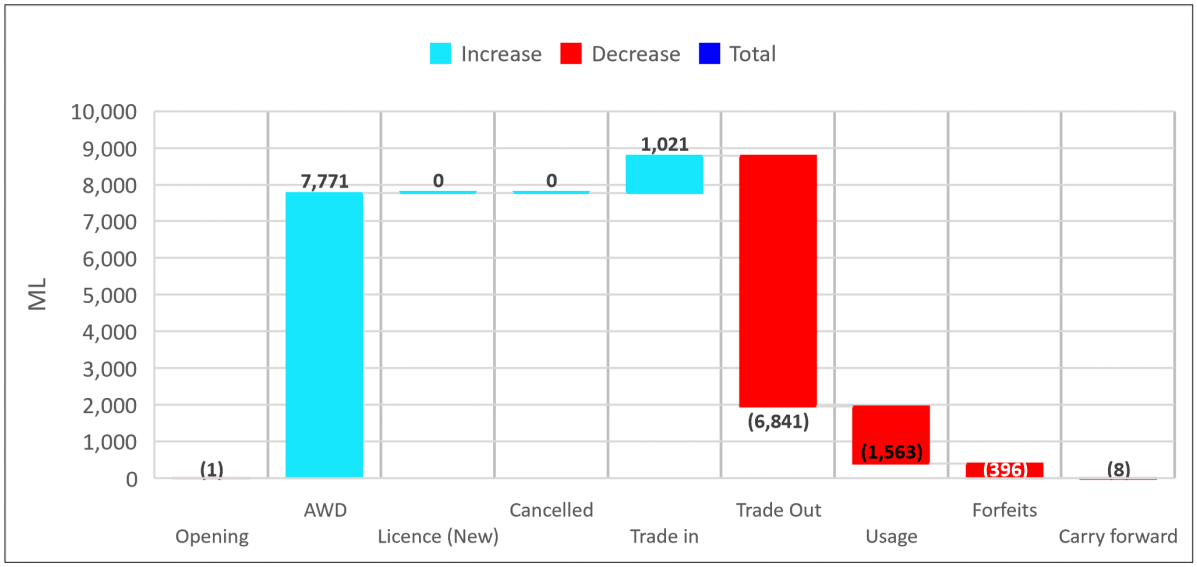


Figure 15: Annual water account summary Lower Darling High Security



Water availability

- Domestic and Stock and Local Water Utility access licence holders received an opening available water determination (AWD) of 100%, the maximum permitted under the water sharing plan. No carryover provision is in place for these categories of licence.
- High Security access licence holders received an opening available water determination (AWD) of 1 megalitres per share (100%), the maximum permitted under the water sharing plan. No carryover provision is in place for High Security access licences.
- Supplementary water access licence holders received an opening AWD of 100%, the maximum allowed for under the water sharing plan.
- General Security access licences carried 38,365 megalitres into the reporting period, equivalent to 48% of the total issued share for this licence category.
- General Security access licences received an opening AWD of 0.3 megalitres per share. Following storage inflows an additional announcement of 0.7 megalitres per share occurred on 15 April 2021, taking the total effective allocation (based on the AWD plus carryover limit) to 100% of the total issued share for this licence category.

- Excluding supplementary access (and temporary restrictions on account water usage) the overall water availability for access licences in the reporting period was 98,892 megalitres, which was the highest since the 2017–18 (Figure 16).
- Historical monthly water availability (carryover and available water determinations) under water sharing plan management conditions is presented for General Security and High Security access licences in Figure 17 and Figure 18 respectively. Periods when temporary water restrictions on usage were applied have been highlighted.

Figure 16: Water availability (AWD plus carry over)[8]

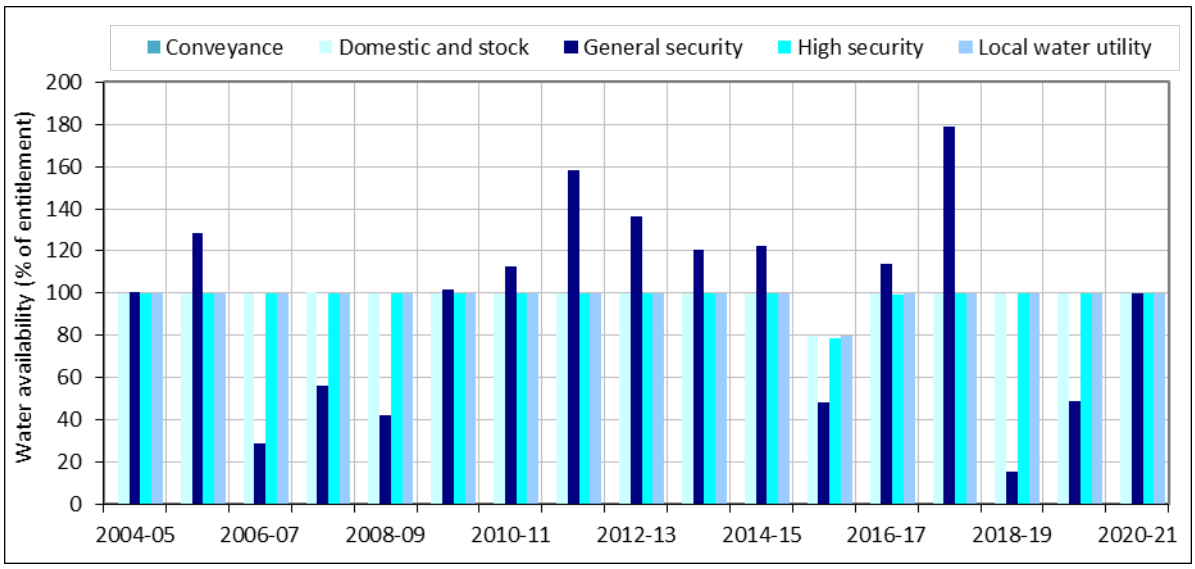
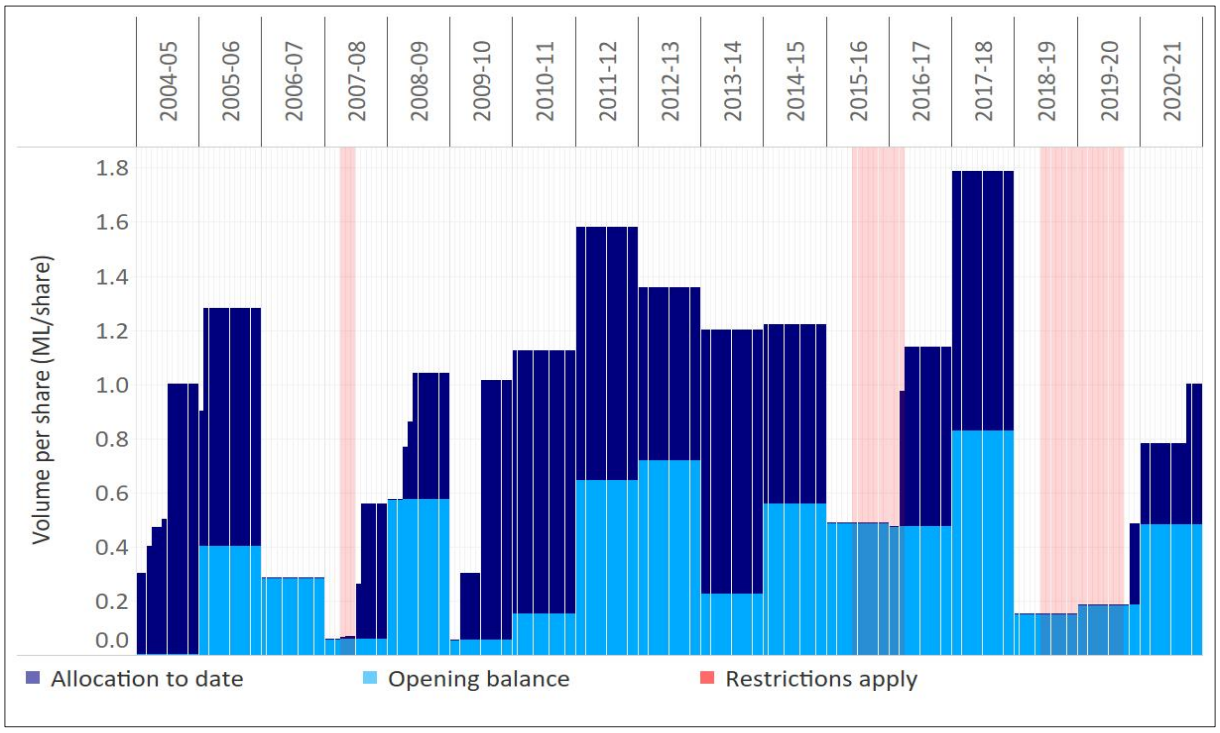
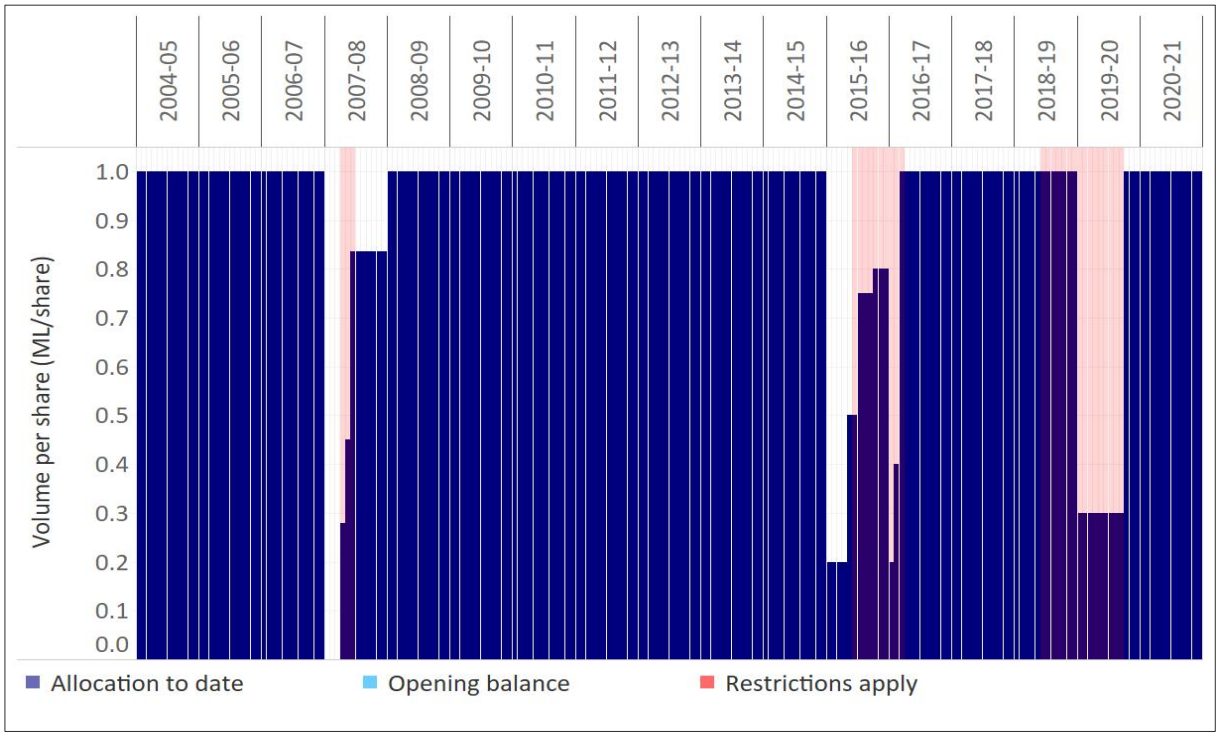


Figure 17: General Security progressive (monthly) carryover and available water determinations as a percentage of share component



[8] 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 18: High Security progressive (monthly) carryover and available water determinations as a percentage of share component



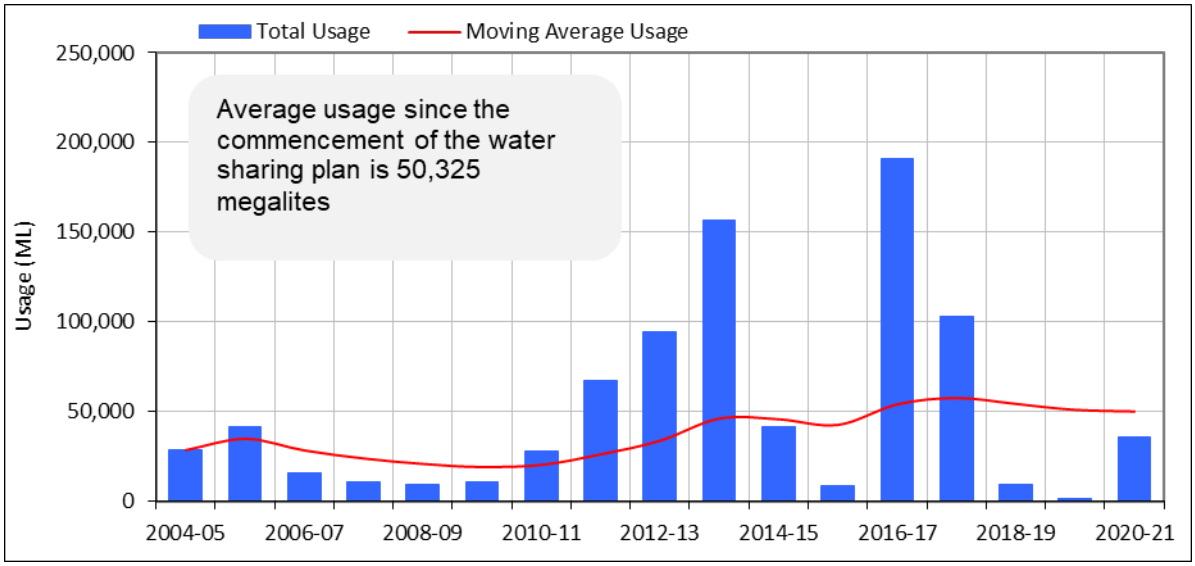
Account usage

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 are additional to account usage.

- Account usage from regulated supply totalled 35,828 megalitres for the reporting period, which was the highest since the 2017–18 water year (Figure 19).
- No supplementary or uncontrolled flow usage has occurred under water sharing plan management conditions[9].
- Average usage (all categories of licence) is 50,325 megalitres (2004–05 to 2020–21)
- Refer to disclosure Note 3 for further usage details.

[9] All supplementary shares are held by the environmental water holder, and flows are kept in system to meet connectivity objectives.

Figure 19: Total annual usage vs moving average since commencement of water sharing plan



Utilisation and inactive share

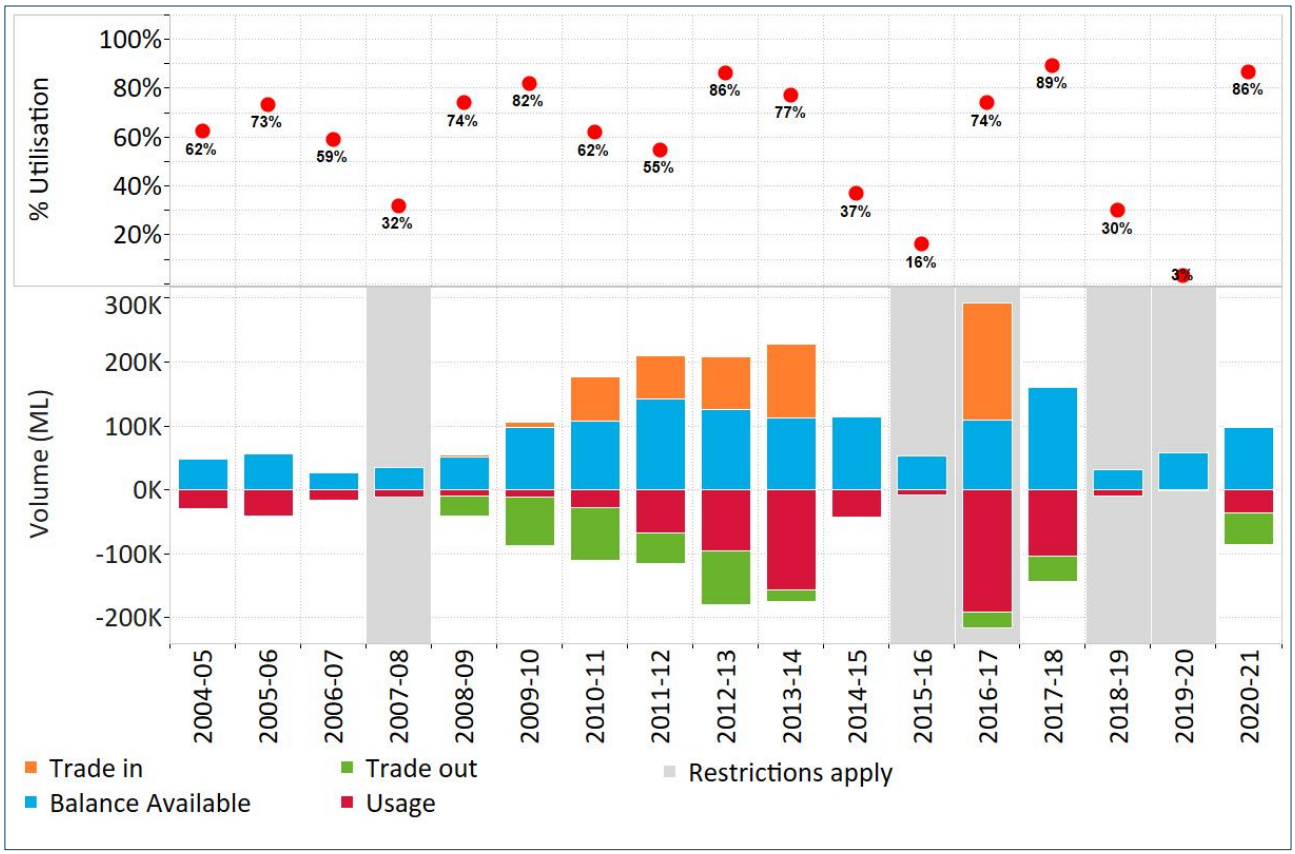
We consider an access licence entitlement inactive if the holding does not use water or access the temporary trade market for the reporting period. Utilisation reflects the amount of water used from regulated supply (this excludes supplementary water) in a specific water year, relative to the maximum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

- 1% of General Security share component was inactive for the reporting period, a decrease of 3% on the prior reporting period (Table 7).
- Considering all categories of access licences with regulated supply, 2% of the share component was inactive, a decrease of 7% 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), increased from 3% to 86%, the second highest under water sharing plan management conditions and reflective of the high water availability and lifting of water use restrictions that were in place during the prior 2 years (Figure 20).

Table 7: NSW Lower Darling Regulated Water Source inactive licence summary 2020–21

Licence category	Inactive licences (number)	Inactive share component	Inactive share component % of total	Inactive share component % of total prior year
Domestic and Stock	8	117	38%	45%
Domestic and Stock [Stock]	2	573	94%	96%
Domestic and Stock [Domestic]	27	76	18%	88%
Local water utility	0	0	0%	0%
Regulated river (General Security)	30	970	1%	4%
Regulated river (High Security)	21	235	3%	49%
Total regulated supply	88	1,971	2%	9%
Supplementary Water	3	250,000	100%	100%

Figure 20: Percentage utilisation (water availability plus net trade in from external water sources against account usage and net trade out to external water sources)[10]

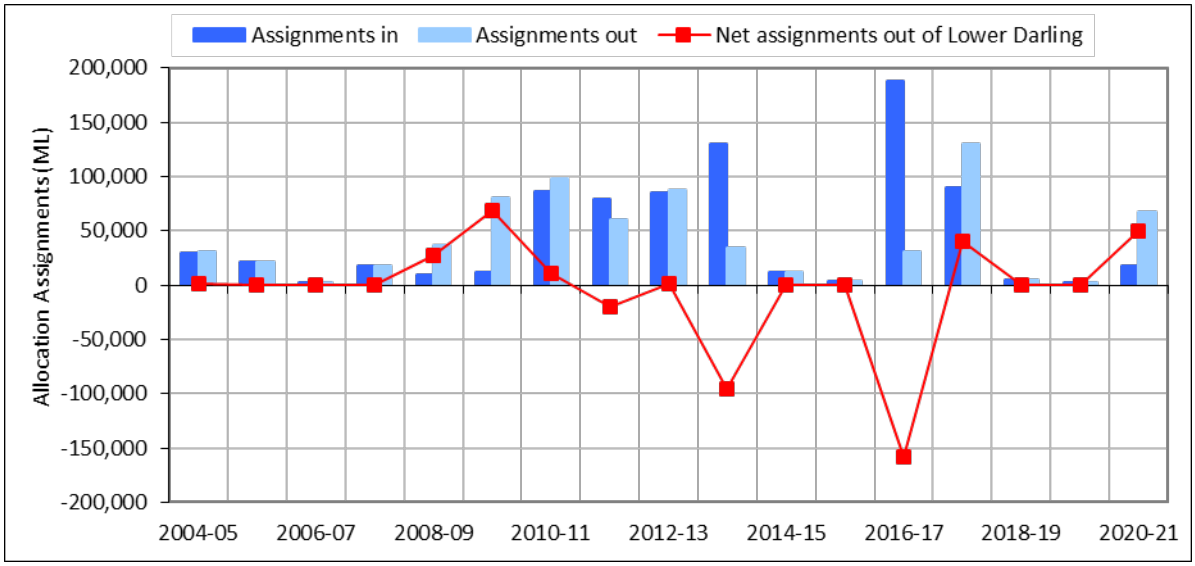


Allocation assignments (temporary trading)

The volume of water moved between accounts via allocation assignments has increased for the period reflective of increased water availability and relaxation restrictions on the use of account water. A total of 18,111 megalitres was assigned in to access licences and 67,816 megalitres assigned out, resulting in a net trade out of the Lower Darling of 49,705 megalitres (Figure 21). This was the first time since 2017–18 a net movement out of the water source has occurred. Detailed information on temporary trading is available in Note 4 of this GPWAR.

[10] Excludes supplementary and account usage restrictions.

Figure 21: Net trade out of the Lower Darling (excluding supplementary)

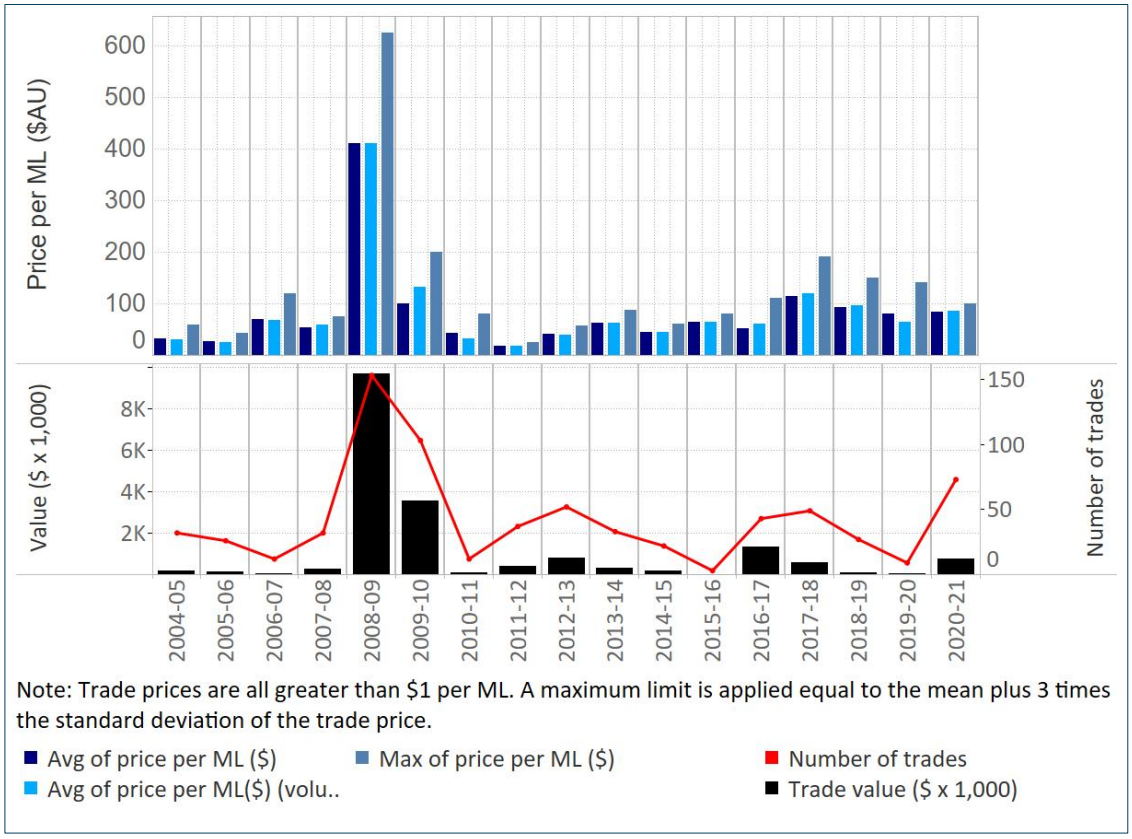


Commercial temporary trading statistics

- A total of 73 transactions were processed for commercial consideration[11] (Figure 22).
- The average price was $84 per megalitre (weighted average $86 per megalitre), up from $80 per megalitre in the prior year.
- The maximum price paid for water was $100 per megalitre.
- The total market value of temporary commercial trade was $753,000, the highest since the 2016-17 water year.

[11] Assumed as trades exchanged for a consideration of greater than $1 per megalitres

Figure 22: Allocation assignments commercial statistics



Permanent trading

There was no High Security share assignment processed in the reporting period for commercial purposes (Figure 24). No General Security shares have been traded since 2013–14 (Figure 23). Overall, the permanent trading market in the Lower Darling (relative to other water sources in the southern Murray Darling Basin) remains subdued (Figure 23 and Figure 24).

In addition to the share assignments, one transfer[12] of licence holder occurred in 2020–21 for commercial purposes (Figure 25).

[12] Transfers associated with a consideration greater than zero. The total for licence transfers was 664 shares via 11 transactions.

Figure 23: Lower Darling permanent assignments of shares since the commencement of the water sharing plan—General Security

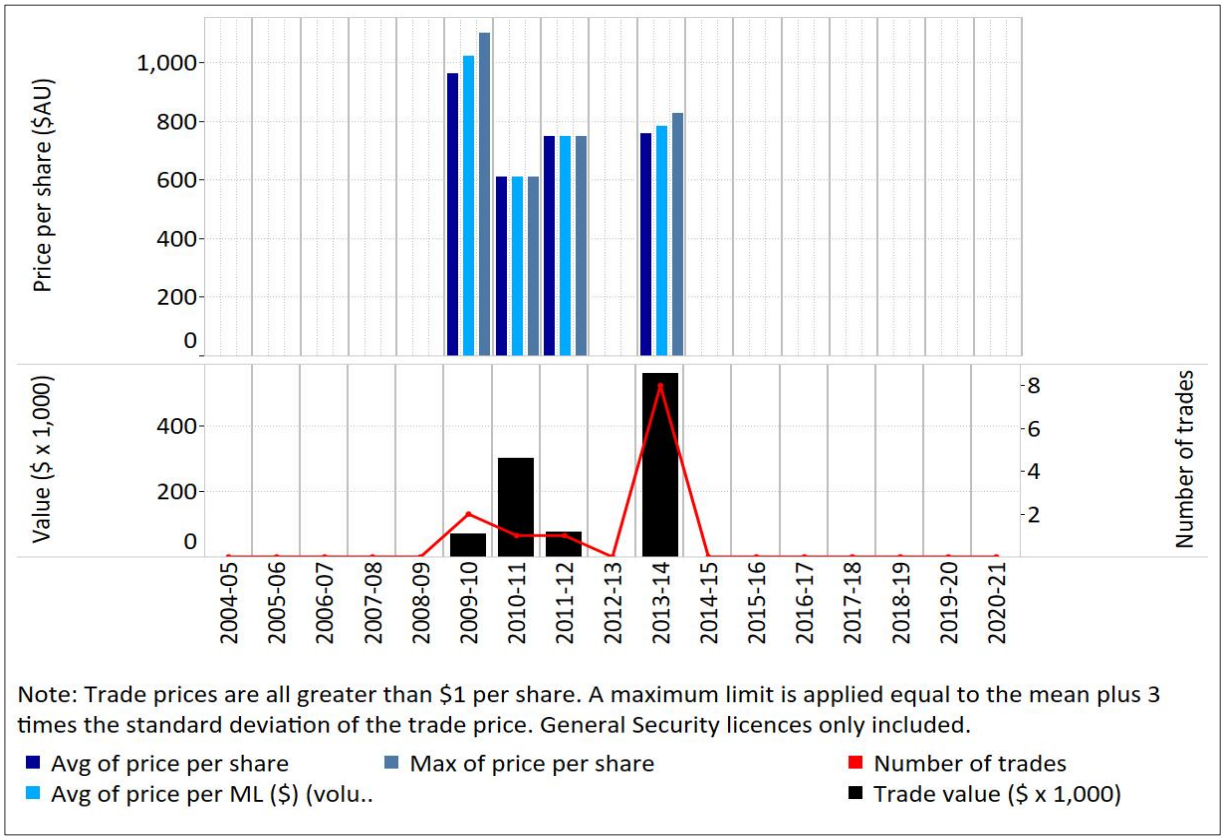


Figure 24: Lower Darling permanent assignments of shares since the commencement of the water sharing plan—High Security

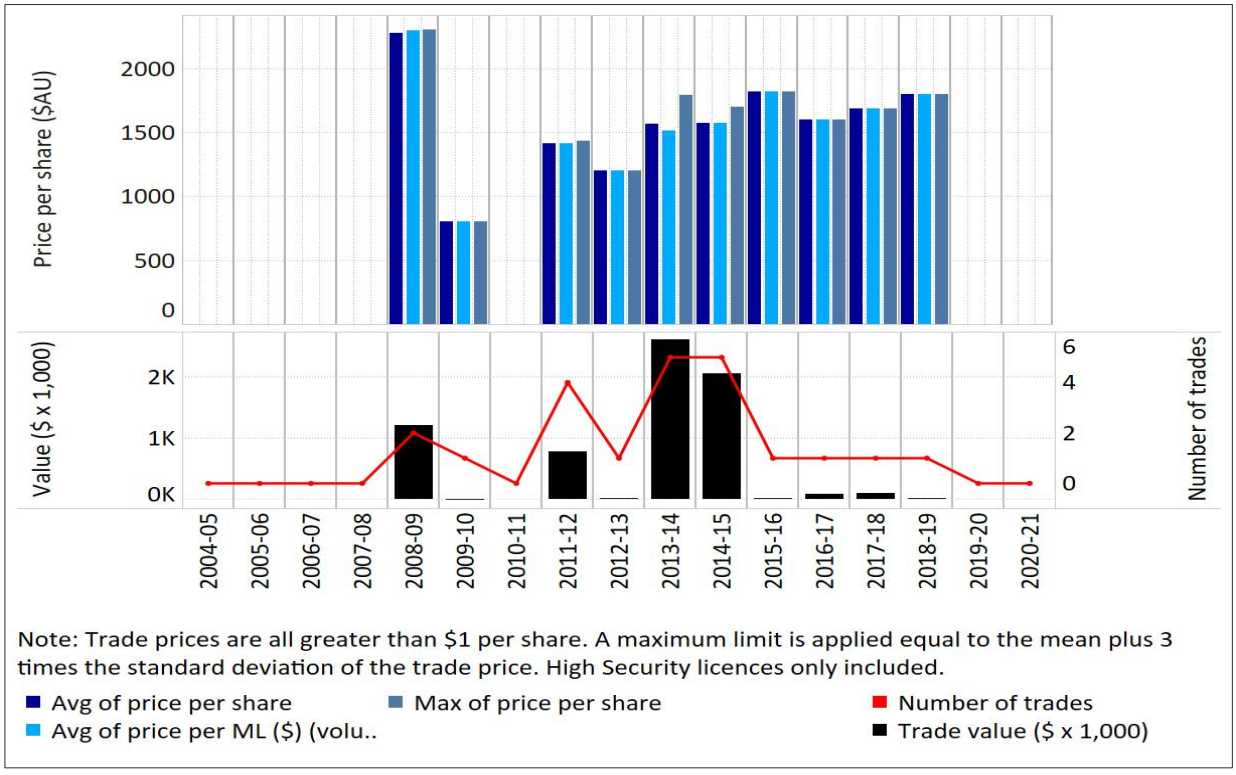
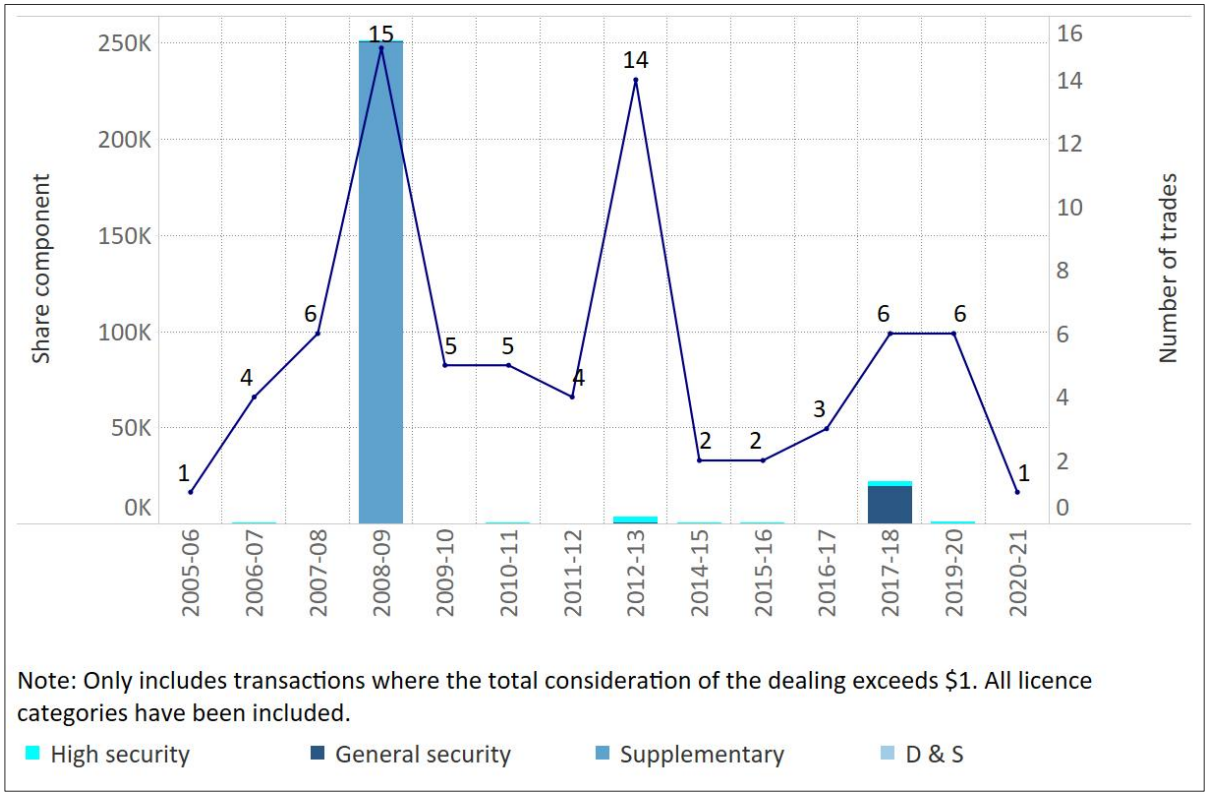


Figure 25: Change of licence holder



Environmental water

There were no changes to the held environmental water portfolio in 2020–21. The total held environmental water share component as of 30 June 2021 was 324,098 shares, which includes a supplementary licence of 250,000 shares (Figure 26).

A total of 32,295 megalitres usage was accounted against general security environmental water holdings (Figure 26). No usage was recorded against high security environmental water holdings.

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

Figure 26: Held environmental water share component in the Lower Darling since the commencement of the water sharing plan

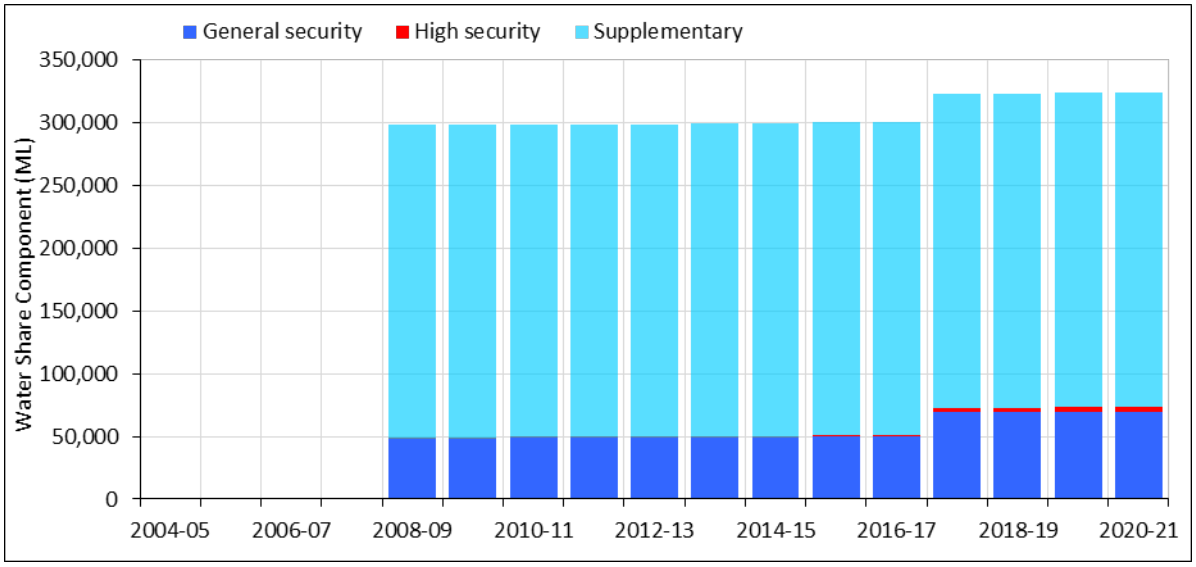
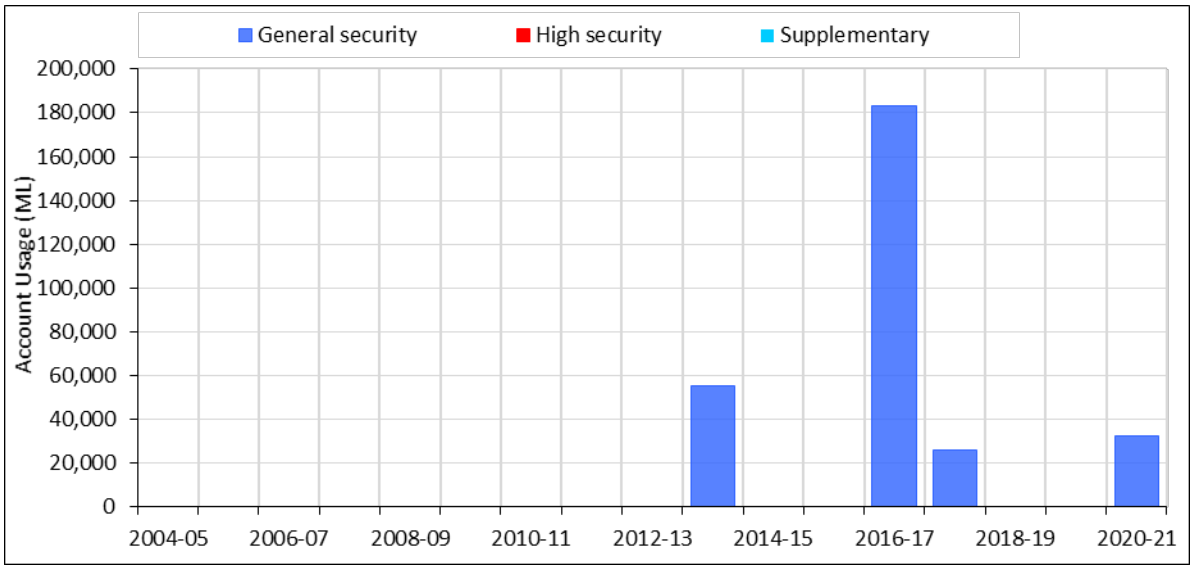


Figure 27: Held environmental usage since commencement of the water sharing plan



Water accounting statements

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 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 and Environment website (www.industry.nsw.gov.au/water).

Quantification of data

Data accuracy

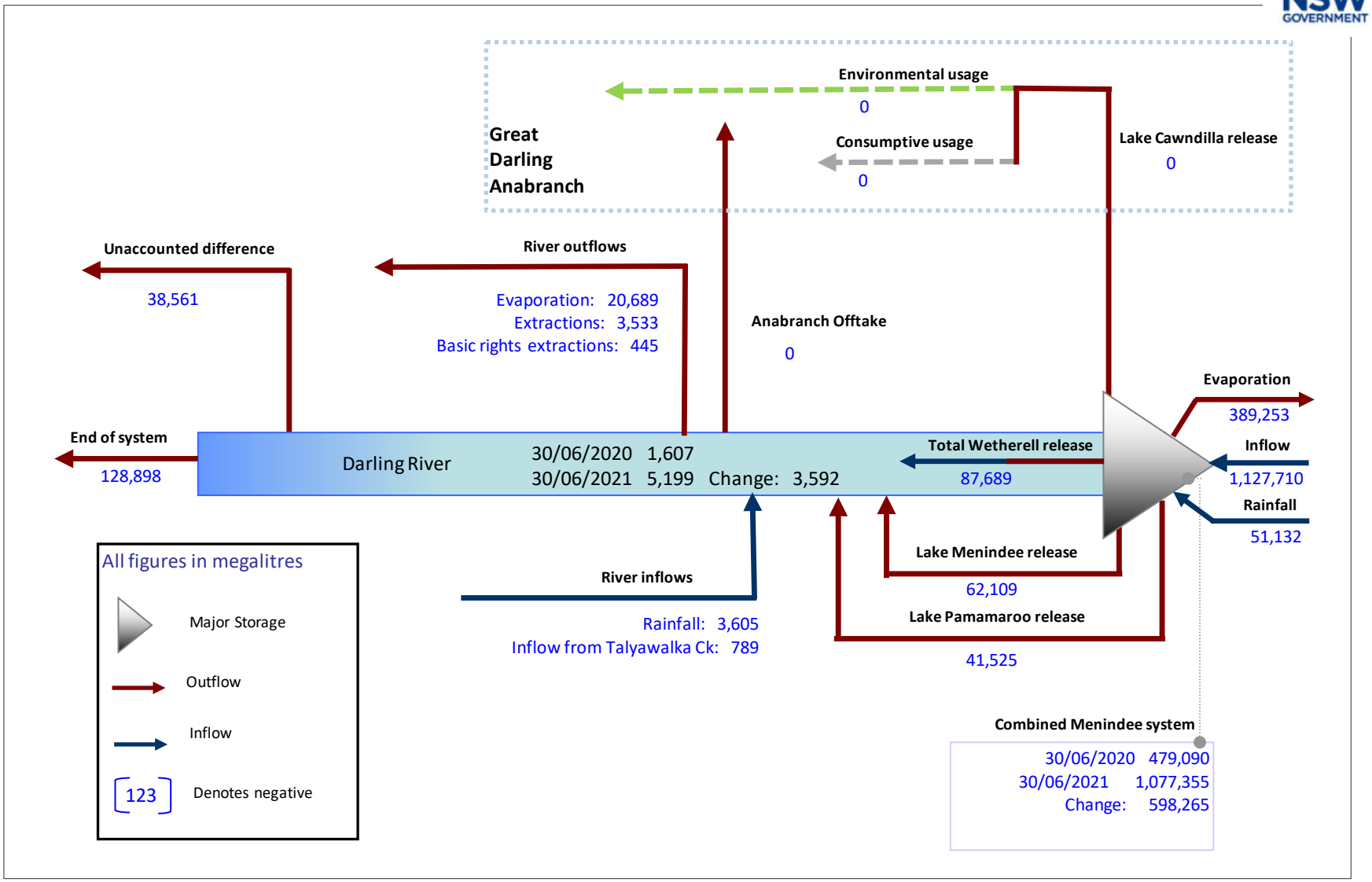
We have gathered the data for water movement and management from a variety of sources and systems. The data ranges from observed values where we anticipate a high degree of accuracy through to modelled results and estimates where accuracy can be highly variable, depending on a range of factors. To improve 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[13]	+/- 0% Data is determined rather than estimated or measured. Therefore, the number contains no inaccuracies.
A	+/- 10%
B	+/- 25%
C	+/- 50%
D	+/- 100%

[13] 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 and Environment corporate database.

2020–21- Physical flows mass balance diagram



Statement of water assets and liabilities

For the year ended 30 June 2021

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

Surface water assets

1. Surface water storage	Accuracy	Notes	30 June 2021	30 June 2020
Combine Menindee System	A	7	1,077,800	479,090
River	B	8	5,199	1,607
Total surface water storage (Asws)	-	-	**1,082,554**	480,697
Change in surface watersStorage	-	-	**601,857**	469,408

Surface water liabilities

2. Allocation account balance	Accuracy	Notes	30 June 2021	30 June 2020
Domestic and Stock	A1	1	0	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	1,080	38,391
High Security	A1	1	(8)	(1)
Total allocation account balance (Lsws)	-	-	**1,072**	38,390
Change in allocation account balance	-	-	**(37,319)**	23,714

3. Environmental contingency account balance	Accuracy	Notes	30 June 2021	30 June2020
ECA (Leca)	A1	6	30,000	0
Change in environmental stimulus flow account balance	-	-	30,000	0

Surface water net changes

4. Net changes	30 June 2021	30 June 2020
Net surface water assets (Asws – Lsws – Leca)	**1,051,482**	**442,307**
Change in net surface water assets	**609,175**	**445,570**

Statement of changes in water assets and liabilities

1 July 2020 to 30 June 2021 (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	2020–21	2019–20
Combined Menindee System	-	-	**-**	-
Inflow	A	9	**1,127,710**	654,663
Rainfall	B	10	**51,132**	8,349
River	-	-	**-**	-
Rainfall	C	11	**3,605**	1,492
Inflow from releases (total)	A	13	**191,324**	66,630
Inflow from Talyawalka Creek	B	12	**789**	0
Total surface water storage increases (Isws)	-	-	**1,374,559**	731,134

Surface water storage decreases	Accuracy	Notes	2020–21	2019–20
Combined Menindee System	-	-	**-**	-
Evaporation	B	10	**389,253**	128,705
Storage releases	-	-	**-**	-
Lake Pamamaroo	A	13	**41,525**	5,410
Main Weir	A	13	**213**	1,200
Lake Wetherell	A	13	**87,476**	60,020
Lake Menindee	A	13	**62,109**	0
Storage release (Anabranch)	-	-	**-**	-
Lake Cawndilla	A	13	**0**	0
Storage rating correction adjustment (decrease)	-	-	**0**	0
River	-	-	**-**	-
Evaporation	C	11	**20,689**	13,182
Flows leaving system	-	-	**-**	-
Anabranch offtake	B	17	**0**	0
End of system	A	14	**128,898**	36,038
Extractions from River	A	15	**3,533**	1,738
Basic Rights extractions (NSW)	C	16	**445**	445
Total surface water storage decreases (Dsws)	-	-	**734,142**	246,738
Unaccounted volume (balancing item) (Usws)	D	18	**38,561**	15,112

Net surface water storage changes	2020–21	2019–20
Net surface water storage inflow (Isws – Dsws – Usws)	**601,857**	469,284

Statement of changes in water assets and liabilities

1 July 2020 to 30 June 2021 (2 of 3)

2. Changes in allocation accounts

Allocation account increases	Accuracy	Notes	2020–21	2019–20
Available water determinations	-	-	-	-
Domestic and Stock	A1	2	**335**	335
Domestic and Stock [Domestic]	A1	2	**421**	421
Domestic and Stock [Stock]	A1	2	**612**	612
Local Water Utility	A1	2	**10,135**	10,135
General Security	A1	2	**41,254**	23,852
High Security	A1	2	**7,771**	7,771
Supplementary demand	-	-	**0**	0
New licences	A1	1	-	-
Internal trade – buyers	A1	4	**18,076**	2,189
Trade in from external	A1	4	**35**	0
Account corrections	A1	19	**(27)**	0
Total allocation increases (Iaa)	-	-	**78,612**	**45,315**

Allocation account decreases	Accuracy	Notes	2020–21	2019–20
Account usage	-	-	-	-
Domestic and Stock	A1	3	**88**	69
Domestic and Stock [Domestic]	A1	3	**128**	37
Domestic and Stock [Stock]	A1	3	**25**	14
Local Water Utility	A1	3	**173**	253
General Security	A1	3	**33,851**	498
High Security	A1	3	**1,563**	869
Supplementary Water	A1	3	**0**	0
Account forfeiture	-	-	-	-
Domestic and Stock	A1	1	**222**	260
Domestic and Stock [Domestic]	A1	1	**290**	384
Domestic and Stock [Stock]	A1	1	**587**	598
Local Water Utility	A1	1	**9,962**	9,882
General Security	A1	1	**803**	1,408
High Security	A1	1	**396**	5,141
Licences cancelled	A1	1	**27**	0
Internal trade – sellers	A1	4	**18,076**	2,189
Trade to external	A1	4	**49,740**	0
Trade allocation account decreases (Daa)	-	-	**115,931**	**21,601**

Net change in allocation accounts	2020–21	2019–20
Net allocation account balance increase (Iaa – Daa)	**(37,319)**	**23,713**

Statement of changes in water assets and liabilities

1 July 2020 to 30 June 2021 (3 of 3)

3. Change in environmental contingency allowance (ECA)

Environmental contingency allowance increases	Accuracy	Notes	2020–21	2019–20
Account credit (Leca)	**A1**	**6**	**30,000**	**0**

Environmental contingency allowance decreases	Accuracy	Notes	2020–21	2019–20
Account usage	A1	6	**0**	0
End of year forfeit	-	-	**0**	0
Total ECA decreases (Deca)	-	-	**0**	**0**
Net environmental stimulus flow account balance increase	-	-	**30,000**	**0**

4. Overall changes

Surface water assets	2020–21	2019–20
Change in net surface water assets (Isws – Dsws – Usws – Iaa + Daa – Ieca + Deca)	**609,175**	**445,570**

Note disclosures

Reconciliation and future prospect descriptions

Lower Darling Catchment: Reconciliation of change in net water asset to net change in physical water storage	2020–21 (ML)	2019–20 (ML)
Change in net surface water assets	**609,175**	**445,571**
Non-physical adjustments		
Net change in allocation accounts	**(37,319)**	**23,714**
Net change in environmental stimulus flow account	**30,000**	**0**
Net change in physical surface water storage	**601,857**	**469,284**

Lower Darling Catchment: Reconciliation of closing water storage to total surface water assets	30 June 2021 (ML)	30 June 2020 (ML)
Closing water storage		
Lake Menindee	286,156	0
Lake Pamamaroo	319,278	329,052
Lake Wetherell	217,106	150,038
Lake Cawndilla	254,815	0
River	5,199	1,607
Total surface water assets	**1,082,554**	**480,697**
Add non-physical surface water assets	**0**	**0**
Subtract other state shares (when system in MDBA control)	**616,140**	**0**
Volume remaining to settle current NSW commitments and future demand	**466,414**	**479,090**

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

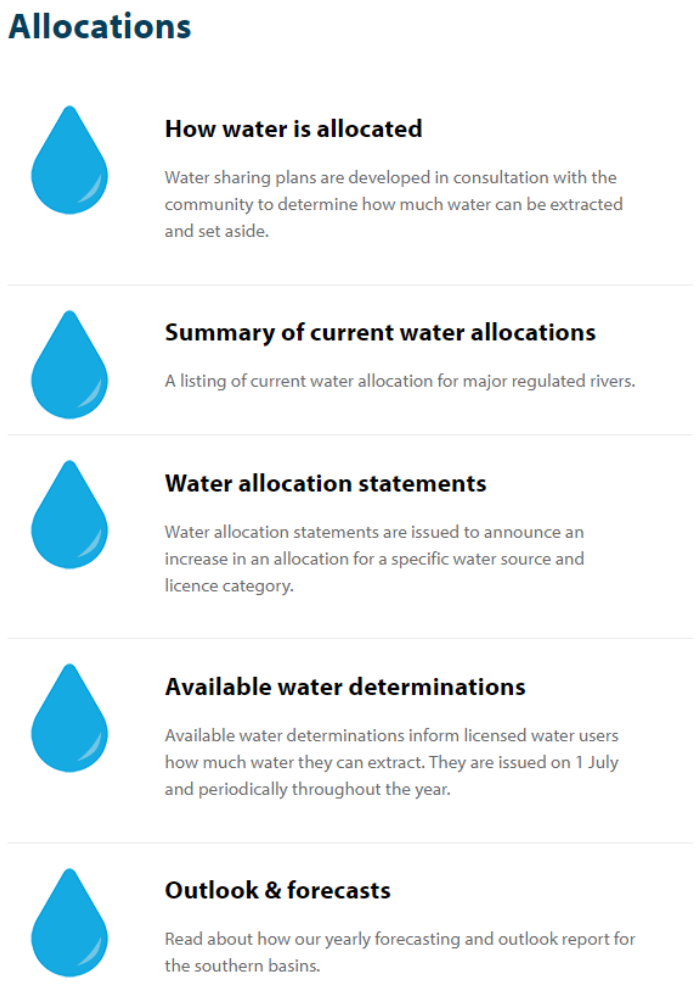
Final datasets for reporting in the GPWAR, including meter readings by field staff, were not available in time to produce an informative 12-month forecast for report users.

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 and Environment webpage at www.industry.nsw.gov.au/water/allocations-availability/allocations

You can also subscribe to receive the latest updates.



Latest storage volumes

See real-time information on storage volumes for the Menindee Lakes storage system at realtimedata.waternsw.com.au

Significant events since 2020–21

Not applicable.

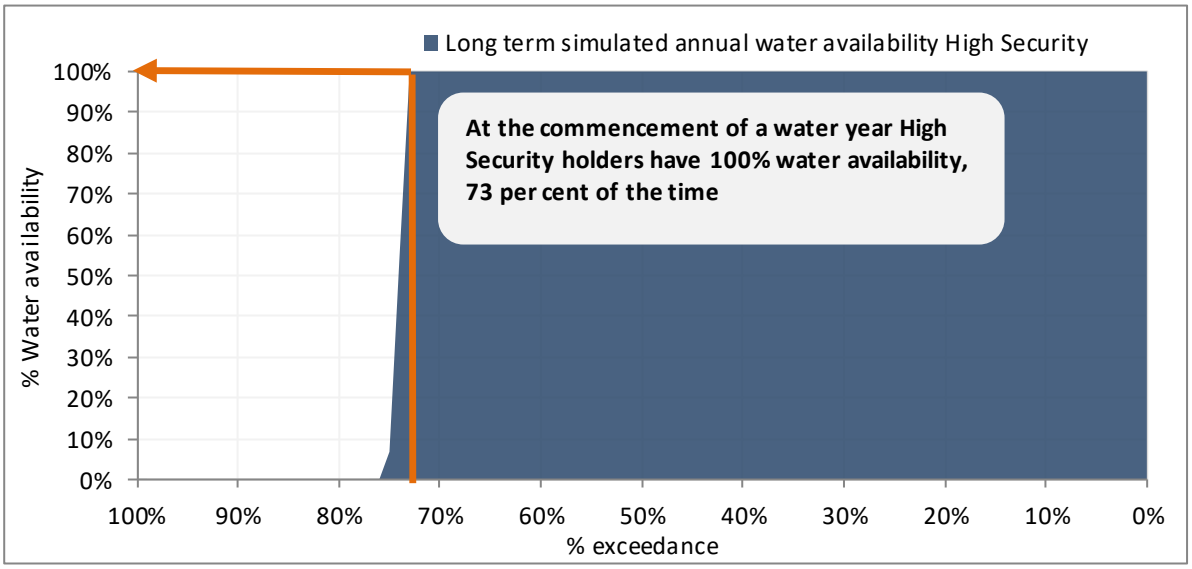
System reliability[14]

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.[15]

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 28). By the end of the water year, effective allocation improves to 100% for 96% of the time (Figure 29).

For General Security holders, long-term opening allocations reach 100% effective allocation 64% of the time (Figure 30). However, by the end of the water year, this significantly increases, with 100% of effective allocation achieved 93% of the time (Figure 31).

Figure 28: Start of water year simulated availability for High Security licences



[14] Models used by MDBA and state water agencies are subject to continuous improvements and updates. The reliability described in this report represents the information available when the report was compiled and may vary from reliability computed in the latest version of the models.
[15] The BIGMOD model simulation uses a water year of July to June. Simulation period 1 July 1895 to 30 June 2008

Figure 29: End of water year simulated availability for High Security licences

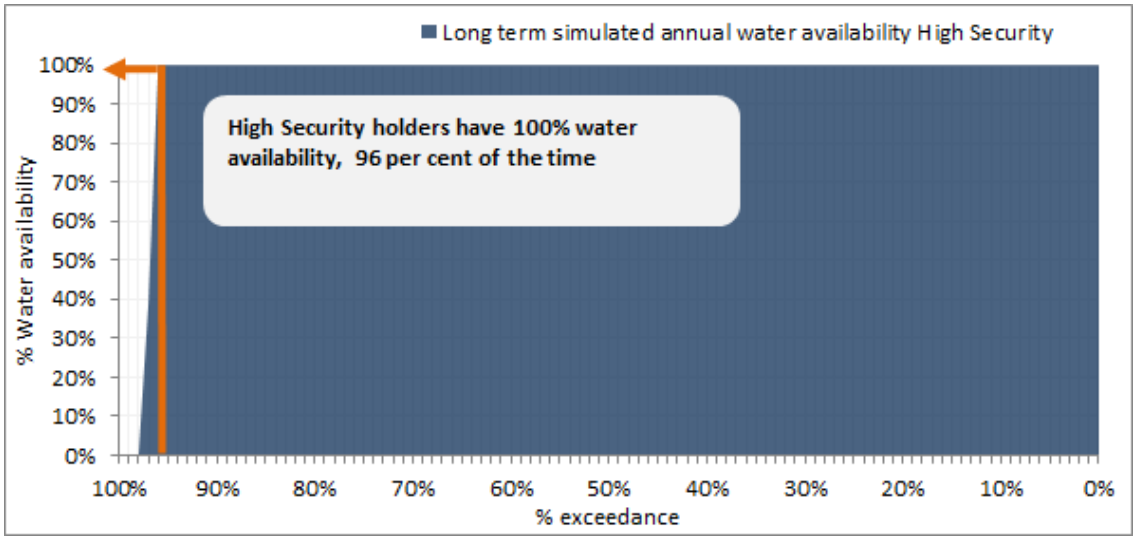


Figure 30: Start of water year availability for General Security licences

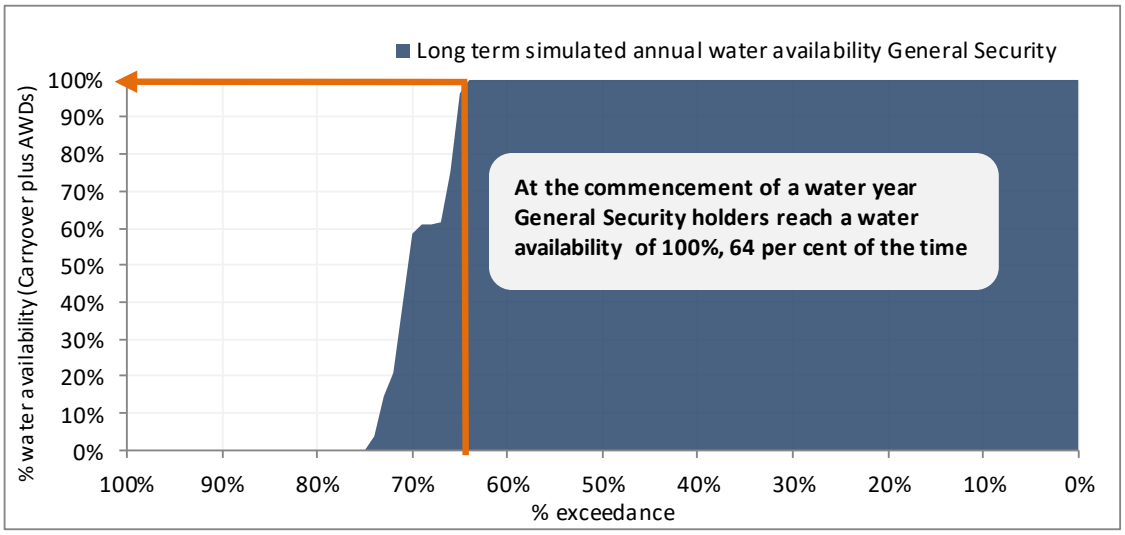
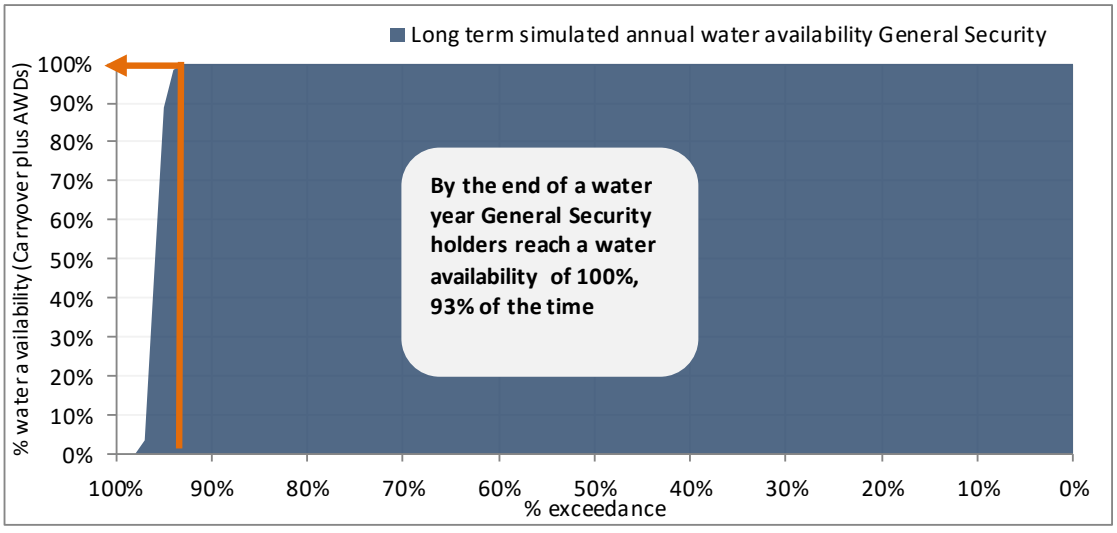


Figure 31: Full water year availability for General Security licences



Carryovers and available water determinations since close of reporting period (2020–21)

Table 9: Carryovers and available water determinations 2020–21 (as of November 2021)

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											
01/Jul/2021	Opening	311	-	-	0.0 %	0.0 %	0	0	0	0.0 %	0.0 %
01/Jul/2021	AWD 100.0 %	311	311	311	100.0 %	100.0 %	311	0	311	100.0 %	100.0 %
Domestic and Stock [Domestic]											
01/Jul/2021	Opening	418	-	-	0.0 %	0.0 %	0	0	(0)	0.0 %	0.0 %
01/Jul/2021	AWD 100.0 %	418	418	418	100.0 %	100.0 %	418	0	418	100.0 %	100.0 %
Domestic and Stock [Stock]											
01/Jul/2021	Opening	612	-	-	0.0 %	0.0 %	0	0	0	0.0 %	0.0 %
01/Jul/2021	AWD 100.0 %	612	612	612	100.0 %	100.0 %	612	0	612	100.0 %	100.0 %
Local Water Utility											
01/Jul/2021	Opening	10,135	-	-	0.0 %	0.0 %	0	0	0	0.0 %	0.0 %
01/Jul/2021	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)											
01/Jul/2021	Opening	79,507	-	-	0.0 %	0.0 %	1,080	0	1,080	1.4 %	1.4 %
01/Jul/2021	AWD 1.0 ML per Share	79,507	78,334	78,334	98.5 %	98.5 %	79,414	0	79,414	99.9 %	99.9 %
Regulated River (High Security)											
01/Jul2021	Opening	7,771	-	-	0.0 %	0.0 %	(8)	0	(8)	(0.1)%	(0.1)%
01/Jul/2021	AWD 1.0 ML per Share	7,771	7,771	7,771	100.0 %	100.0 %	7,763	0	7,763	99.9 %	99.9 %
Supplementary Water											
01/Jul/2021	Opening	250,000	-	-	0.0 %	0.0 %	0	0	0	0.0 %	0.0 %
01/Jul/2021	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 and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A1—Estimated in the range +/- 0%

Providing agency

NSW Department of Planning 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
Licence category		Licence category, as defined in the *Water Management Act 2000*, issued in the water source
Share		This is the total amount of entitlement in the specific licence category.
Opening		The volume of water that has been carried forward from the previous year's allocation account
AWD		Total available water determination—The total annual volume of water added to the allocation account as a result of allocation assessments.
Licences	New	Increase in account water as a result of issuing new access licences
	Cancelled	Decrease in account water as a result of licence cancellation
Assignments	In	Increase in account water as a result of temporary trade in
	Out	Decrease in account water as a result of temporary trade out
Account usage		Volume of water that is extracted or diverted from the river and is accountable against the relevant licence category
During-year forfeit		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.
End-of-year balance	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
End-of-year forfeit		Account water that is forfeited at the end of the water year as a result of carryover rules that restrict the carry forward volume
Carry forward		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 2020–21

Licence category	Share 30 June 2020	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	24	0	0	88	0	222	0	222	0
Domestic and Stock [Domestic]	421	(0)	421	0	3	0	0	128	0	290	0	290	0
Domestic and Stock [Stock]	612	0	612	0	0	0	0	25	0	587	0	587	0
Local Water Utility	10,135	0	10,135	0	0	0	0	173	0	9,962	0	9,962	0
General Security	79,507	38,365	41,254	0	0	17,090	60,975	33,851	0	1,883	0	803	1,080
High Security	7,771	(1)	7,771	0	0	1,021	6,841	1,563	0	388	0	396	(8)
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 and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A1—Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning and Environment

Data source

- Water Accounting System
- Available Water Determination Register: waterregister.waternsw.com.au

Methodology

The AWD procedure itself is generally divided into 2 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[1]	Very high
Local Water Utility	Very high

[1] Domestic and Stock is further broken down into 3 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 2020–21

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											
01/Jul/2020	Opening	335	-	-	0.0 %	0.0 %	0	0	0	0.0 %	0.0 %
01/Jul/2020	AWD 100.0 %	335	335	335	100.0 %	100.0 %	335	0	335	100.0 %	100.0 %
Domestic and Stock [Domestic]											
01/Jul/2020	Opening	421	-	-	0.0 %	0.0 %	(0)	0	(0)	0.0 %	0.0 %
01/Jul/2020	AWD 100.0 %	421	421	421	100.0 %	100.0 %	421	0	421	100.0 %	100.0 %
Domestic and Stock [Stock]											
01/Jul/2020	Opening	612	-	-	0.0 %	0.0 %	0	0	0	0.0 %	0.0 %
01/Jul/2020	AWD 100.0 %	612	612	612	100.0 %	100.0 %	612	0	612	100.0 %	100.0 %
Local Water Utility											
01/Jul/2020	Opening	10,135	-	-	0.0 %	0.0 %	0	0	0	0.0 %	0.0 %
01/Jul/2020	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)											
01/Jul/2020	Opening	79,507	-	-	0.0 %	0.0 %	38,365	0	38,365	48.3 %	48.3 %
01/Jul/2020	AWD 0.3 ML per Share	79,507	23,852	23,852	30.0 %	30.0 %	62,217	0	62,217	78.3 %	78.3 %
15/Apr/2021	AWD 0.7 ML per Share	79,507	17,402	41,254	21.9 %	51.9 %	79,619	0	79,619	100.1 %	100.1 %
Regulated River (High Security)											
01/Jul2020	Opening	7,771	-	-	0.0 %	0.0 %	(1)	0	(1)	0.0 %	0.0 %
01/Jul/2020	AWD 1.0 ML per Share	7,771	7,771	7,771	100.0 %	100.0 %	7,770	0	7,770	100.0 %	100.0
Supplementary Water											
01/Jul/2020	Opening	250,000	-	-	0.0 %	0.0 %	0	0	0	0.0 %	0.0 %
01/Jul/2020	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 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	88
Domestic and Stock [Domestic]	128
Domestic and Stock [Stock]	25
Local Water Utility	173
Regulated River (GS)	33,851
Regulated River (High Security)	1,563
Supplementary Water	0
Total	**35,828**

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 and Environment website at 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

Data accuracy

A1—Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning 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 2020–21

From/To			To water source							
			Lower Darling		NSW Murray		Murrumbidgee	South Australia water source	Victoria water source	
			General Security	High Security	General Security	High Security	General Security	Interstate transfer	Interstate transfer	**Total**
From water source	**Lower Darling**	General Security	12,166.9	148.5	40,616.6	125.0	5,722.0	60.0	2,136.0	**60,975.0**
		High Security	4,888.0	872.5	951.8	11.5	-	-	117.0	**6,840.8**
	NSW Murray	General Security	35.0	-	-	-	-	-	-	**35.0**
	Total		**17,089.9**	**1,021.0**	**41,568.4**	**136.5**	**5,722.0**	**60.0**	**2,253.0**	**67,850.8**

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 and 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 and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning and Environment

Data source

- Water Accounting System
- Available Water Determination Register: 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 18 describes each balance component of the Table 19 summary.

Table 19 summarises held environmental water for the reporting period.

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
Share		This is the total volume of entitlement in the specific licence category.
Opening		The volume of water that has been carried forward from the previous year's allocation account
AWD		The total annual volume of water added to the allocation account as a result of allocation assessments
Licences	**New**	Increase in account water as a result of issuing new access licences
	Cancelled	Decrease in account water as a result of licence cancellation
Assignments	**In**	Increase in account water as a result of temporary trade in
	Out	Decrease in account water as a result of temporary trade out
Account usage		Volume of water that is extracted or diverted from the river under controlled river conditions and is accountable against the licence
During-year forfeit		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.
End-of-year balance	**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
End-of-year forfeit		Account water that is forfeited at the end of the water year as a result of carryover rules that restrict the carry forward volume
Carry forward		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	34,682	34,782	0	0	16,500	53,756	32,295	0	(87)	0	0	(87)
High Security	4,734	0	4,734	0	0	0	4,734	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 2020	Share 30 June 2021	Share Difference	No. Licences 30 June 2020	No. Licences 30 June 2021	No. Licence Difference
General Security	69,364	69,364	0	6	6	0
High Security	4,734	4,734	0	9	9	0
Supplementary Water	250,000	250,000	0	3	3	0

Note 6—Environmental provisions

There are 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 established in the water sharing plan to ensure that the potential for growth in diversions is contained and that 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 and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A1—Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning 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)[17]

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
2020–21	0	30,000	0	30,000

[17] 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 and Environment

Data source

- NSW Department of Planning 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 32 to Figure 35 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 2020 (ML)	Volume 30 June 2021 (ML)	2020–21 Volume % change
Lake Menindee	629,488	71,190	0	286,156	45%
Lake Pamamaroo	277,725	31,730	329,052	319,278	-3%
Lake Wetherell	192,621	11,800	150,038	217,106	35%
Lake Cawndilla	631,052	100,970	0	254,815	40%
Combined Lakes	**1,730,886**	**215,690**	**479,090**	**1,077,355**	34%

Figure 32: Lake Wetherell storage level and effective full storage capacity 2020–21

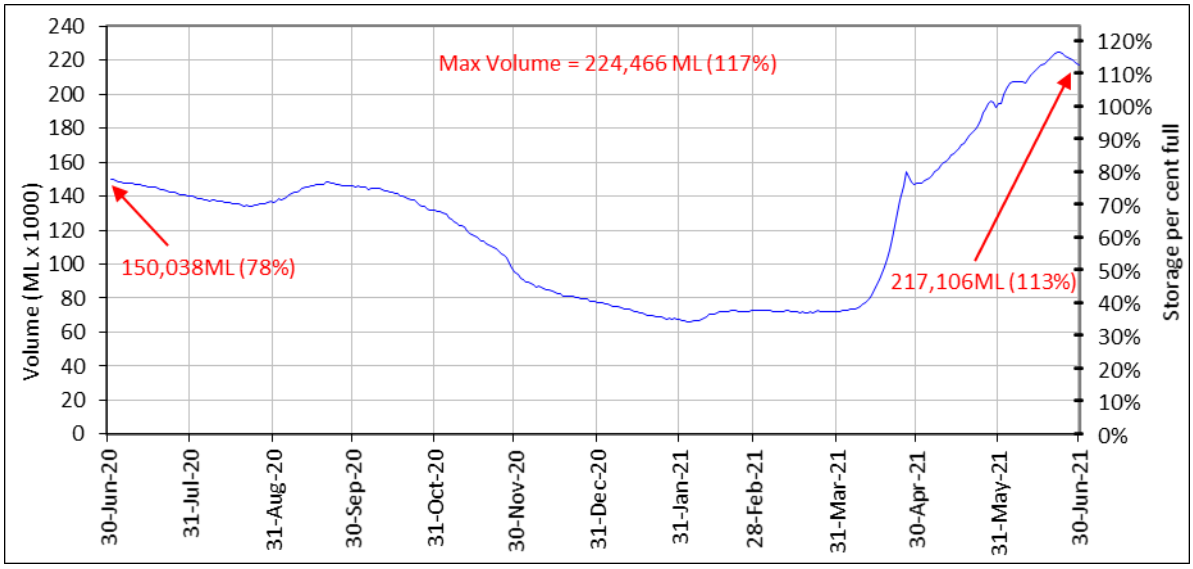


Figure 33: Lake Pamamaroo storage level and effective full storage capacity 2020–21

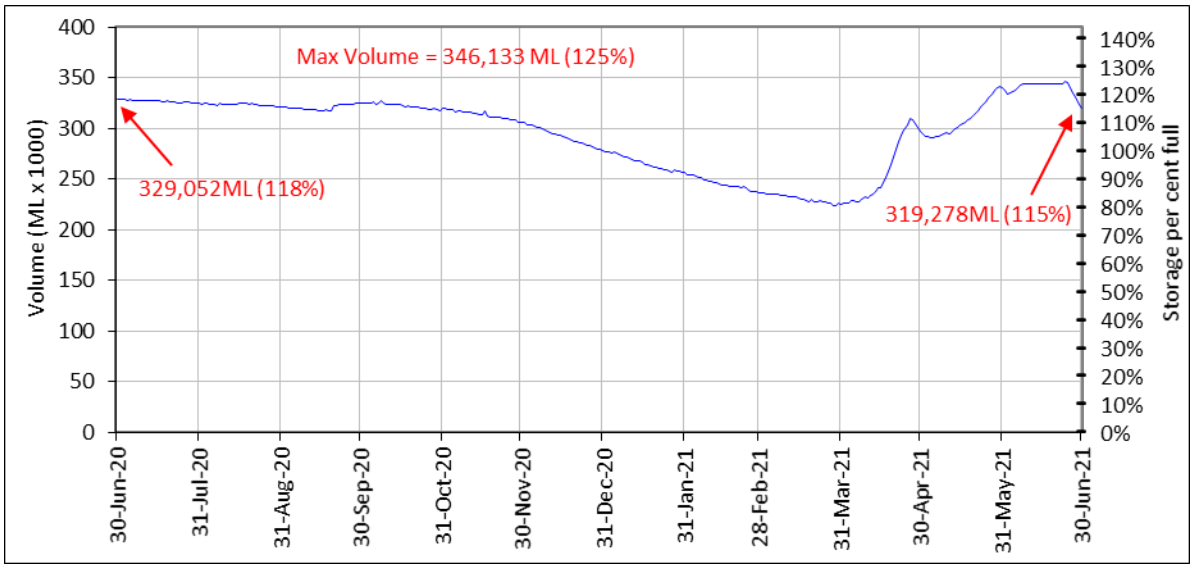


Figure 34: Lake Menindee storage level and effective full storage capacity 2020–21

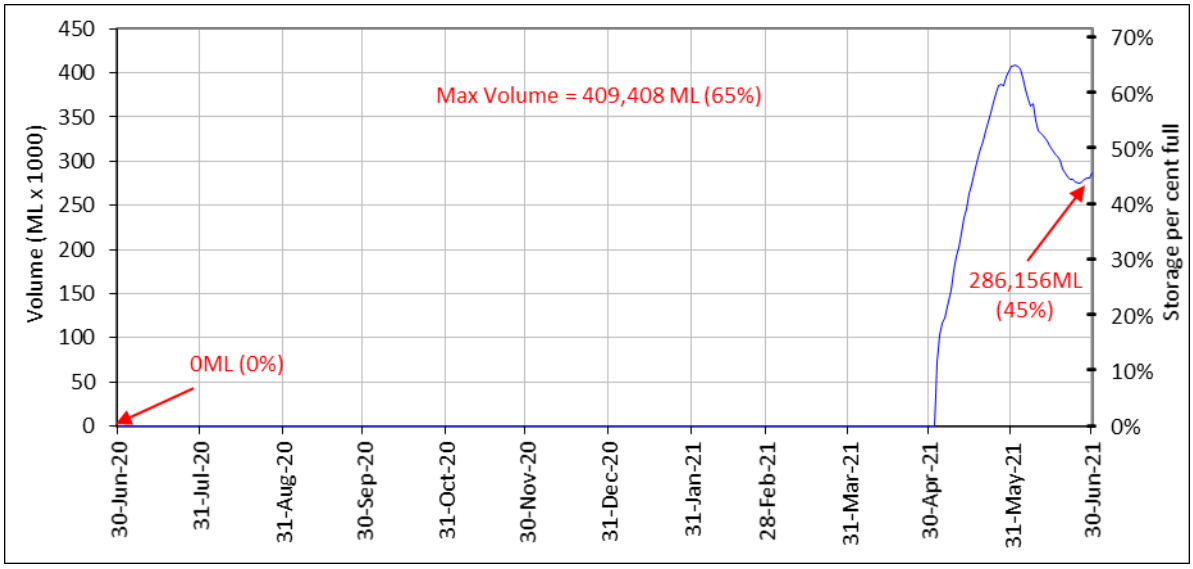
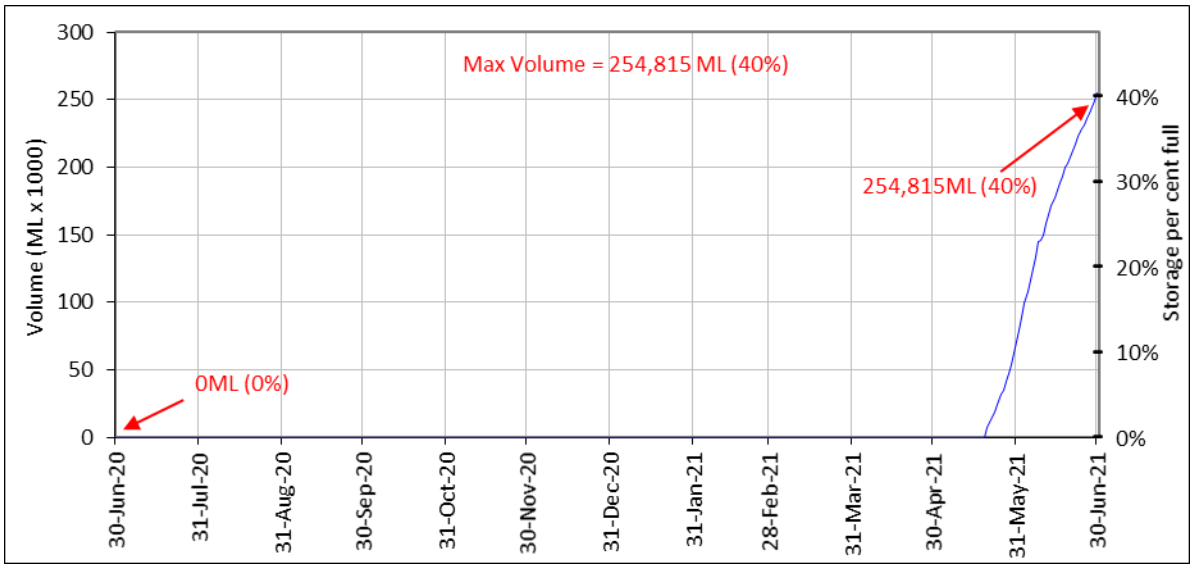


Figure 35: Lake Cawndilla storage level and effective full storage capacity 2020–21



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 and Environment

Data sources

- HYDSTRA
- CAIRO

Methodology

For each river section *i*:

$$V_i = Q_i \times T_i$$

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

$$River\ channel\ storage = \sum_{i}^{n} V_i$$

The formula components are defined in Table 23.

Table 23: Summary of river storage calculation components

Symbol	Variable	Data source	Unit
Q_i	Average flow in the river section. Calculated by averaging the daily flows at the upstream and downstream river gauges.	HYDSTRA	ML/d
V_i	Volume in each river section.	Calculated	ML
T_i	Average travel time for a parcel of water to travel through the river section.	CAIRO	Days
n	Total number of sections in the river		

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 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). The formula components are defined in Table 24.

Table 24: Components for back-calculation of inflow

Symbol	Variable	Unit
I	Inflow	ML/year
ΔS	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 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.

Rainfall Volume (ML) = Rainfall (mm) x Area (Ha)/100

Evaporation Volume (ML) = Pan Evaporation (mm) x Pan Factor x 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 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 2 gauging locations using ArcGIS and as such an area for each reach can be defined.

Area (m^2) = Average W (m) x 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:

$$V = \sum_{i=1}^{n} \left(\frac{R_i \times \mathrm{A}_i}{10^6} \right)$$

Evaporation:

$$V = \sum_{i=1}^{n} \left(\frac{ETO_i \times K_c \times \mathrm{A}_i}{10^6} \right)$$

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^2
ETO	reference evapotranspiration from SILO	mm/day
Kc	Crop coefficient for open water (1.05)	-
n	Total number of days accounted for the water year	-

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 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 the volume of 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

Historical estimates of flow entering the Lower Darling system from Talyawalka Creek is shown in Table 27.

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
2019–20	0
2020–21	789

Note 13—Dam releases, river inflow from dam releases

This refers to the volume of water released from Wetherell, Pamamaroo, Menindee and Cawndilla storages, into the accounted river extent of the Lower Darling.

In the AWAS1 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 Anabranch is considered as a decrease in outflow only (the anabranch is not included as part of the accounted river extent for this GPWAR).

Policy

Not applicable

Data type

Measured data

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning 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

Releases from the lakes for this reporting period is summarised in Table 28.

Table 28: Summary of releases for reporting period

Storage	Release (ML)	Increase to river asset (ML)
Lake Cawndilla[18]	0	N/A
Lake Pamamaroo	41,525	191,324
Lake Wetherell— Outlet	87,476	
Lake Wetherell—Main Weir	213	
Lake Menindee	62,109	

[18] 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 and Environment

Data source

- HYDSTRA

Methodology

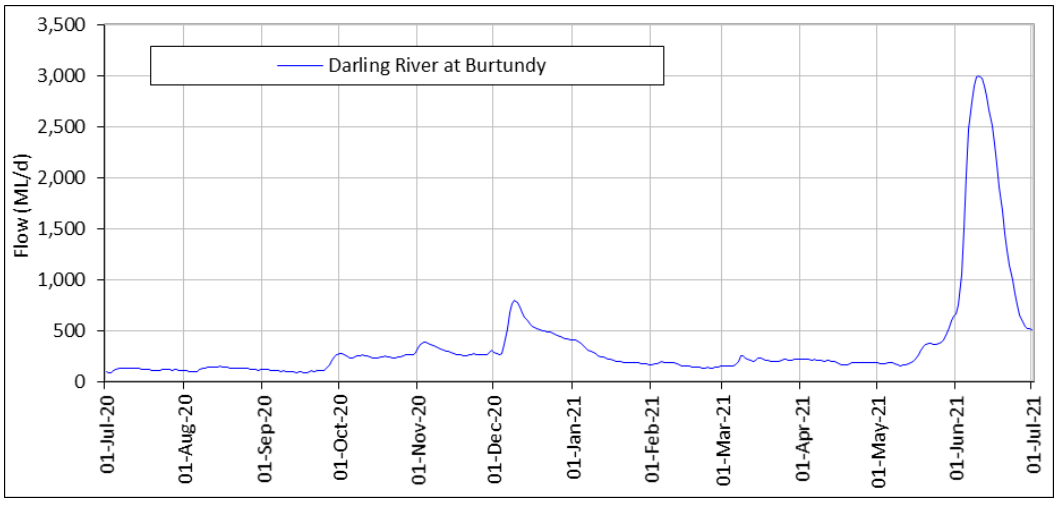
The end-of-system flow is calculated by adding the flows at the specified end of system gauging stations and then subtracting the proportion of this outflow that can be attributed to either replenishment flow or held environmental water. The following table summarises the calculation used to assess the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

End-of-system flow for the reporting period is summarised in Table 29 and illustrated in Figure 36.

Table 29: End-of-system flow summary table

System	Gauging station	Volume (ML)
Lower Darling	425007 | Darling River at Burtundy	128,898

Figure 36: End-of-system flow for Darling River 2020–21



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 Anabranch). 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 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 Anabranch.

Additional information

Extraction from the river for this reporting period is summarised in Table 30.

Table 30: Reconciliation of extraction from river to account usage for reporting period

Item	Volume (ML)
Extractions from River	3,533
Instream usage (not diverted)	32,295
Licenced water ordered to leave system	0
Environmental use—Great Darling Anabranch	0
Consumptive use—Great Darling Anabranch	0
Licence Account usage	**35,828**

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 and Environment website at www.industry.nsw.gov.au/water

Data accuracy

C—Estimated in the range +/- 50%

Providing agency

NSW Department of Planning 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 Anabranch

This figure is water that leaves the main Darling River, in high flow events, via an effluent offtake approximately halfway 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 and Environment

Data source

- HYDSTRA

Methodology

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

For 2020–21 these conditions did not eventuate therefore, no flow was accounted as being diverted at the Darling River at Great Anabranch 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 31).

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 31. 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. A summary of the historical unaccounted differences since reporting under AWAS1 commenced is provided in Table 31.

Table 31: Unaccounted difference summary

Water year	Unaccounted volume	System inflow[19]	Proportion of system inflow[20]
2013–14	(42,488)	235,939	(18)%
2014–15	13,667	70,890	19%
2015–16	5,052	28,957	17%
2016–17	(6,042)	518,753	(0)%
2017–18	32,259	154,226	21 %
2018–19	25,520	55,368	46%
2019–20	15,112	68,122	22%
2020–21	38,561	195,718	20%

[19] Releases passing Menindee lakes system plus rainfall on regulated Darling River plus inflow from Talyawalka Creek
[20] 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 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

An account adjustment was applied for this water account to the general security to correct the opening balance to decrease it by 27 megalitres.

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