



10TH ANNUAL RELEASE

GENERAL PURPOSE WATER ACCOUNTING REPORT

NSW Lachlan and Belubula Catchments

2018–19



Published by NSW Department of Planning, Industry and Environment

dpie.nsw.gov.au

Title: General Purpose Water Accounting Report | NSW Lachlan and Belubula Catchments

Year: 2018–19

ISSN: 2652-4996

Department reference number: PUB20/80

More information

This report may be cited as Burrell M., Moss P., Petrovic J., Ali A., Nicholls D., Ching M. (2020) **General Purpose Water Accounting Report 2018–19: Lachlan Catchment**, NSW Department of Planning, Industry and Environment.

Acknowledgements

Produced by the water information team, NSW Department of Planning, Industry and Environment—Water Group

© State of New South Wales through Department of Planning, Industry and Environment 2020. You may copy, distribute, display, download and otherwise freely deal with this publication for any purpose, provided that you attribute the Department of Planning, Industry and Environment as the owner. However, you must obtain permission if you wish to charge others for access to the publication (other than at cost); include the publication in advertising or a product for sale; modify the publication; or republish the publication on a website. You may freely link to the publication on a departmental website.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (March 2020) and may not be accurate, current or complete. The State of New South Wales (including the NSW Department of Planning, Industry and Environment), the author and the publisher take no responsibility, and will accept no liability, for the accuracy, currency, reliability or correctness of any information included in the document (including material provided by third parties). Readers should make their own inquiries and rely on their own advice when making decisions related to material contained in this publication.

Contents

Director’s foreword	1
Contextual statement	2
Accounting extent.....	3
Snapshot.....	5
Climate.....	5
Storage volumes and inflows.....	9
Major flow events.....	14
Surface water resources and management—Lachlan Catchment.....	14
Extreme events stage and temporary water restrictions (Lachlan).....	16
Surface water resources and management—Belubula Catchment.....	25
Extreme events stage and temporary water restrictions (Belubula).....	26
Environmental Water.....	33
Water Accounting Statements	35
Significant water accounting policies.....	36
Quantification of data.....	36
Belubula 2018–19 physical flows mass balance diagram.....	37
Belubula catchment—Statement of water assets and liabilities.....	38
Belubula catchment—Changes in water assets and liabilities.....	39
Lachlan 2018–19 physical flows mass balance diagram.....	41
Lachlan catchment—Statement of water assets and liabilities.....	42
Lachlan catchment—Changes in water assets and liabilities.....	43
Note Disclosures	45
Reconciliation and future prospect descriptions.....	46
Water assets available to settle water liabilities and future commitments within 12-months of reporting date.....	47
Latest Water Availability.....	47
Significant events since the reporting period.....	48
System reliability/long-term water availability.....	48
Lachlan carryovers and available water determinations 2019–20 (as of January 2020).....	51
Belubula carryovers and available water determinations 2019–20 (as of January 2020).....	52
Detailed item notes	53
Note 1—Allocation accounts.....	53
Note 2—Available water determination (allocation announcement).....	56
Note 3—Allocation account usage.....	61
Note 4—Internal trading (allocation assignments).....	64
Note 5—Spill reset and forfeiture.....	66
Note 6—Held environmental water.....	68
Note 7—Environmental provisions.....	72
Note 8—Surface water storage.....	75

Note 9—River channel storage.....	77
Note 10—Storage inflow—Carcoar and Wyangala	78
Note 11—Storage inflow—Lake Cargelligo and Lake Brewster	79
Note 12—Storage evaporation and storage rainfall	80
Note 13—River evaporation and river rainfall	82
Note 14—Gauged tributary inflow.....	83
Note 15—Ungauged runoff estimate	84
Note 16—Dam releases, river inflow from dam releases	85
Note 17—Regulated effluents.....	88
Note 18—Flow leaving	89
Note 19—Extractions from river.....	91
Note 20—Basic rights.....	93
Note 21—Supplementary/Uncontrolled flows extractions	94
Note 22—Replenishments flows.....	96
Note 23—River and groundwater interaction	97
Note 24—Unaccounted difference.....	98
Note 25—Adjusting entry.....	100

Abbreviations

Acronym	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
Ck	creek
D/S	downstream
DISV	dry inflow sequence volume
EWA	environmental water allowance
GPWAR	general purpose water accounting report
MDBA	Murray–Darling Basin Authority
MIL	Murray Irrigation Limited
ML	megalitres (1,000,000 litres)
ML/d	megalitres per day
MODFLOW	modular, three-dimensional, finite-difference groundwater flow model
SILO	climatic data provision system run by Queensland government for the provision of both measured and modeled data.
U/S	upstream

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

Term	Definition
non-physical transaction	an accounting transaction representing a process that is not a component of the water cycle (e.g. an available water determination)
physical transaction	an accounting transaction representing a process of the water cycle (e.g. an extraction)
regulated river	<p>a river system where flow is controlled via one or more major man-made structures such as dams and weirs</p> <p>For the purposes of the <i>Water Management Act 2000</i>, a regulated river is one that is declared by the minister to be a regulated river. Within a regulated river system, licence holders can order water against a held entitlement.</p>
share component	<p>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</p> <p>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.</p>
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	<p>a smaller river or stream that flows into a larger river or stream</p> <p>Usually a number of smaller tributaries merge to form a river.</p>
ungauged catchment	<p>a catchment without a flow gauge to accurately record stream flows</p> <p>Modelled estimates must be used to approximate the contribution of ungauged catchments to the main river.</p>
water accounting	the systematic process of identifying, recognising, quantifying, reporting, assuring and publishing information about water, the rights or other claims to that water, and the obligations against that water
water assets	the physical water held in storage, as well as any claims to water that are expected to increase the future water resource (e.g. external water entering the system through inter-valley trading)
water liabilities	claims on the water assets of the water report entity including water that has been allocated to licence holder accounts or environmental accounts, but yet to be taken at the end of the reporting period
water sharing plan	a water management plan that defines the rules for sharing of water within a region under the <i>Water Management Act 2000</i>

Director's foreword

This is the tenth release of the annual general-purpose water accounting report (GPWAR) for the regulated, component of the Lachlan and Belubula Regulated River Water Sources. It has been prepared for the accounting period 1 July 2018 to 30 June 2019 (the reporting period) under the Australian Water Accounting Standard 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 the reporting period
- 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 licensed 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
 - available water determination detailed report
 - temporary trading by licence category
 - supplementary announcements and usage by river reach (Belubula)
 - physical inflows and outflows to the system for the water year

Where possible quantification of the physical groundwater interactions with the regulated river water source are provided however detailed groundwater accounting information is not included in this GPWAR.

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

- the information presented in these accounts as a faithful representation of the management and operation of the Lachlan and Belubula Regulated River Water Sources for the reporting period
- all data presented in this report provides the best accounting information available at the time of publication
- NSW Department of Planning, Industry and Environment has to the best of its ability prepared this GPWAR in accordance with the Australian Water Accounting Standard 1.



Danielle Baker

Director Water Analytics

NSW Department of Planning, Industry and Environment

Contextual statement

The Lachlan catchment occupies an area of around 90,000 square kilometres. The Lachlan River begins in the Great Dividing Range near Gunning and flows 1,400 kilometres across western NSW to its junction with the Murrumbidgee River near Oxley. Under normal conditions the Lachlan River is a terminal system with little water flowing past the Great Cumbung Swamp at the end of the river. Only in large flood events does water flow through into the Murrumbidgee River.

The Lachlan River moves through a diverse range of landscapes. The headwaters rise at elevations of up to 1,400 meters and are characterised by rapidly flowing streams with sandy and pebbly beds which flow through a mix of steep forested ranges and cleared grazing lands. The undulating landscape of the middle catchment has been extensively cleared but pockets of remnant vegetation remain. The extensive floodplain environment of the western part of the catchment is generally less than 200 metres in elevation and features many wetlands and effluent streams.

Water in the Lachlan catchment is regulated by Wyangala Dam which was built in 1935 and then enlarged in 1970 to provide a regulated source of water for irrigators and towns along the river. In the Belubula catchment, a tributary of the Lachlan, water is regulated by Carcoar Dam which was built in 1970 to supply water for irrigation and domestic and stock. Several natural lakes have also been modified for use as storages, the largest of these being Lake Cargelligo and Lake Brewster. Irrigated agriculture occurs along the river and its major effluents downstream of Wyangala Dam, and in the Jemalong–Wyldes Plains Irrigation District. Outside of these areas, land use is dominated by grazing and dryland cropping. Groundwater is an important source of water in the western part of the catchment, with a large irrigation industry in the Hillston area reliant on groundwater to produce citrus and vegetable crops.

The Lachlan catchment has been home to Aboriginal people for 40,000 years. Most of the catchment falls within Wiradjuri country but it also includes lands occupied by the Dhurug, Ngunawal and Gundungurra people of the upper catchment, and the Wongaibon, Barindji, Ngiyampaa, Yitha Yitha, Muthi Muthi and Nari Nari in the far west.

The catchment is home to approximately 106,000 people. Of these, around 30% live within the major rural centres of Cowra, Parkes, Forbes and Young which all have populations of 7,000-10,000 people. Smaller towns with populations ranging from 1,000 to 4,000 people include Blayney, Crookwell, Boorowa, Canowindra, Molong and Grenfell in the upper catchment, and Temora, West Wyalong, Condobolin, Lake Cargelligo and Hillston in the mid to lower catchment.

A number of significant wetlands in the catchment are considered of national significance, particularly as waterbird habitat. These include Lake Cowal near Forbes, Lake Brewster, and the Booligal wetlands and Great Cumbung Swamp in the lower Lachlan valley.

A more detailed description of the catchment can be found in the document *Water resources and management overview—Lachlan catchment* which is available from the NSW Department of Planning, Industry and Environment website.

Accounting extent

The accounted river extent is illustrated in Figure 1 and includes the area managed by the water sharing plan for the Lachlan Regulated River Water Source, and the water sharing plan for the Belubula Regulated River Water Source.

Given that these two water sources are managed under separate allocation schemes (and utilise separate physical resources), individual accounting statements have been provided for each.

For the purposes of this GPWAR the Lachlan accounting extent includes the Lachlan River from Wyangala Dam to Booligal, and Willandra Creek to the streamflow gauging station at Willandra Homestead.

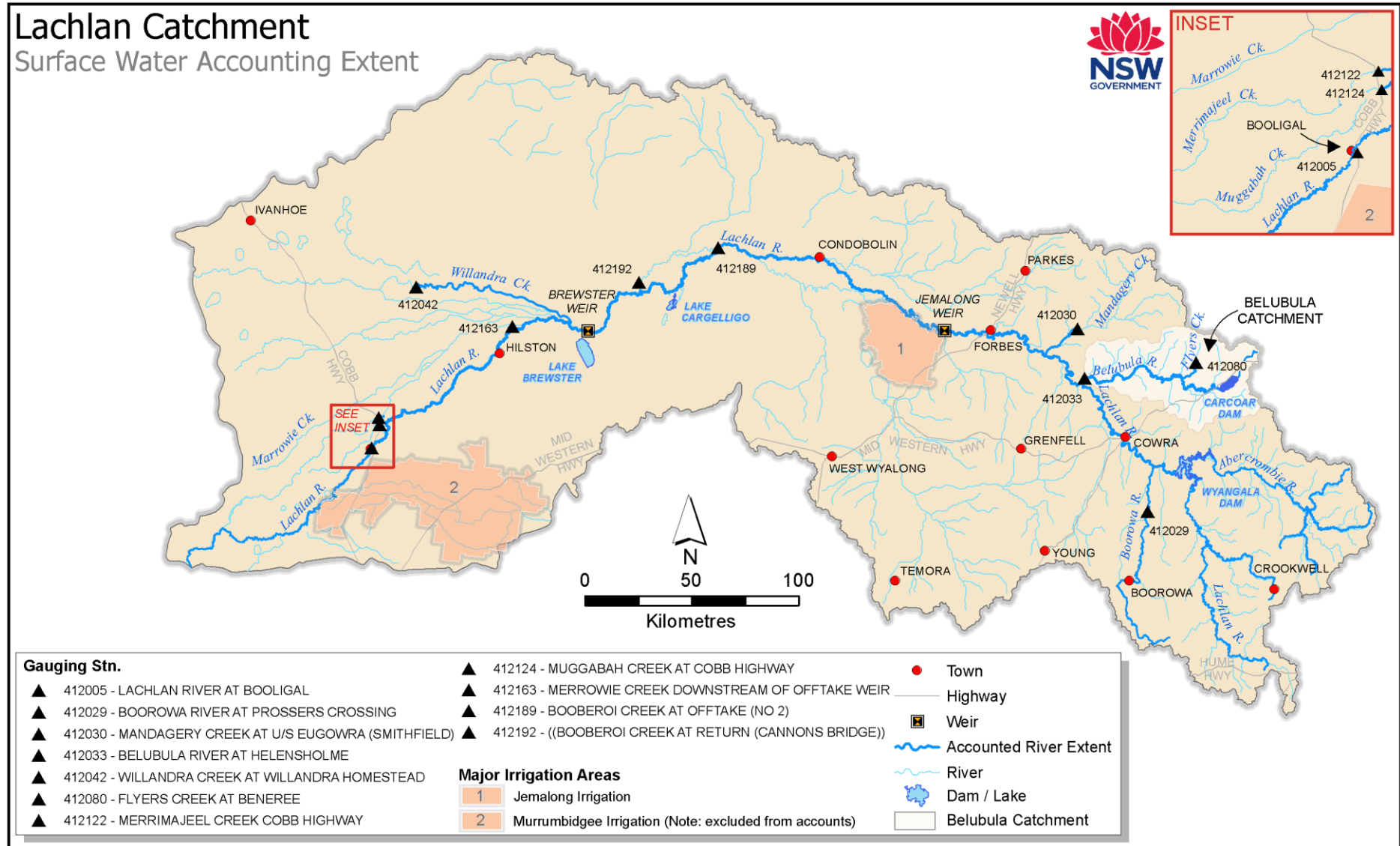
While the unregulated licences and the associated allocations located on the effluents of Merrimajeel Creek and Muggabah Creek are not considered, the flow gauging sites available on these water courses form part of the end of system outflow calculated for the Lachlan Catchment. Gauged inflow for the Lachlan consists of inflow from the Belubula River, Mandagery Creek and the Boorowa River.

The Belubula accounting extent includes the Belubula River from Carcoar Dam to the Belubula River at Helensholme, situated near the river's junction with the Lachlan River. The only gauged inflow available for use in the Belubula is Flyers Creek.

While physical groundwater volumes that interact with the regulated river are included in GPWAR statements where possible¹ (and any interactions not directly estimated form part of the unaccounted difference) all other groundwater flows and groundwater management are excluded from the GPWAR.

¹ Groundwater modelling information on river fluxes for 2018–19 was unavailable at the time of publication and has not been quantified for the reporting period. The process therefore forms a component of the stated unaccounted difference within the physical flow balance of the river. Figures will updated retrospectively in future releases of the GPWAR.

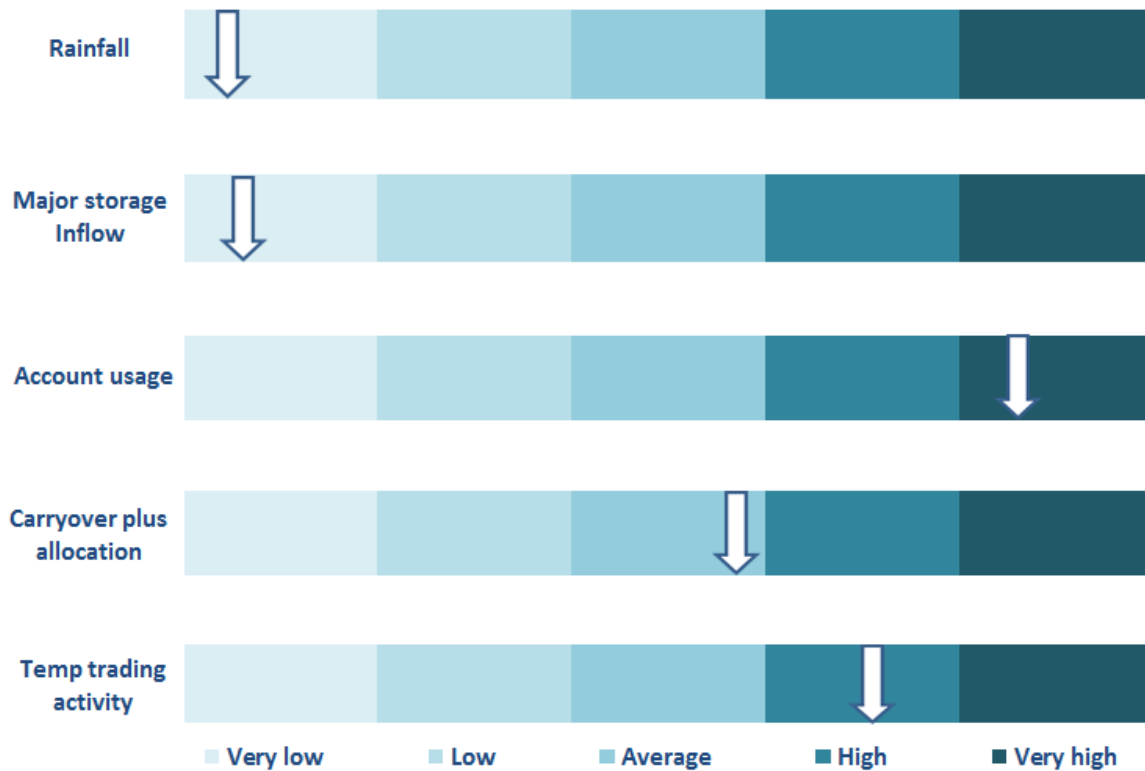
Figure 1: Surface water geographical extent of the accounts



Snapshot

The key indicators for 2018–19 relative to other years under water sharing plan management conditions are presented in Figure 2. The water year experienced very low rainfall and major storage inflows, while account usage was very high following average effective allocations (carryover plus allocation)

Figure 2: 2018–19 Summary indicators



Climate

At Grenfell (middle-upper catchment), 380 mm of rainfall was recorded in the reporting period (Table 1, Figure 3 and Figure 4). Comparatively this volume of rainfall is:

- 65% of the long-term median rainfall for this location
- 32% of the highest rainfall on record at the location
- The majority of rainfall fell in Nov 2018 (71 mm) and Jan 2019 (76 mm)

At Booligal (lower catchment), 248 mm of rainfall was recorded in the reporting period (Table 2, Figure 3 and Figure 4). Comparatively this volume of rainfall is:

- 80% of the long-term median rainfall for this location
- 27% of the highest rainfall on record at the location.

The majority of rainfall fell in November 2018 (43 mm) and May 2019 (58 mm).

Spatially, the rainfall was below mean across the entire extent of the Lachlan (and Belubula) catchment (Figure 5 and Figure 6).

Figure 3: Monthly rainfall data and historical median deviations at Grenfell and Booligal

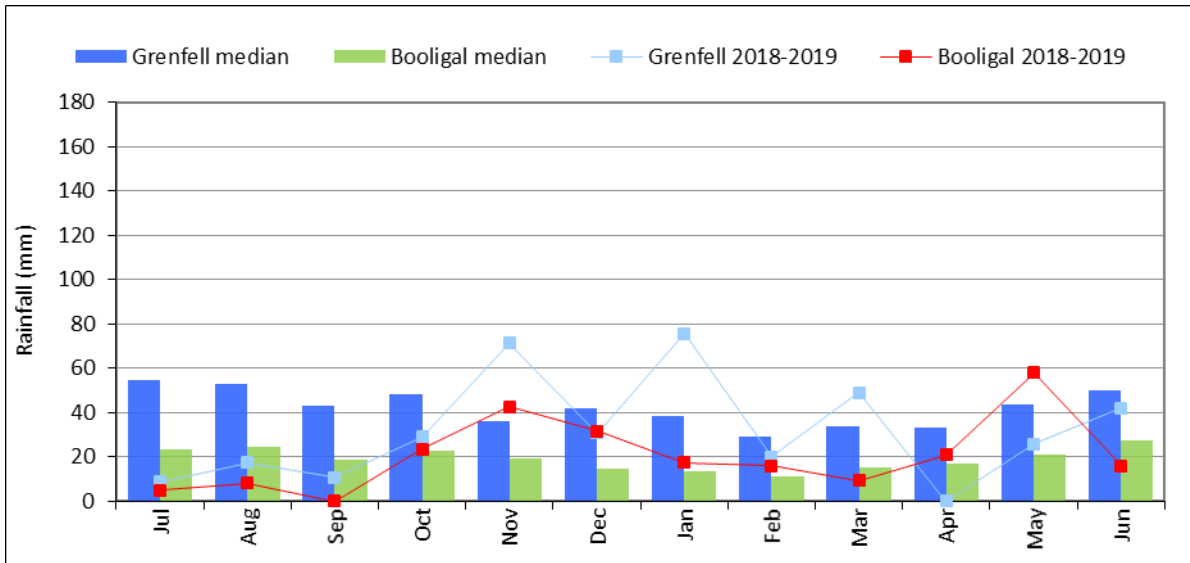


Figure 4: Monthly rainfall data and historical median deviations at Grenfell and Booligal

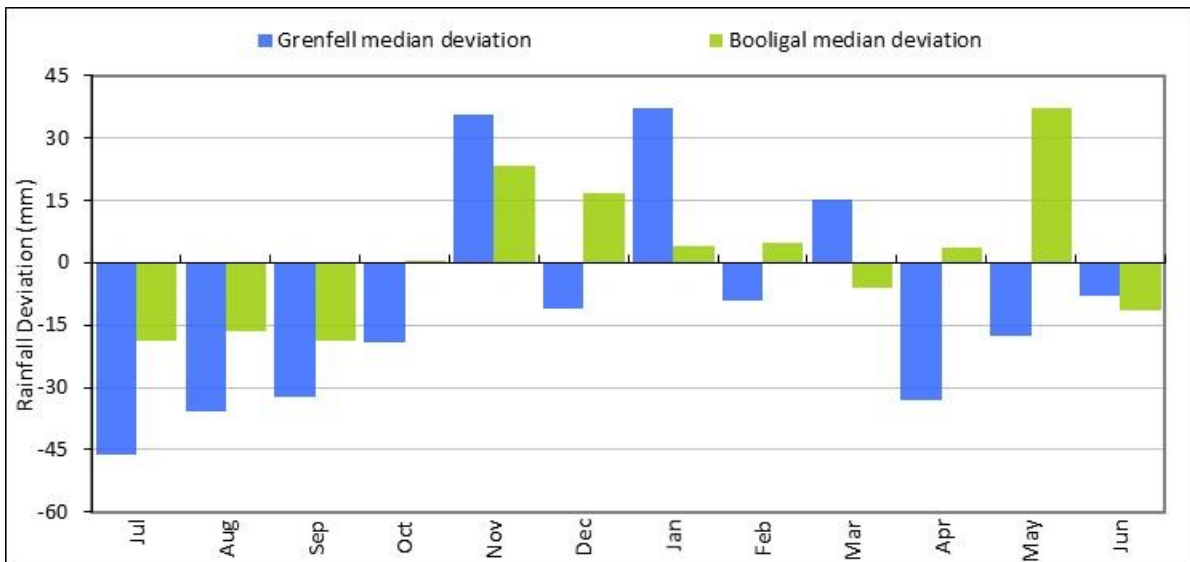


Table 1: 2018–19 monthly rainfall and historic monthly rainfall statistics at Grenfell²

Grenfel	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Annual
2018–19	8.6	17.4	10.6	29.0	71.4	30.6	75.6	20.0	49.0	0.0	25.8	42.0	380.0
Historic mean	56.2	55.6	50.8	54.5	50.6	55.8	52.0	47.5	49.0	46.2	49.5	57.7	625.2
Historic median	54.9	53.0	42.9	48.1	35.8	41.7	38.3	29.0	33.9	33.2	43.5	50.2	583.5
Historic low	2.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	297.2
Historic high	189.8	144.6	233.8	180.2	230.4	239.1	289.8	223.9	236.4	344.4	200.9	176.2	1203.9
Year of high³	1993	1886	2016	1973	2010	1947	1983	1956	1950	1990	1931	1923	1886-87

Table 2: 2018–19 monthly rainfall and historic monthly rainfall statistics at Booligal³

Booligal	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Annual
2018–19	5.0	8.0	0.0	23.5	42.7	31.5	17.5	16.0	9.4	20.8	58.1	15.8	248.3
Historic mean	26.7	27.2	25.6	31.7	25.2	26.1	26.4	24.9	29.8	23.8	31.4	31.5	329.0
Historic median	23.6	24.4	18.8	22.9	19.4	14.7	13.6	11.2	15.3	17.1	21.0	27.2	311.0
Historic low	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	107.3
Historic high	90.9	73.2	110.3	168.1	132.0	152.6	257.0	159.0	263.8	136.5	127.6	139.5	932.1
Year of high	1956	1907	1998	2010	1912	1992	1974	1947	1989	1988	1968	1923	1973-74

² Long-term statistics are from the Bureau of Meteorology using the climatic stations '73014—Grenfell (Manganese Road)' and '75007—Booligal (Belmont)'. Historic record statistics are 1886 to current for Grenfell and 1890 to current for Booligal

³ Calendar year for monthly high and water year (July to June) for annual high

Figure 5: Annual rainfall for 2018–19

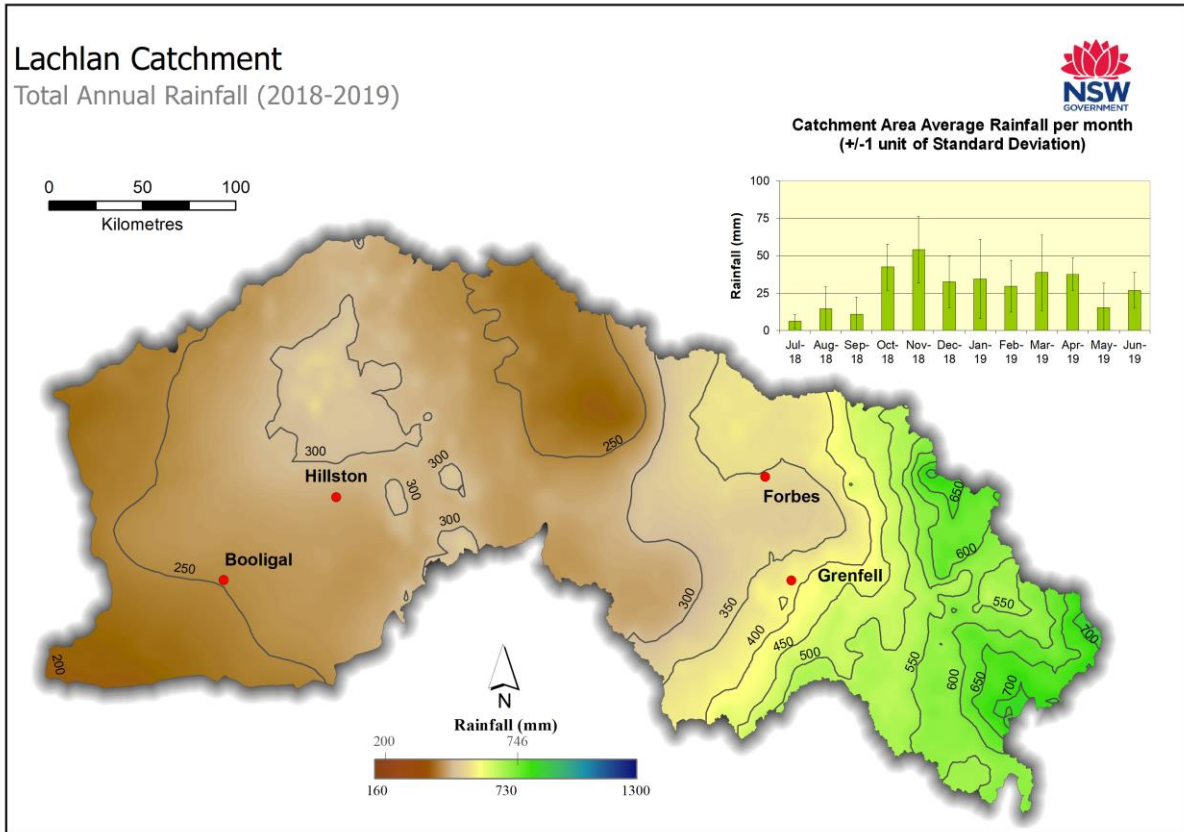
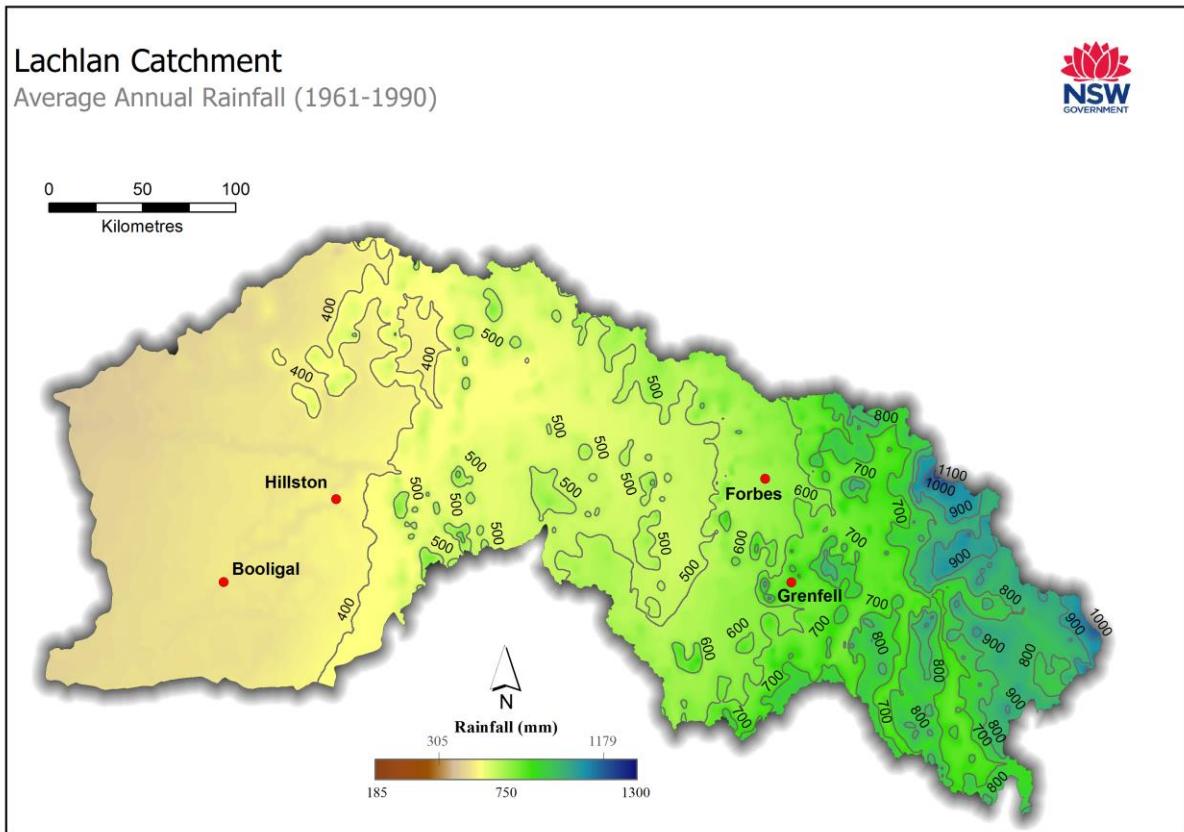


Figure 6: Average annual rainfall in the Lachlan catchment (1961–90)



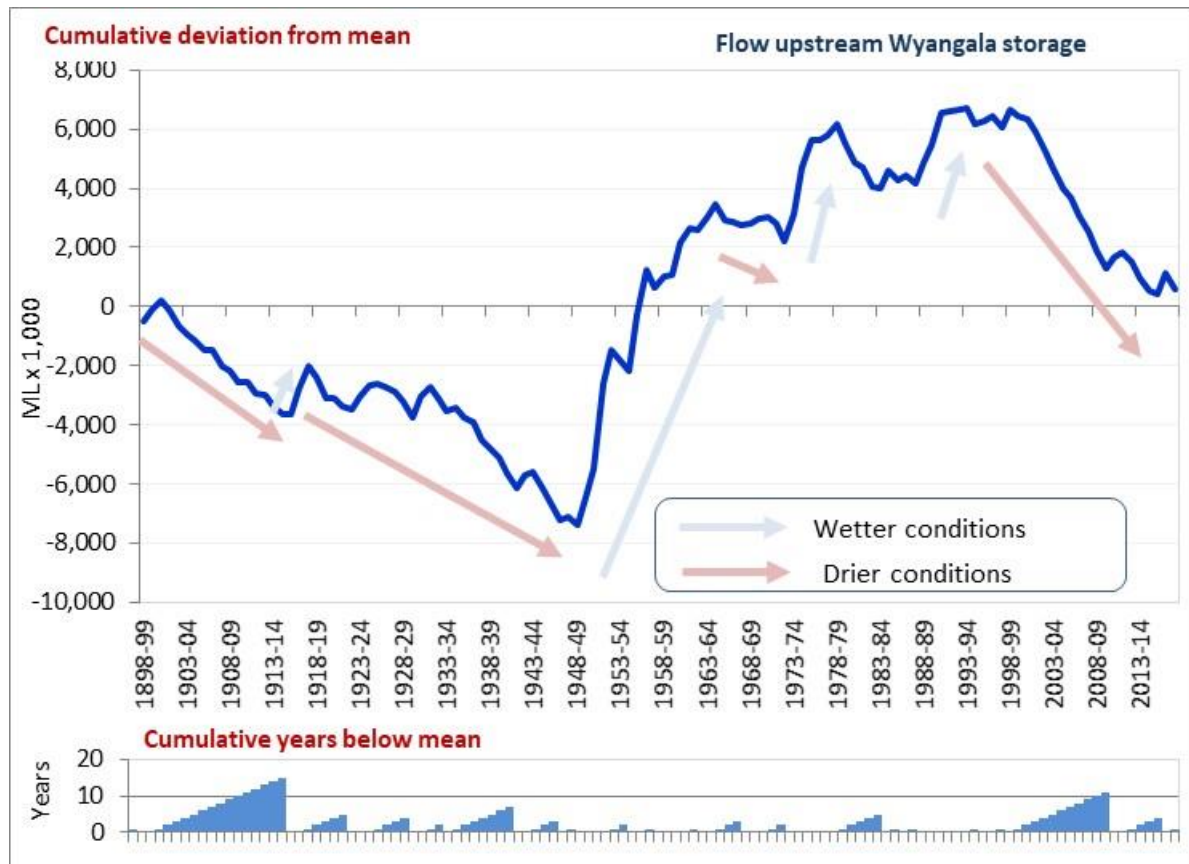
Storage volumes and inflows

Inflow

Historically long-term average annual inflow⁴ at the Wyangala storage site has varied significantly cycling through prolonged periods of wet and dry flow regimes. Broadly the data (Figure 7) illustrates predominantly:

- dry conditions 1900 to 1950
- wet conditions 1950 to 2000
- dry conditions 2000 to present.

Figure 7: Long-term annual flow at Wyangala storage site, cumulative deviation from mean



Wyangala

For the reporting period, the total inflow to Wyangala dam was 101,112 megalitres (Figure 9), which is:

- 14% of the long-term average annual inflow (716,961 megalitres)
- very low relative to the long-term data set exceeding 4% of years in the dataset (1898-99 to 2018–19)
- the second consecutive year of below average inflow

The maximum mean daily inflow rate for the reporting period was 6,338 megalitres, occurring on 14 December 2018 (Figure 10)

⁴ Inflows are back-calculate storage inflow for the period from storage construction to present and gauged or rainfall runoff model estimates for the prior period.

Carcoar

For the reporting period, the total inflow to Carcoar dam was 2,437 megalitres (Figure 12), which is:

- 15% of the long-term average annual inflow (16,284 megalitres)
- very low relative to the long-term data set exceeding 8% of years in the dataset (1894–95 to 2018–19)
- the second consecutive year of below average inflow

The maximum mean daily inflow rate for the reporting period was 99 megalitres, occurring on 12 December 2018 (Figure 13).

Volume

Wyangala

Wyangala storage volume:

- commenced the reporting period at 747,031 megalitres or 61% of full supply capacity (Figure 8)
- ended the reporting period at 321,864 megalitres or 26% of full supply, a change of -35% for the water year
- the maximum volume during the reporting period was 747,031 megalitres, occurring on 30 June 2018.

Carcoar

Carcoar storage volume:

- commenced the reporting period at 19,907 megalitres or 55% of full supply capacity (Figure 11)
- ended the reporting period at 7,711 megalitres or 21% of full supply, a change of -34% for the water year
- the maximum volume during the reporting period was 20,257 megalitres, occurring on 9 September 2018.

Figure 8: Wyangala Dam storage volume and per cent full for 2018–19

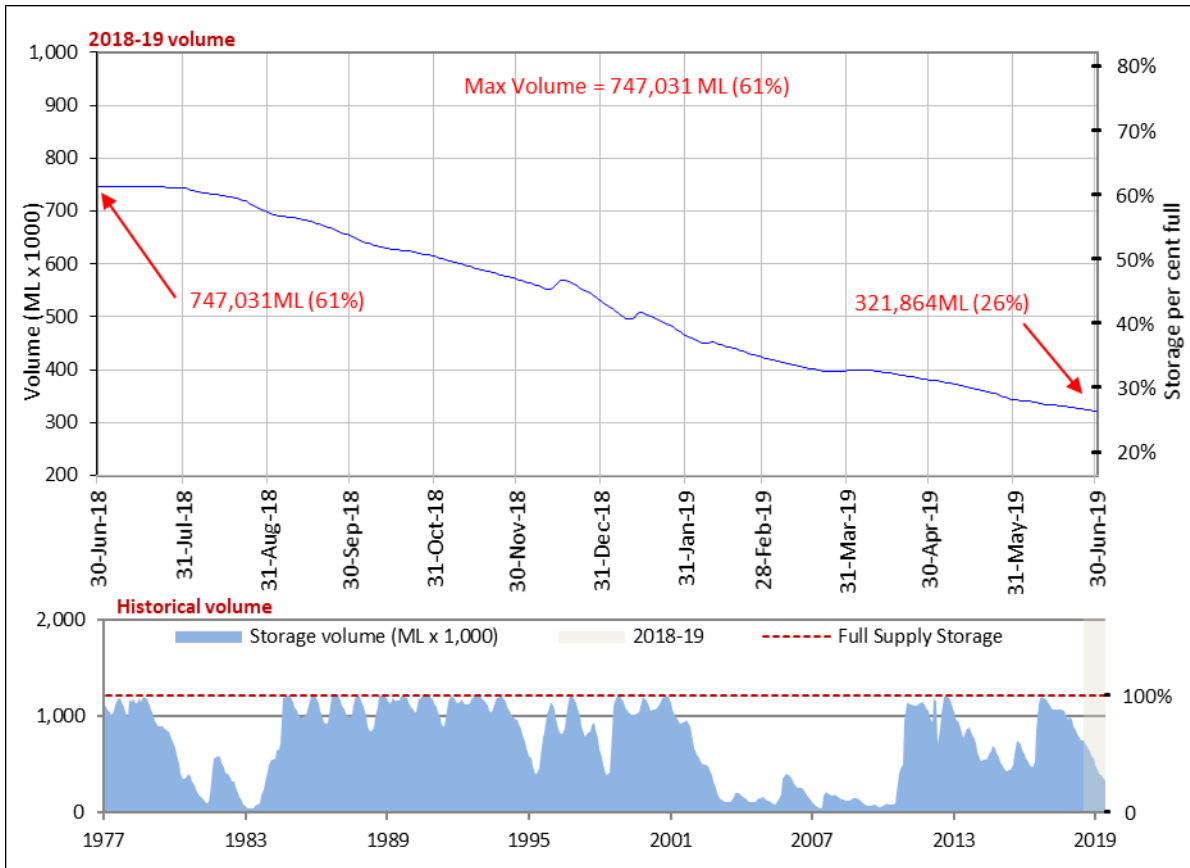


Figure 9: Long-term inflows to Wyangala Dam against mean and reporting year inflow

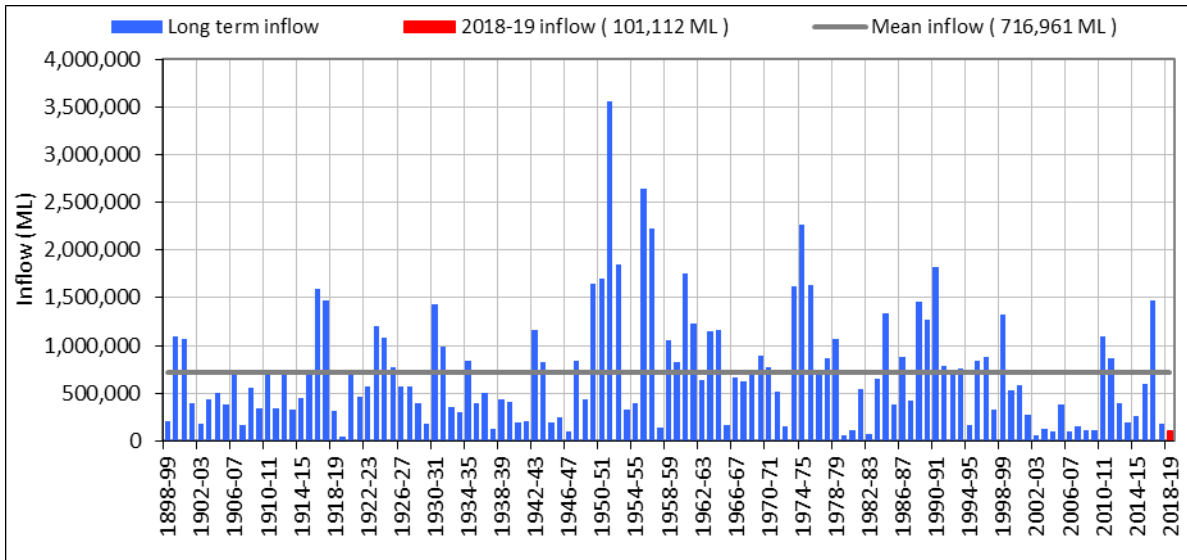


Figure 10: Daily inflows and rainfall at Wyangala Dam 2018–19

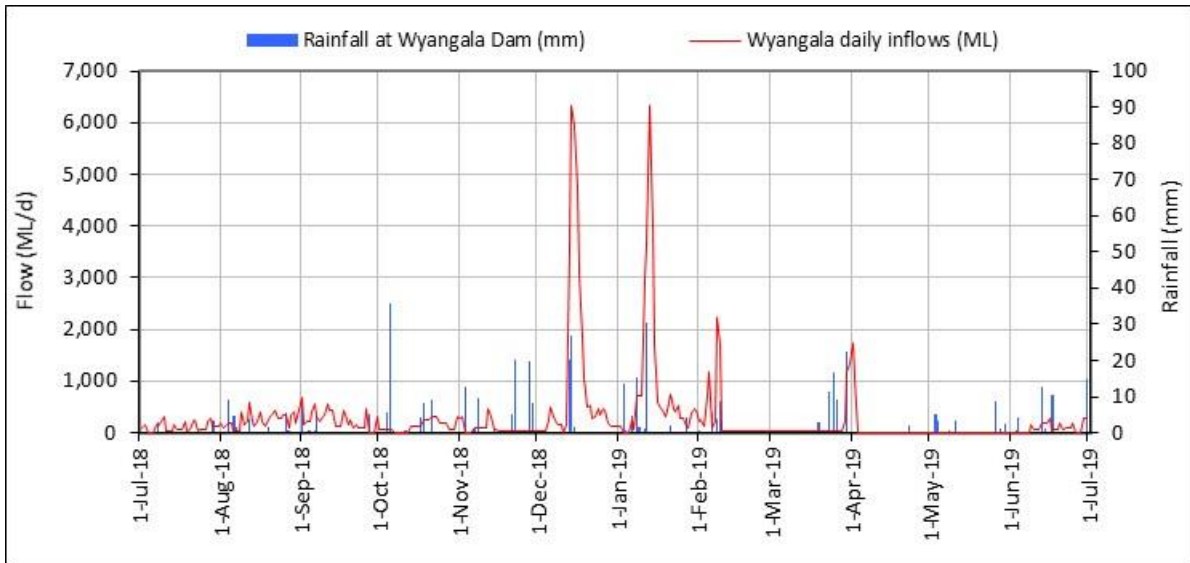


Figure 11: Carcoar Dam storage volume and per cent full for 2018–19

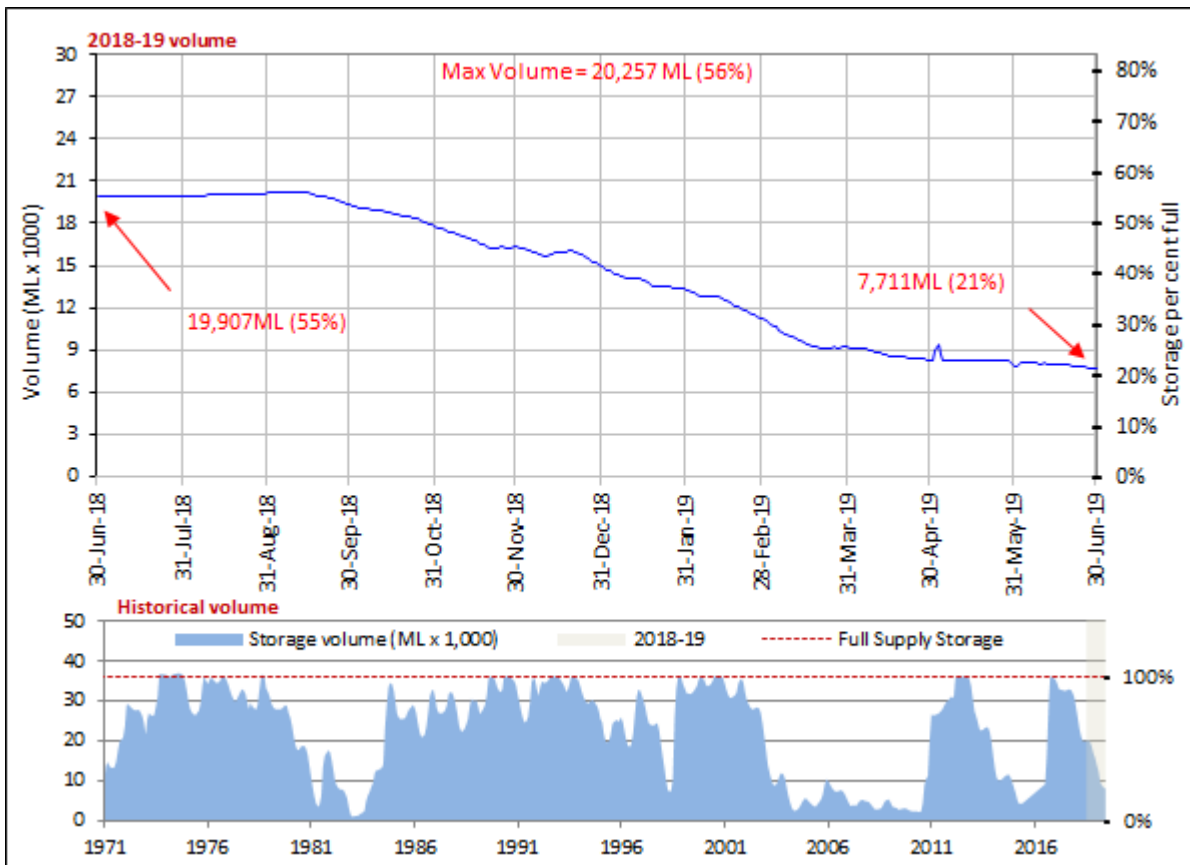


Figure 12: Long-term inflows to Carcoar Dam against mean and reporting year inflow

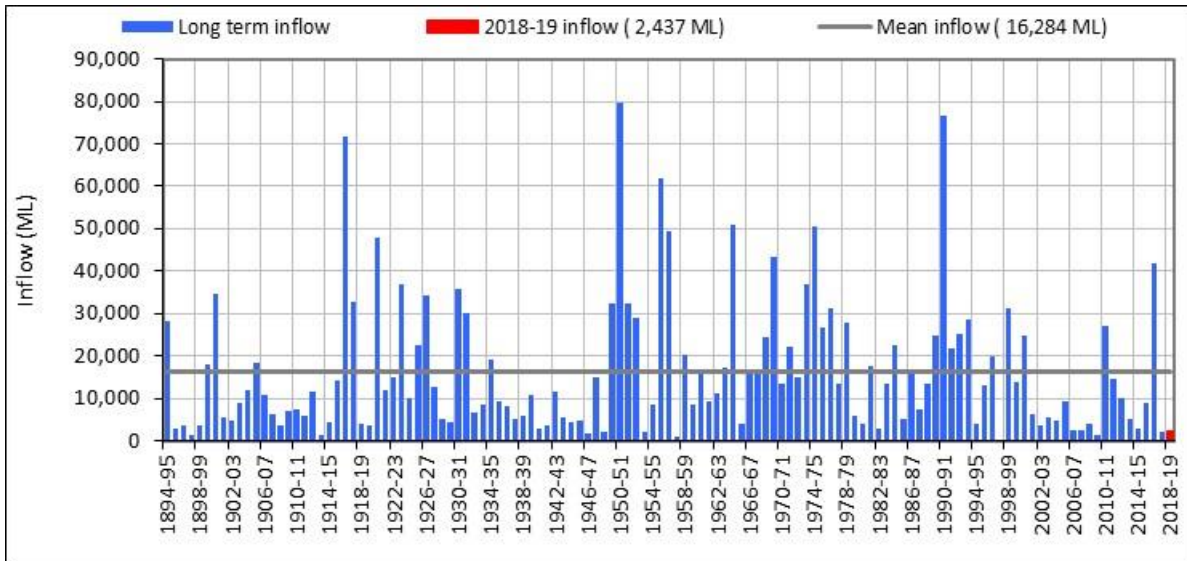
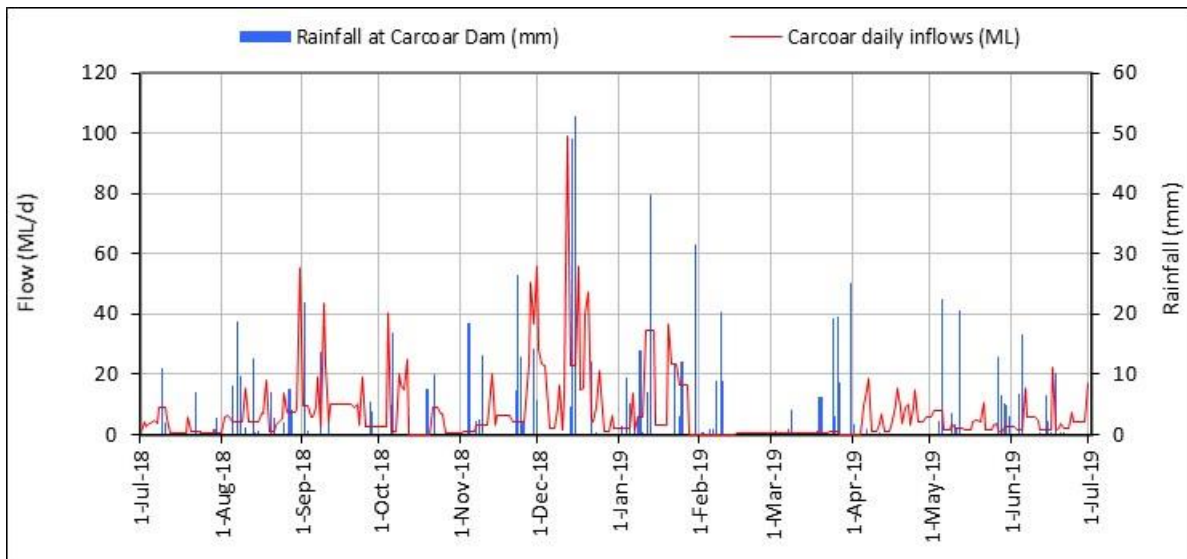


Figure 13: Daily inflows and rainfall at Carcoar Dam 2018–19



Major flow events

There were no major high flow events in the Lachlan and Belubula systems in the reporting period. River height at Forbes remained below 1.5 metres for the entirety of the reporting period (Figure 14). River height at upstream Canowindra remained below 2.0 metres for the entirety of the reporting period (Figure 15).

Figure 14: Maximum daily river heights at Forbes

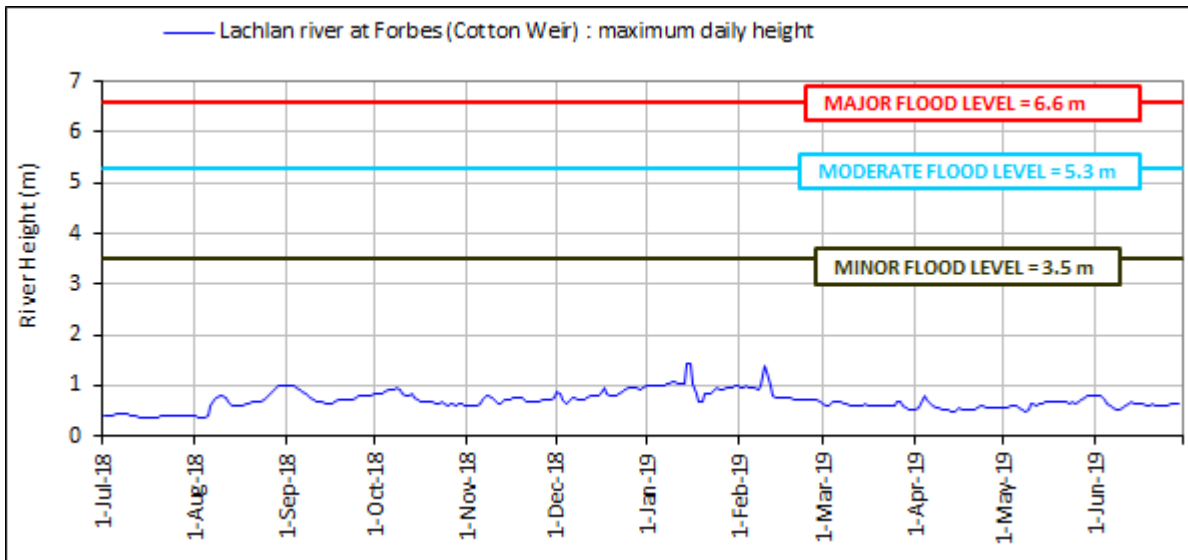
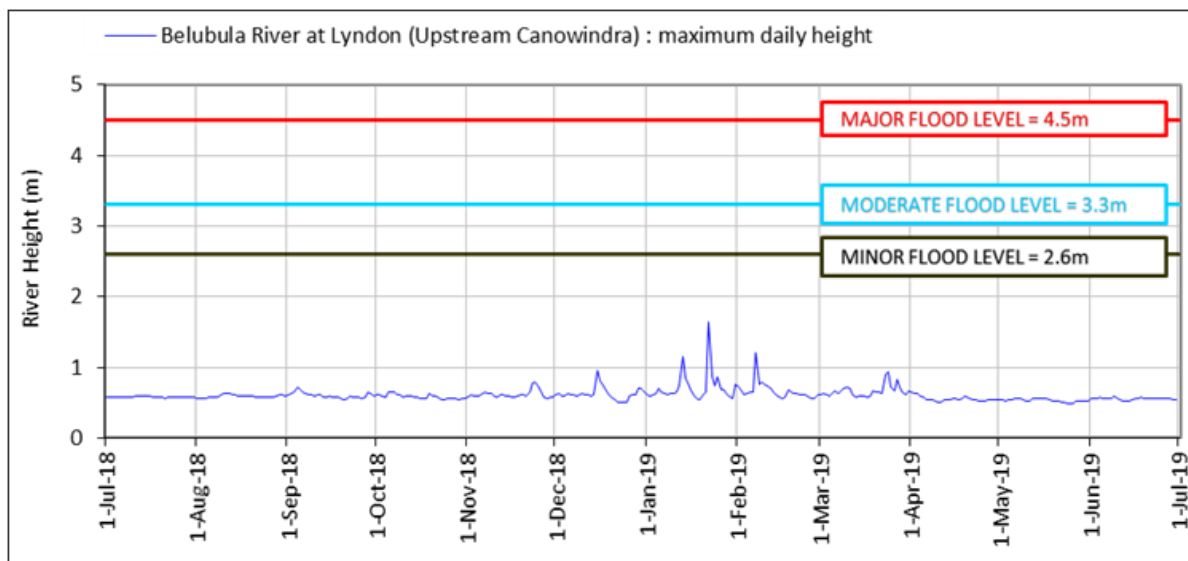


Figure 15: Maximum daily river heights at Forbes



Surface water resources and management—Lachlan Catchment

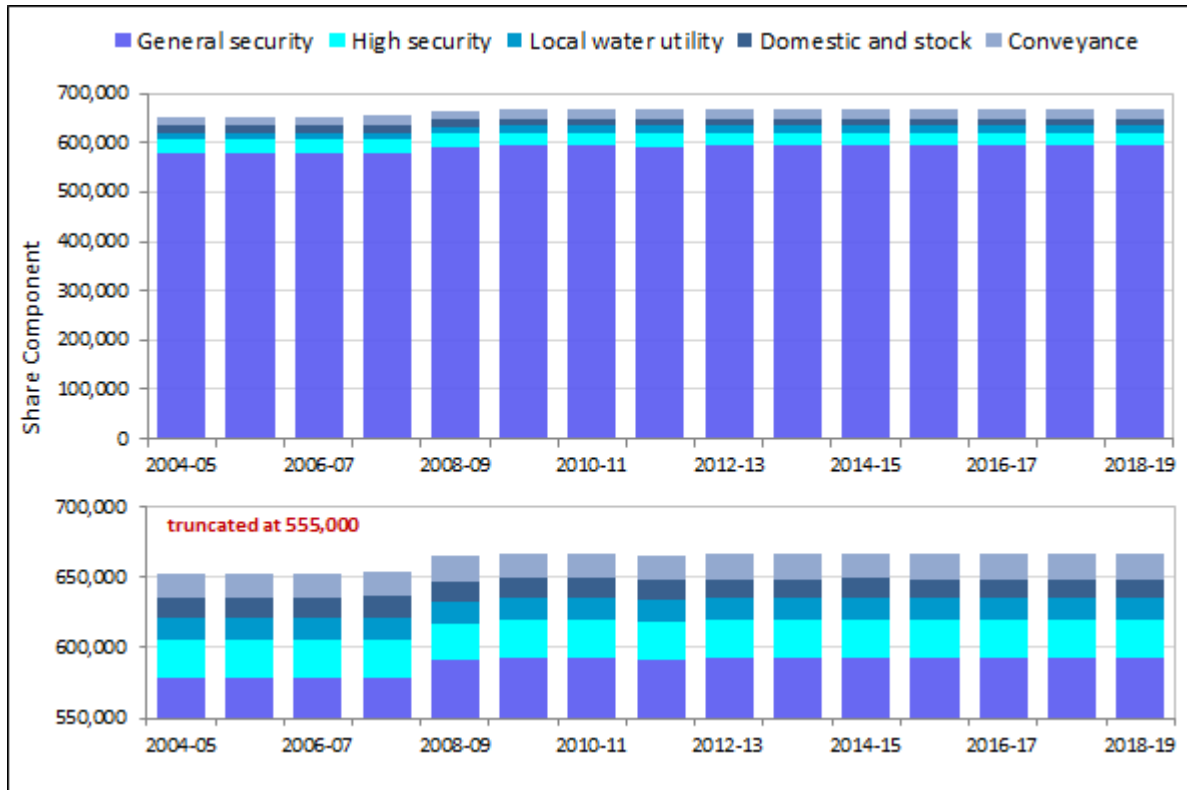
Legislation

The Lachlan water source was managed under the conditions set out in the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*. The water sharing plan commenced on 1 July 2016 and will remain active until 30 June 2026. The water sharing plan was produced to meet the water management principles outlined in the *Water Management Act 2000*.

Access rights

- Issued access licence share component remained constant in the reporting period.
- Total issued share component was 666,698 shares on 30 June 2019 (Figure 16).

Figure 16: Lachlan total issued share component since introduction of the water sharing plan



Access licence account management

The account management rules applied to an access licence in the Lachlan regulated river water source is presented, by access licence category in Table 3. General security access licence management adopts a flexible, continuous accounting approach, with licence holders able to store (and carry forward) up to 2 megalitres per share. Accounts are subject to a reset however when Wyangala storage spills. Annual usage for this category is restricted to 1 megalitre per share, plus allocation assignments in, minus allocation assignments out.

All other categories of access licence are effectively limited to a maximum available water determination (AWD) of 1 megalitre per share (or 100%) and are not allowed to carryover unused water to the following water year.

Table 3: Lachlan Water Allocation Accounting Rules.

Licence category	Account limit	Carryover limit	Annual use limit	Maximum AWD
Domestic and Stock	100%	0%	N/A	100%
Domestic and Stock [Domestic]	100%	0%	N/A	100%
Domestic and Stock [Stock]	100%	0%	N/A	100%
Local Water Utility	100%	0%	N/A	100%
Regulated River (Conveyance)	1 ML/share	1 ML/share ⁵	1 ML/share	1 ML/share
Regulated River (General Security)	2 ML/share	2 ML/share ⁶	1 ML/share	N/A
Regulated River (High Security)	1 ML/share	0 ML/share	N/A	1 ML/share

Extreme events stage and temporary water restrictions (Lachlan)

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

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

Table 4 outlines the conditions that may be associated with different stages of criticality for surface water quality. Further information is available at www.industry.nsw.gov.au/water/what-we-do/legislation-policies/eep

Table 4: Determination of stages of criticality for surface water quantity

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

Temporary water restrictions for the reporting period

No temporary water restrictions were enforced within the Lachlan Regulated River water source throughout the reporting period.

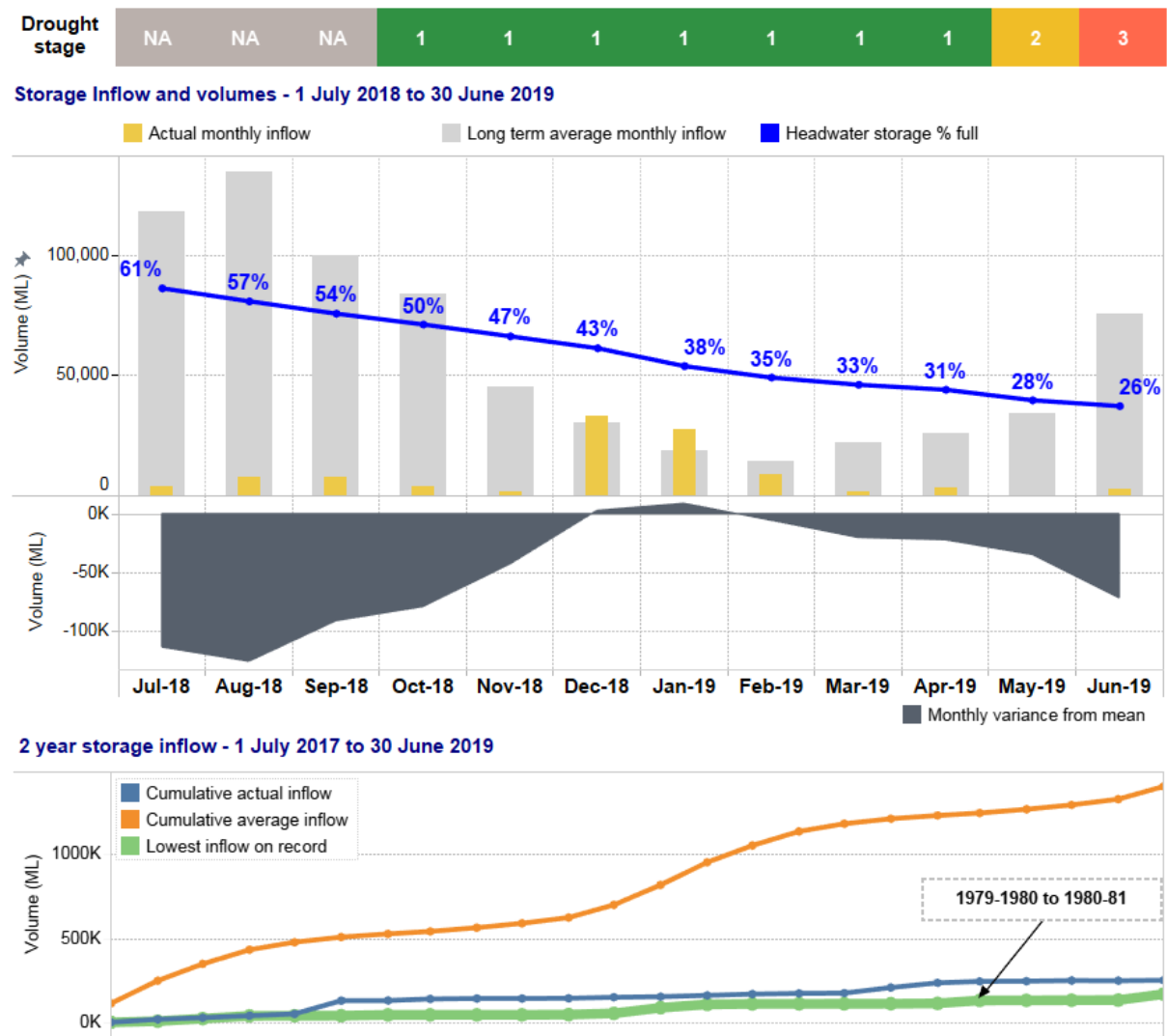
⁵ Carryover was permitted into the 2011-12 water year for Conveyance access licences

⁶ Inferred from account limit

Extreme events stage

- Following the release of the NSW Extreme Events Policy in October 2018, the Lachlan Regulated River Water Source was declared as being in Stage 1.
- Climatic conditions continued to deteriorate throughout the reporting period with major storage inflow tracking significantly below long-term averages for the majority of the water year.
- Consequently, the water source was declared as being in Stage 2 in May 2019, and Stage 3 in June.
- The historical two-year inflow sequence of major storage inflow to 30 June 2019 reached a deficit of 1,149,564 megalitres relative to long-term average two-year inflow, equivalent to 95% of the full supply volume of Wyangala storage (Figure 17).

Figure 17: Drought stage for the reporting period referenced with monthly headwater storage inflows, monthly storage inflow variance from mean and two-year cumulative inflow sequence



Water availability

- Domestic and Stock, Local Water Utility, and High Security access licences (including sub-categories of these) received an opening available water determination (AWD) of 100% or 1 megalitre per share, the maximum amount allowable under the water sharing plan (Figure 18).
- One announcement was made to the category of Regulated River (Conveyance), of 0.93 megalitre per share on 1 July 2018 (16,657 megalitres).

- General security access licences had a carryover of 368,925 megalitres into the reporting period, equating to 62.2% of total issued general security share component.
- General security access licence holders received an opening AWD of zero megalitres per share, and no further announcements were made throughout the year (Figure 19).
- No storage spill reset transactions were triggered in the reporting period.
- Water availability was at a three-year low (Figure 18).

Figure 18: Lachlan account water availability (carryover plus available water determinations)⁷

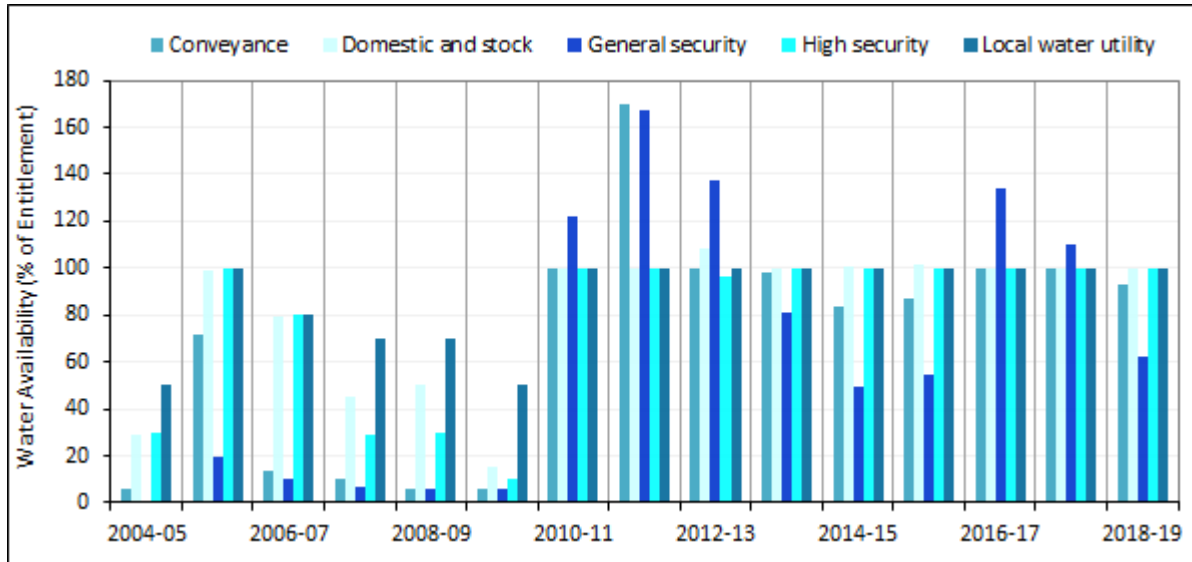
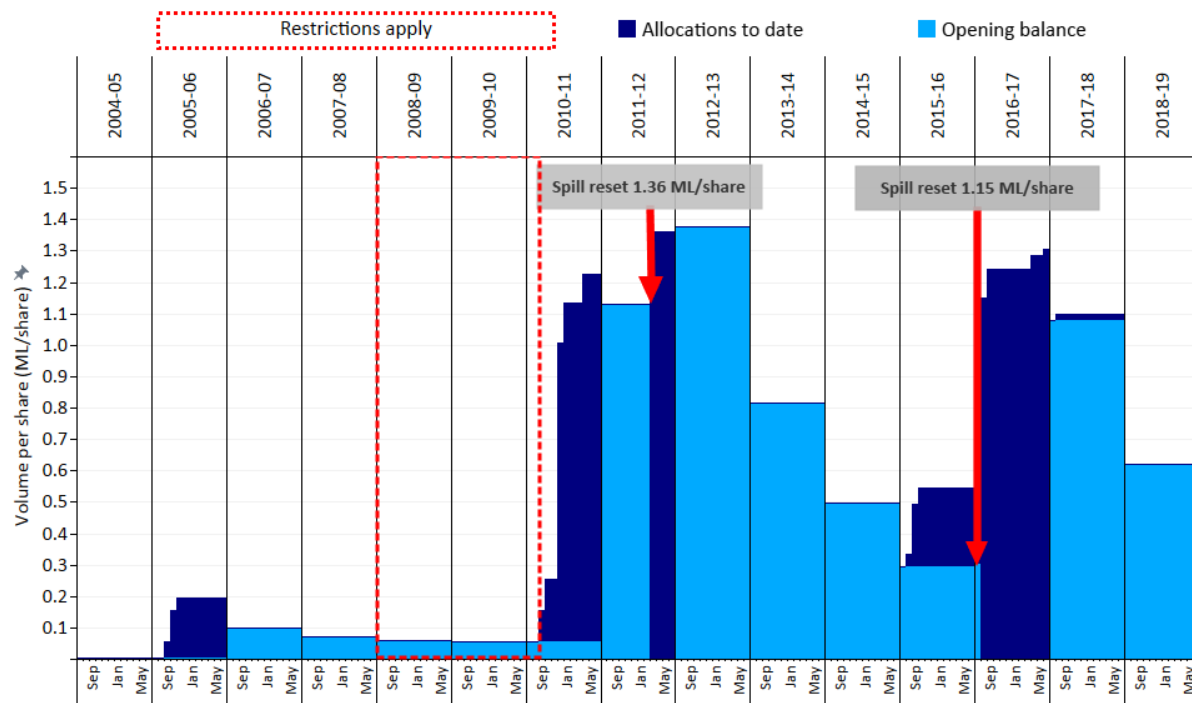


Figure 19: Incremental available water determination and carryover volumes for general security as a proportion of share component

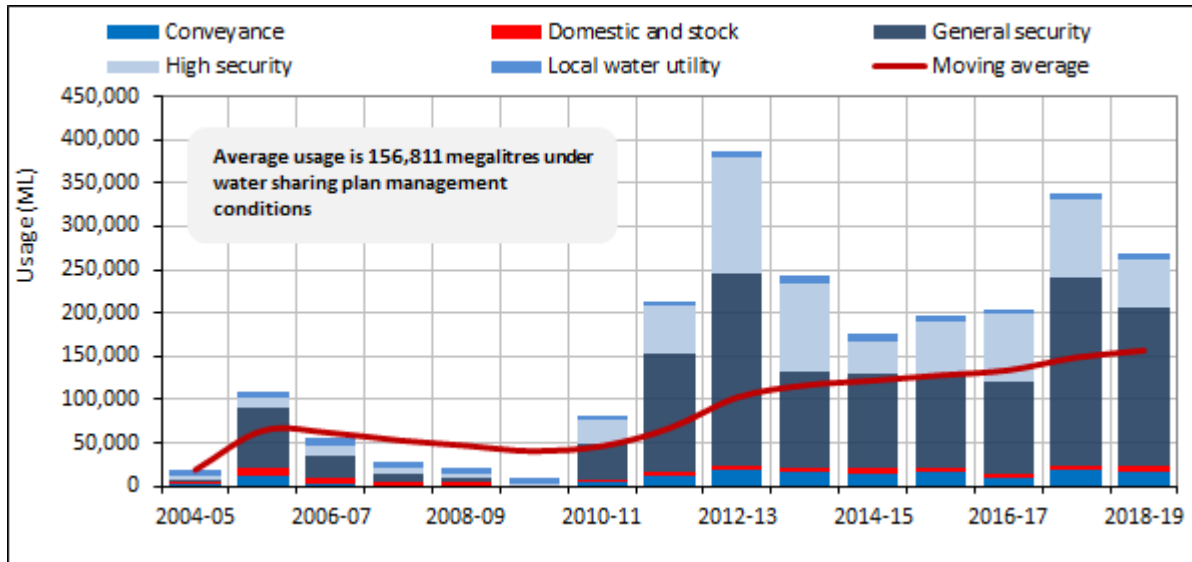


⁷ The 2011–12 and 2016–17 General Security availability takes into account water that was allocated but then withdrawn (forfeited) due to the storage spill accounting rules Information is inclusive of licences held by an environmental holder (see note 5 of this report for further clarification).

Account usage

- Total account usage from regulated supply totalled 269,788 megalitres for the reporting period (Figure 20).
- This was the third-highest usage under water sharing plan management conditions.
- Average account usage (all categories) under water sharing plan management conditions is 156,811 megalitres.

Figure 20: Lachlan average annual account usage versus account usage



Utilisation and inactive share.

- 12% of general security share component was inactive⁸ for the reporting period, an increase of 6% on the prior reporting period (Table 5).
- Considering all categories of access licence 12% of issued share component was inactive, an increase of 6% on the prior reporting period.
- Utilisation⁹ of available water from regulated supplies increased (by 9%) to 64%, the highest since 2008–09 (Figure 21).

⁸ An access licence is considered to be inactive for the reporting period if the holding does not use water or access the temporary trade market for the reporting period.

⁹ Carryover plus available water determinations for all categories of licence

Figure 21: Percentage utilisation (water availability plus trade in from external water sources against account usage and trade out to external water sources)

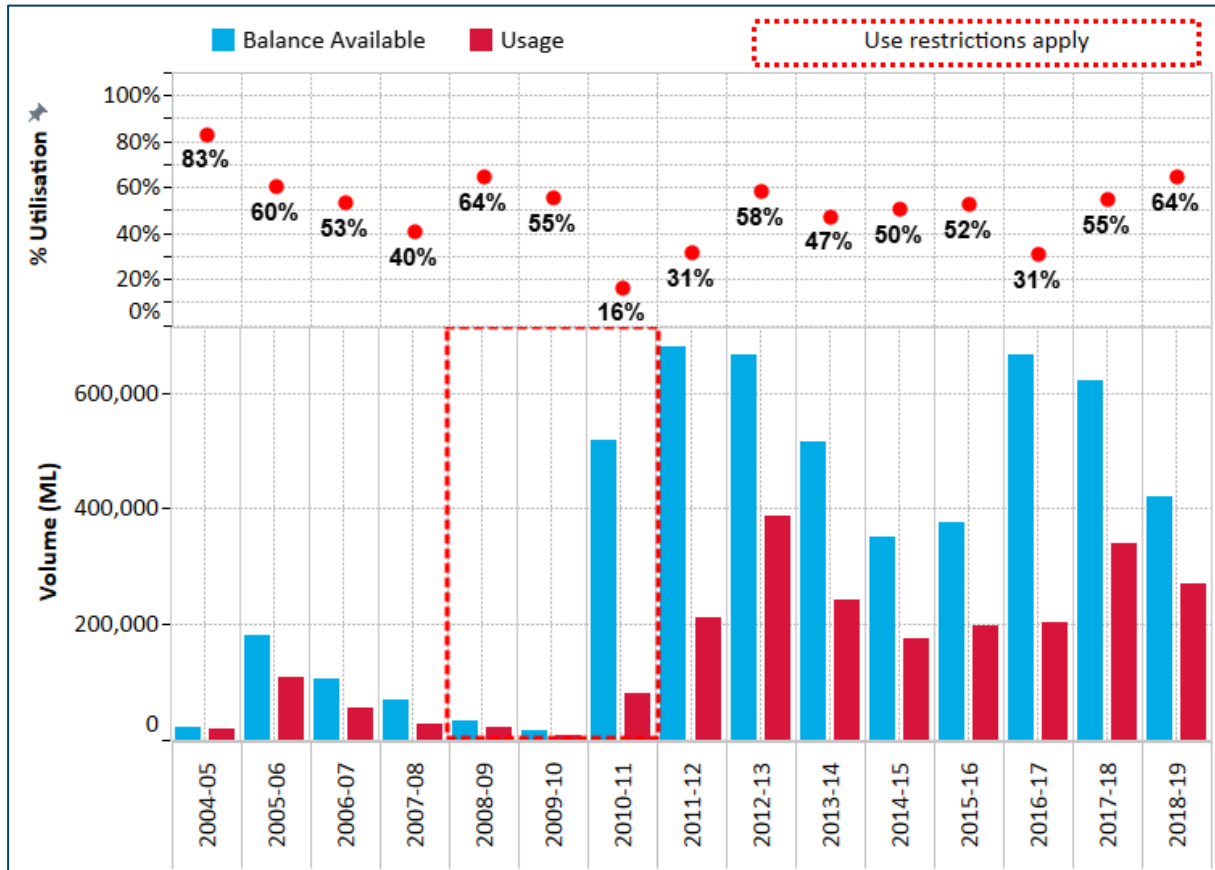


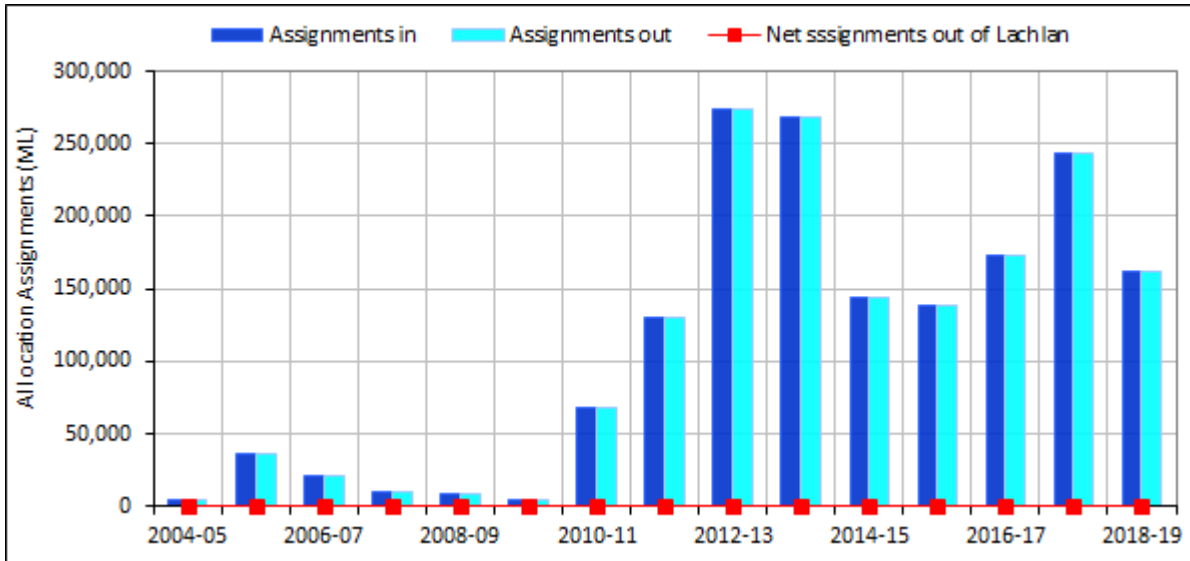
Table 5: Lachlan inactive licence summary

Licence Category	Inactive licences (number) 2018–19	Inactive share component 2018–19	Inactive share component % of total 2018–19	Inactive Share Component % of total prior year 2017–18
Domestic and Stock	263	4070	37%	37%
Domestic and Stock [Stock]	133	1262	79%	82%
Domestic and Stock [Domestic]	73	172	97%	85%
Local water utility	4	1,105	7%	3%
Regulated river (General Security)	348	72,249	12%	6%
Regulated river (High Security)	81	1790	6%	1%
Regulated river (Conveyance)	0	0	0%	0%
Total regulated supply	902	80,648	12%	6%

Temporary trading (allocation assignments)

- The total volume of allocation assignments for the reporting period was 161,720 megalitres which was lower than the prior two water years (Figure 22).
- No water is allowed to be traded between the Lachlan Regulated River Water Source and other water sources (net assignments out is zero).

Figure 22: Total allocation assignments

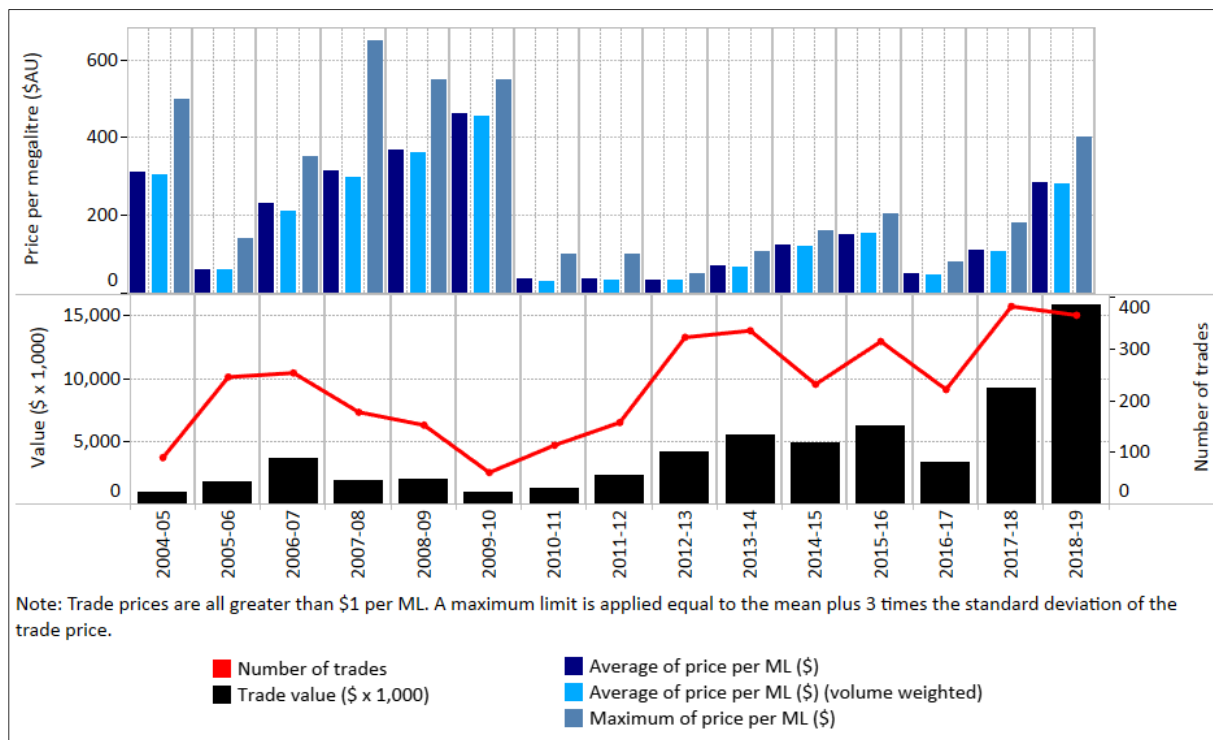


Temporary commercial statistics

For the reporting period, considering commercial trades only (> \$1 per megalitre), 366 transactions were processed with the following characteristics. The:

- average price for water was \$284 per megalitre (weighted average \$281), a 155% increase on the prior year
- maximum price for water was \$400 per megalitre
- total trade value being \$15,912,000 the highest ever under water sharing plan management conditions and a 71% increase on the prior water year (Figure 23).

Figure 23: Allocation assignment commercial statistics—Lachlan



Permanent trading

Permanent commercial statistics

For the reporting period, considering commercial trades only (> than \$1 per megalitres), 17 general security share assignment transactions (Figure 24) were processed with the following characteristics the:

- average price for general security was \$961 per share (weighted average \$993), a 38% increase on the prior year
- maximum price was \$1,250 per share
- total trade value was \$3,033,000, the highest since 2015–16 and a 71% increase on the prior reporting period.

One high security share assignment of five shares (Figure 25) was also processed for an exchange of \$6,600 per share.

In addition to assignments of share a total of 15,432 shares (all categories of licence consider), were subject to a change of holder for commercial purposes through 36 transactions. Note reliable pricing information for change of holder dealings is unavailable as often the sale is bundled with land (Figure 26).

Figure 24: Share assignments commercial statistics—Lachlan, General Security

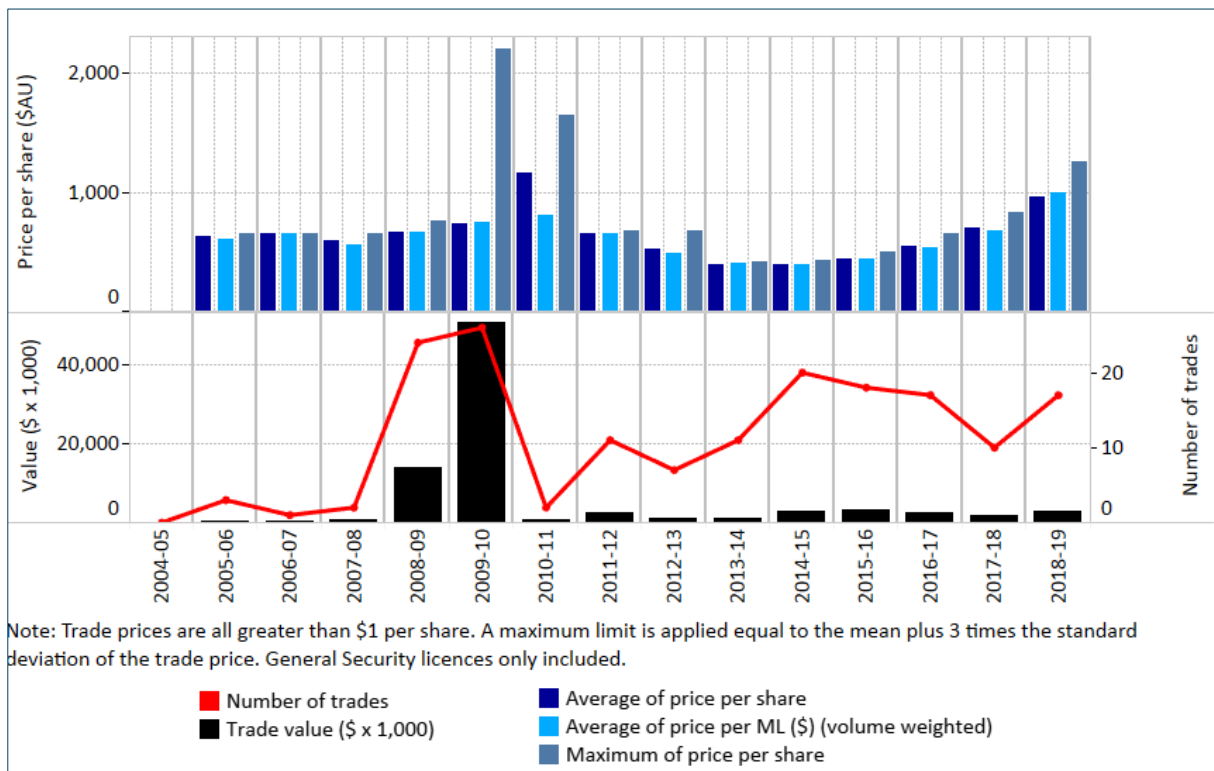


Figure 25: Share assignments commercial statistics—Lachlan, High Security

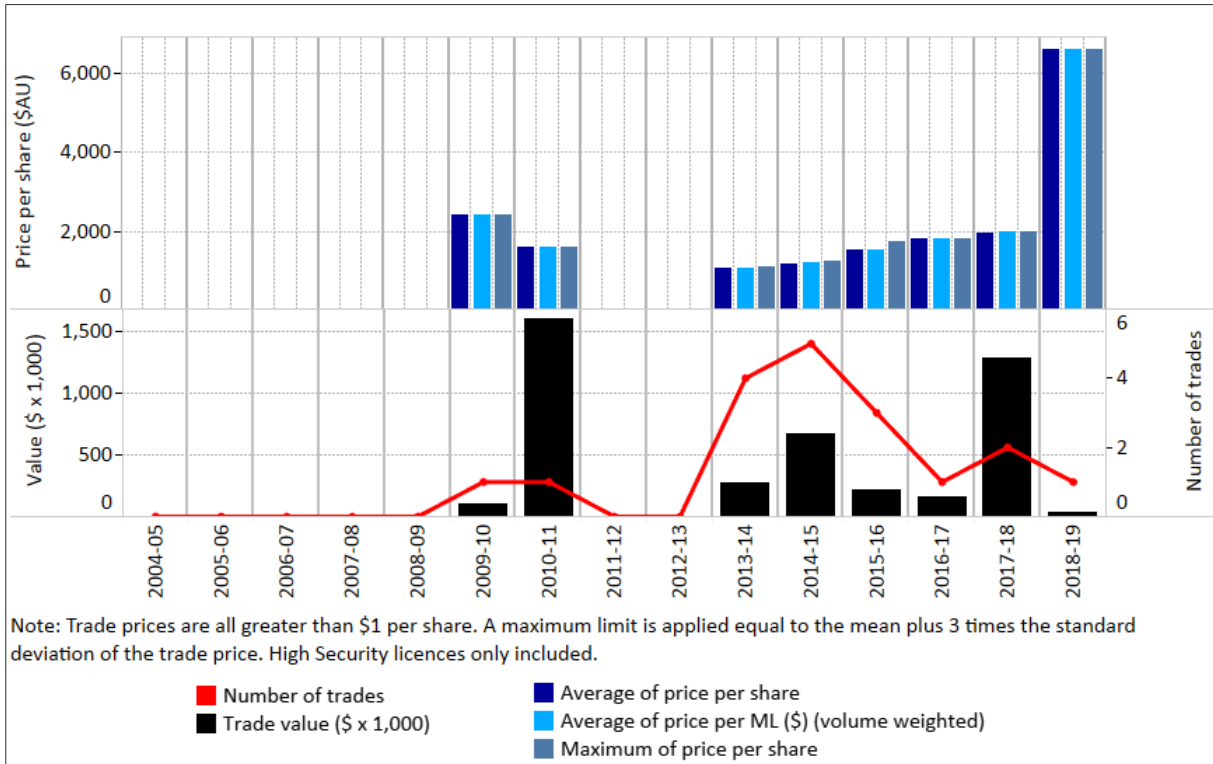
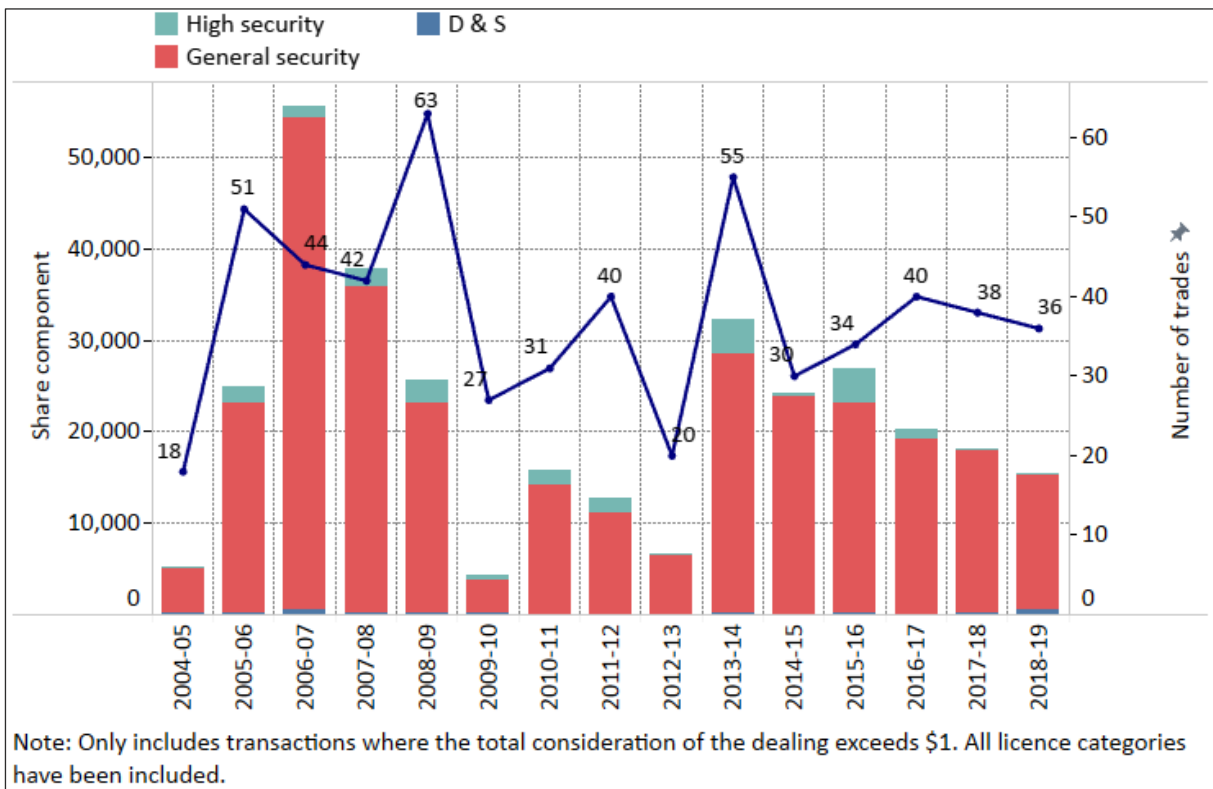


Figure 26: Change of holder commercial statistics, Lachlan



Replenishment flows

Throughout the reporting period the following volumes were delivered to replenish river volumes for stock and domestic access in line with the requirements of the water sharing plan:

- 11,338 megalitres to Booberoi Creek
- 9,926 megalitres to Merrowie Creek
- 9,605 megalitres to Willandra Creek
- 5,329 megalitres to Merrimajeel and Muggabah creeks.

Minimum flows

- A visible flow at Geramy was successfully achieved for the entirety of the reporting period¹⁰.

¹⁰ Typically, an average flow of about 20 to 30 megalitres per day in cooler months and about 70 to 80 megalitres per day in warmer months at Booligal would maintain a visible flow at Geramy.

Surface water resources and management—Belubula Catchment

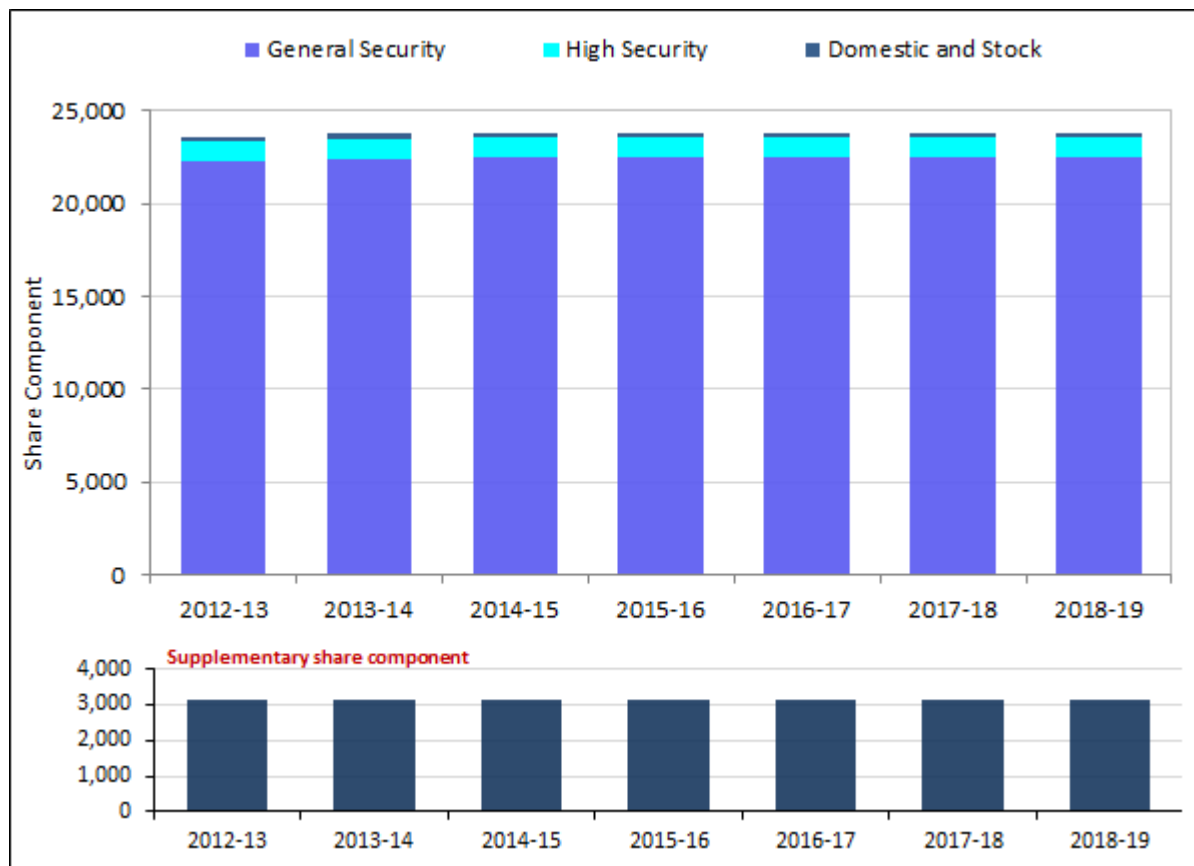
Legislation

The Belubula water source was managed under the conditions set out in the *Water Sharing Plan for the Belubula Regulated River Water Source 2012*. The water sharing plan commenced on 4 October 2012 and will remain active until 30 June 2022. The water sharing plan was produced to meet the water management principles outlined in the *Water Management Act 2000*.

Access rights

- Issued access licence share component remained constant in the reporting period.
- Total issued share component was 26,896 shares on 30 June 2019, which includes 3,125 shares of supplementary water access licences (Figure 27).

Figure 27: Belubula total share component since the commencement of the water sharing plan



Access licence account management

The account management rules applied to an access licence in the Belubula regulated river water source is presented, by access licence category in Table 6. General security access licence management adopts a flexible, continuous accounting approach, with licence holders able to store (and carry forward) up to 1.3 megalitres per share. Annual usage for this category is restricted to 1 megalitre per share, plus allocation assignments in from the A sub account (water that can be used in the current water year), minus allocation assignments out of the A sub account.

All other categories of access licence are effectively limited to a maximum available water determination (AWD) of 1 megalitre per share (or 100%) and are not allowed to carryover unused water to the following water year¹¹.

Table 6: Belubula water allocation accounting rules

Licence category	Account limit	Carryover limit	Annual use limit	Maximum AWD
Domestic and Stock	100%	0%	N/A	100%
Domestic and Stock[Domestic]	100%	0%	N/A	100%
Domestic and Stock[Stock]	100%	0%	N/A	100%
Regulated River (General Security)	1.3 ML/Share	N/A	1 ML/Share	N/A
Regulated River (High Security)	1 ML/Share	0 ML/Share	N/A	1 ML/Share
Supplementary Water	1 ML/Share	0 ML/Share	N/A	1 ML/share

Extreme events stage and temporary water restrictions (Belubula)

Generic policy background on the NSW extreme events policy and temporary water restrictions is provided under 'Extreme events stage and temporary water restrictions (Lachlan)' of this document

Temporary water restrictions for the reporting period

No temporary water restrictions were enforced within the Belubula Regulated River water source throughout the reporting period.

Extreme events stage

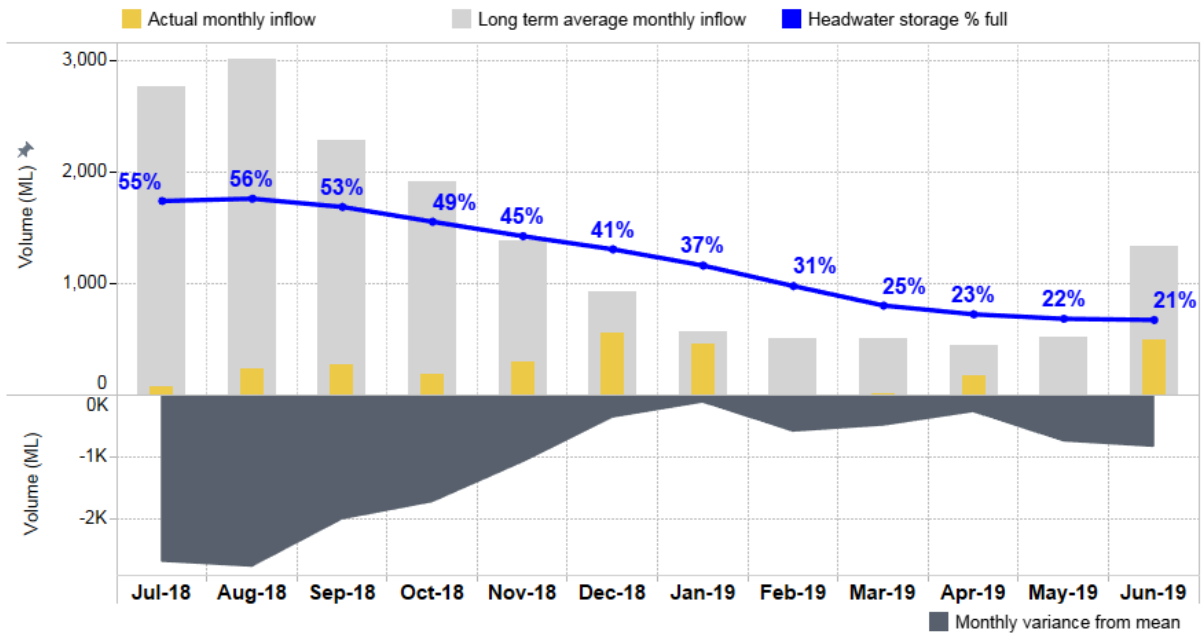
- Following the release of the NSW Extreme Events Policy in October 2018, the Belubula Regulated River Water Source was declared as being in Stage 1.
- Climatic conditions continued to deteriorate throughout the reporting period with major storage inflow tracking significantly below long-term monthly averages for all of the water year.
- Consequently, the water source was declared as being Stage 3 in May 2019.
- The historical two-year inflow sequence of major storage inflow to 30 June 2019 reached a deficit of 27,453 megalitres relative to long-term average 2 year inflow, equivalent to 76% of the full supply volume of Carcoar storage (Figure 28).
- The historical two-year inflow sequence was the lowest on record (reference data period 1895 to 2019).

¹¹ An exception was applied to the 2013-14, 2014-15 and 2015-16 water years

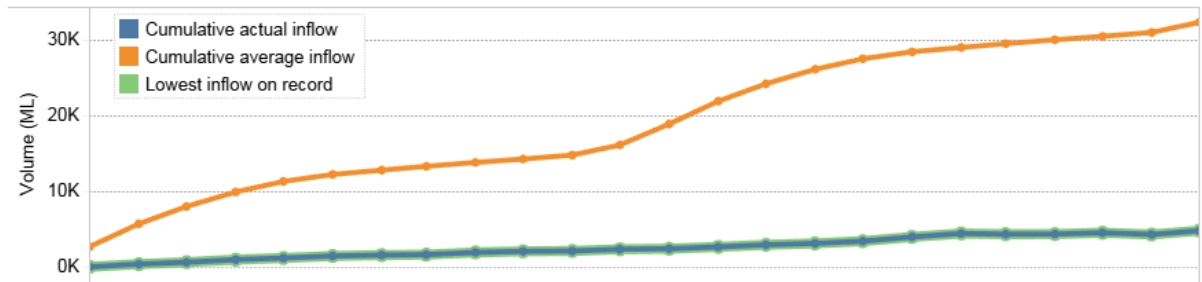
Figure 28: Drought stage for the reporting period referenced with monthly headwater storage inflows, monthly storage inflow variance from mean and two-year cumulative inflow sequence

Drought stage	NA	NA	NA	1	1	1	1	1	1	1	3	3
----------------------	----	----	----	---	---	---	---	---	---	---	---	---

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



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



Water availability

- Domestic and Stock and High Security access licences received an opening available water determination of 100% / 1 megalitre per share, the maximum amount allowable under the water sharing plan.
- Supplementary access licences received an opening available water determination of 100%/1 megalitre per share, the maximum amount allowable under the water sharing plan.
- General security access licences had a carryover of 15,463 megalitres into the reporting period, equating to 69% of total issued general security share component (Figure 29).
- General security access licence holders received an opening AWD 0.0 megalitre per share. No additional water was made available to this category throughout the water year.
- The total water availability by licence category under water sharing plan management conditions is presented in Figure 30. Water availability was the lowest since 2015-16 (Figure 30).

Figure 29: Belubula incremental available water determination and carryover volumes for general security as a proportion of share component

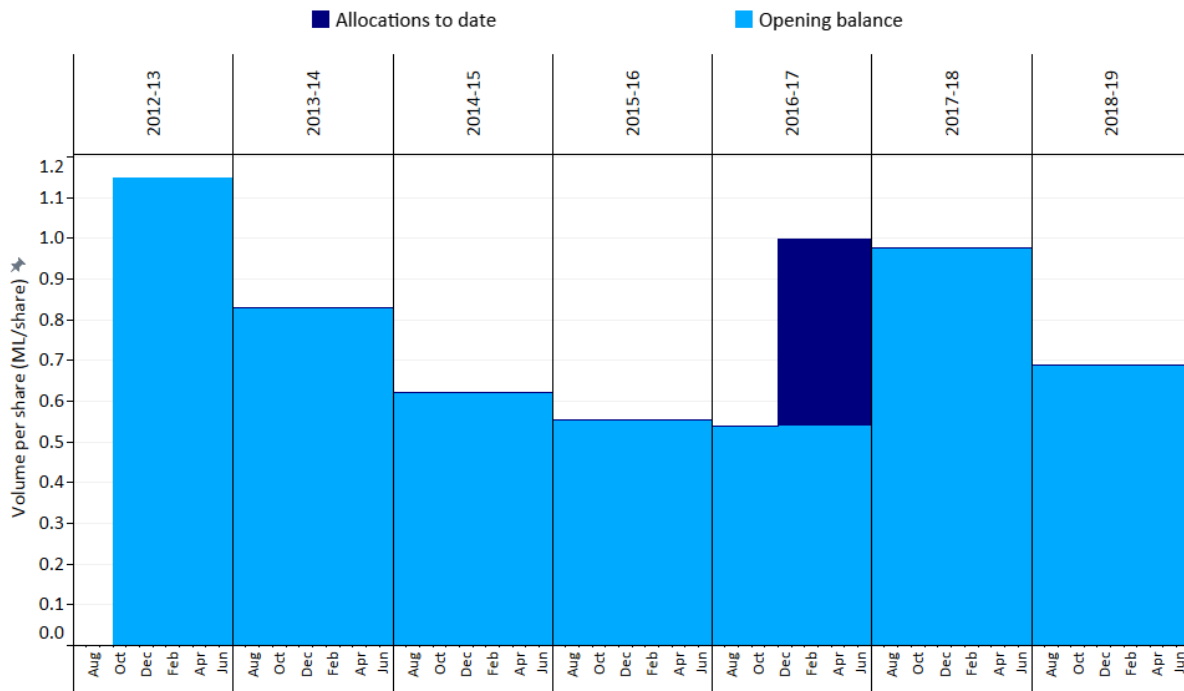
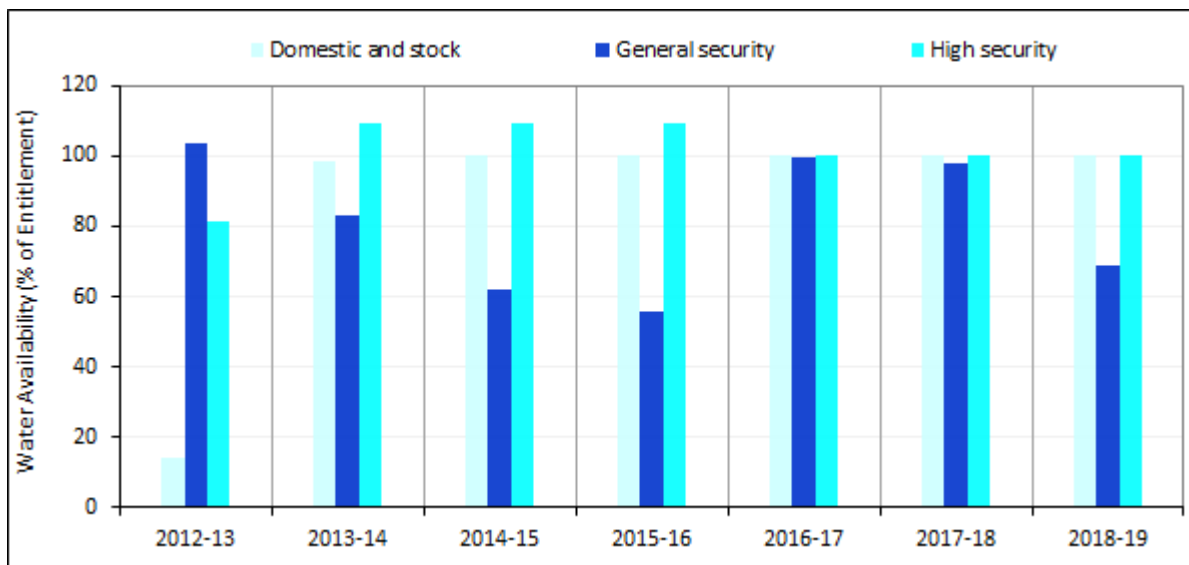


Figure 30: Belubula Account Water Availability (Carryover + Available Water Determinations)¹²

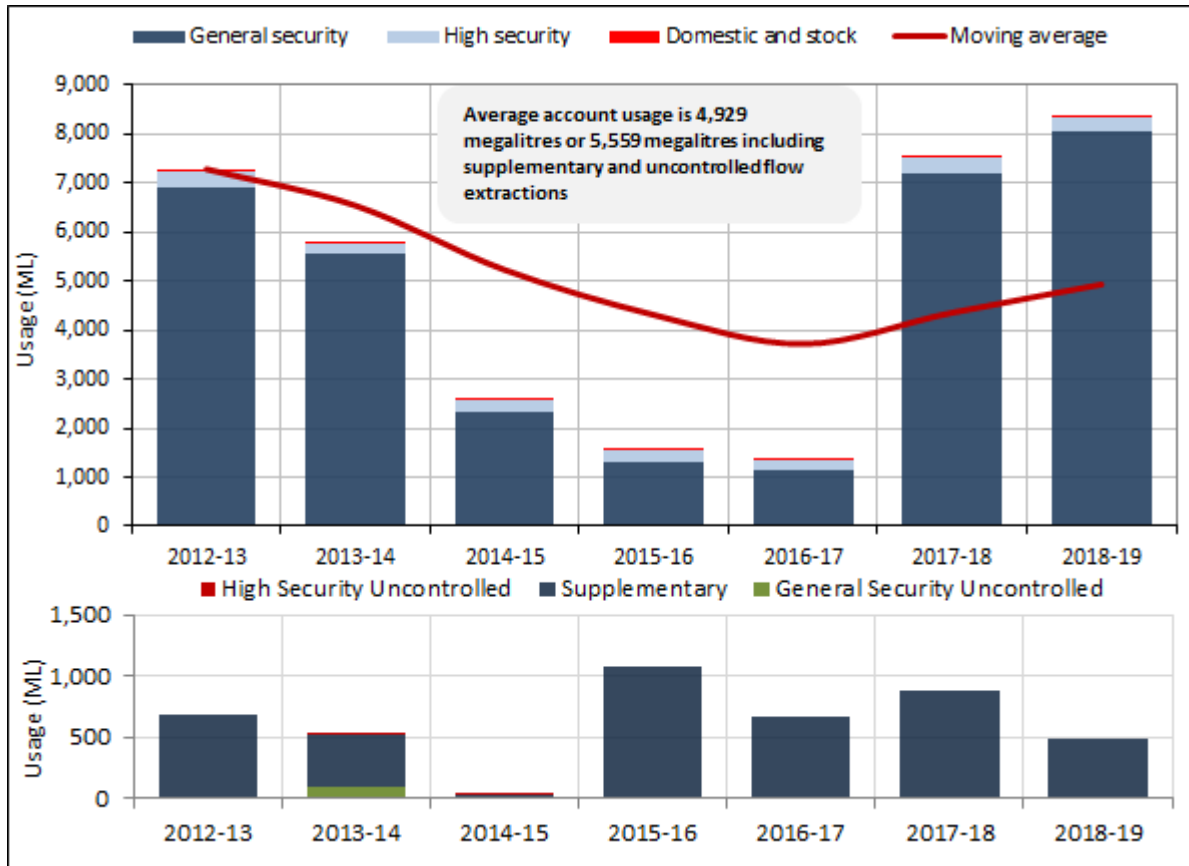


Account usage

- Usage from regulated supply totalled 8,366 megalitres for the reporting period (Figure 31).
- Additionally, 489 megalitres was accessed from supplementary events
- Total usage was the highest since the water sharing plan was established (2012–13).
- Average usage (all categories of licence plus uncontrolled flow access) is 5,559 megalitres per year.

¹² Water availability also includes adjustments made as a result of the storage spill in 2012-13 and during year forfeits while still operating under the Water Act 1912. In addition, the 2012-13 figures have been adjusted to take into account the period of operation under the Water Act being 1 July 2012 to 4 October 2012.

Figure 31: Belubula average annual account usage versus account usage



Utilisation and inactive share

- 22% of share component with regulated supply was inactive¹³ for the reporting period, an increase of 2% on the prior reporting period (Table 7).
- Utilisation¹⁴ of available water from regulated supplies increased significantly (by 17%) to 54%, the highest since the commencement of the water sharing plan (Figure 32).

¹³ An access licence is considered to be inactive for the reporting period if the holding does not use water or access the temporary trade market for the reporting period.

¹⁴ Carryover plus available water determinations for all categories of licence

Figure 32: Percentage utilisation (water availability plus trade in against usage and trade out external water sources). Excludes supplementary and uncontrolled flow access

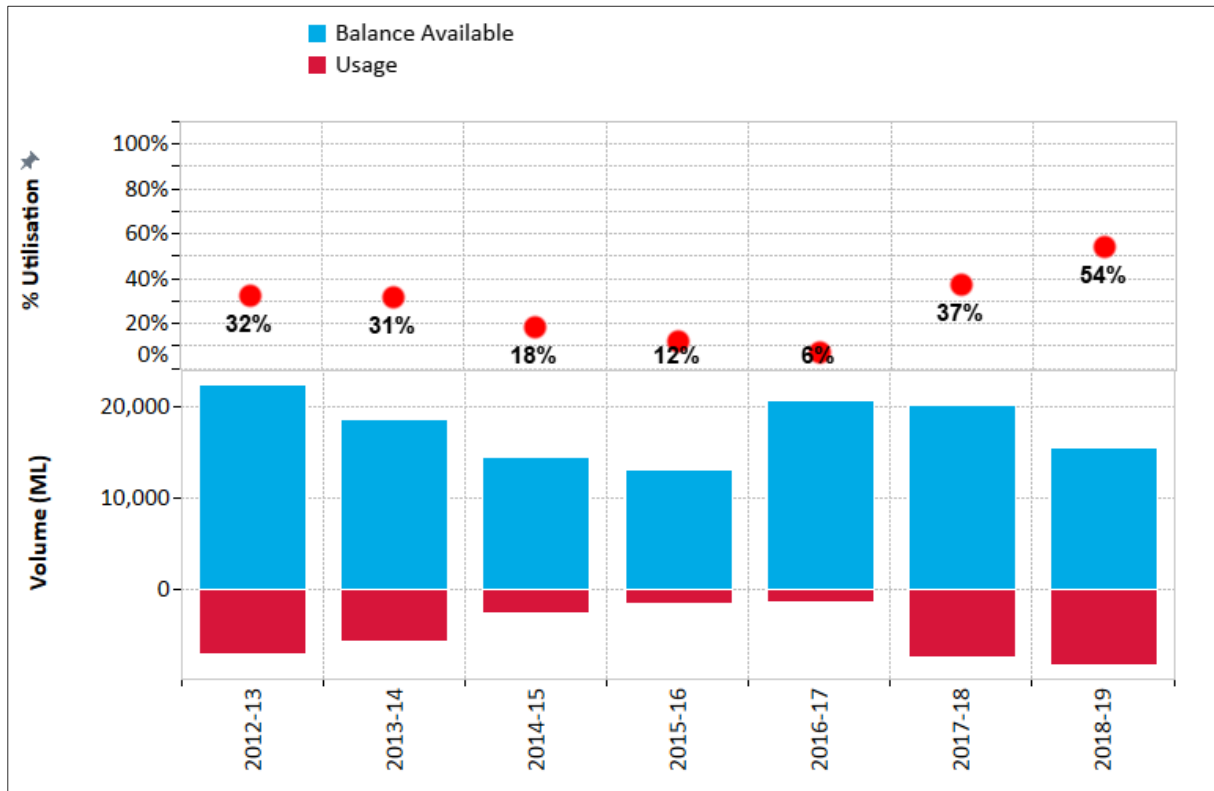


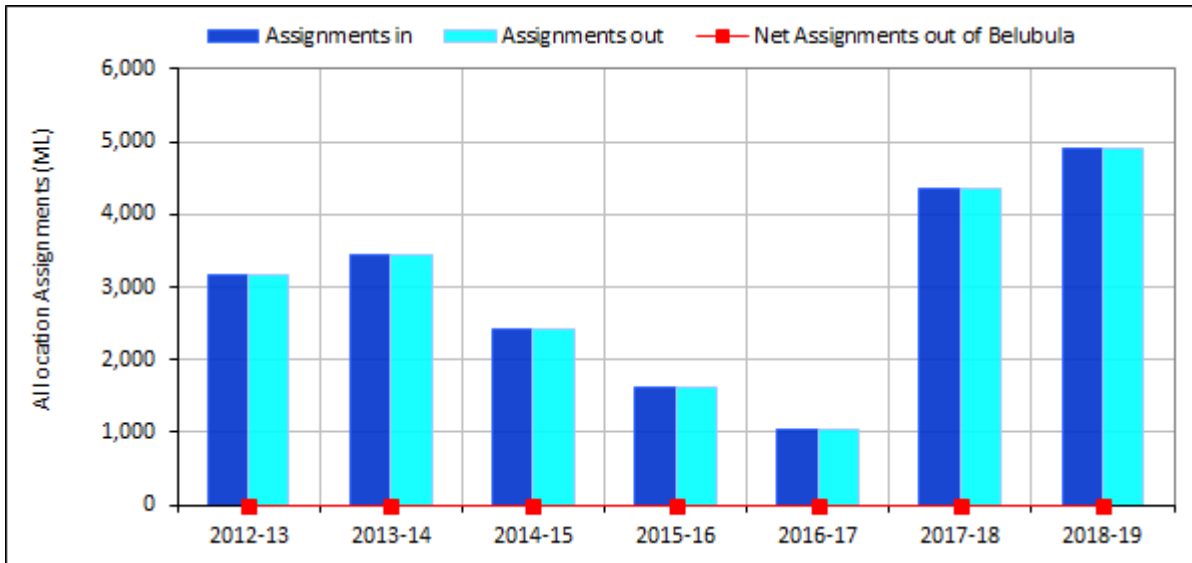
Table 7: Belubula inactive licence summary

Licence category	Inactive licences (number) 2018–19	Inactive share component 2018–19	Inactive share component % of total 2018–19	Inactive Share Component % of total prior year 2017–18
Domestic and Stock	17	149	88%	88%
Domestic and Stock [Stock]	6	34	77%	89%
Domestic and Stock [Domestic]	3	8	100%	100%
General Security	33	5,128	23%	20%
High Security	0	0	0%	0%
Total regulated supply	59	5,319	22%	20%
Supplementary Water	0	0	0%	0%

Temporary trading (allocation assignments)

- The total volume of allocation assignments for the reporting period was 4,896 megalitres which was the highest volume since the water sharing plan commenced (Figure 33).
- No water is allowed to be traded between the Belubula Regulated River Water Source and other water sources (net assignments out is zero).

Figure 33: Total allocation assignments

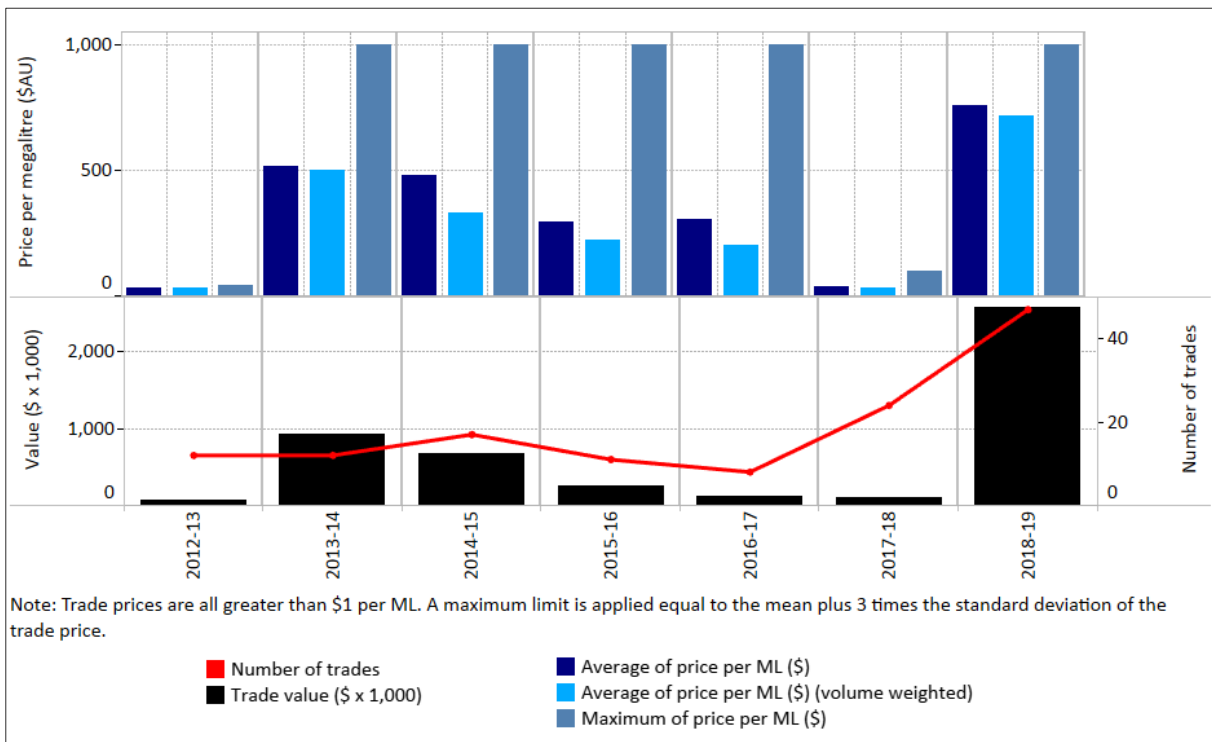


Temporary commercial statistics

For the reporting period, considering commercial trades only (>\$1 per megalitres), 47 transactions were processed (Figure 34) with the following characteristics. The:

- average price for water was \$757 per megalitre (weighted average \$714), a 2,155% increase on the prior reporting period
- maximum price for water was \$1,000 per megalitre
- total trade value was \$2,581,000, the highest under water sharing plan management conditions and a 2,330% increase on the prior reporting period.

Figure 34: Allocation assignment commercial statistics—Belubula



Permanent water trading

Permanent commercial statistics

- No general security share assignments (Figure 35) were processed.
- No high security share assignments have been processed since the commencement of the water sharing plan.
- Three licences were subject to change of holder for commercial purposes. 1,448 shares were transferred (Figure 36).

Figure 35: Share assignments commercial statistics—Belubula, General Security

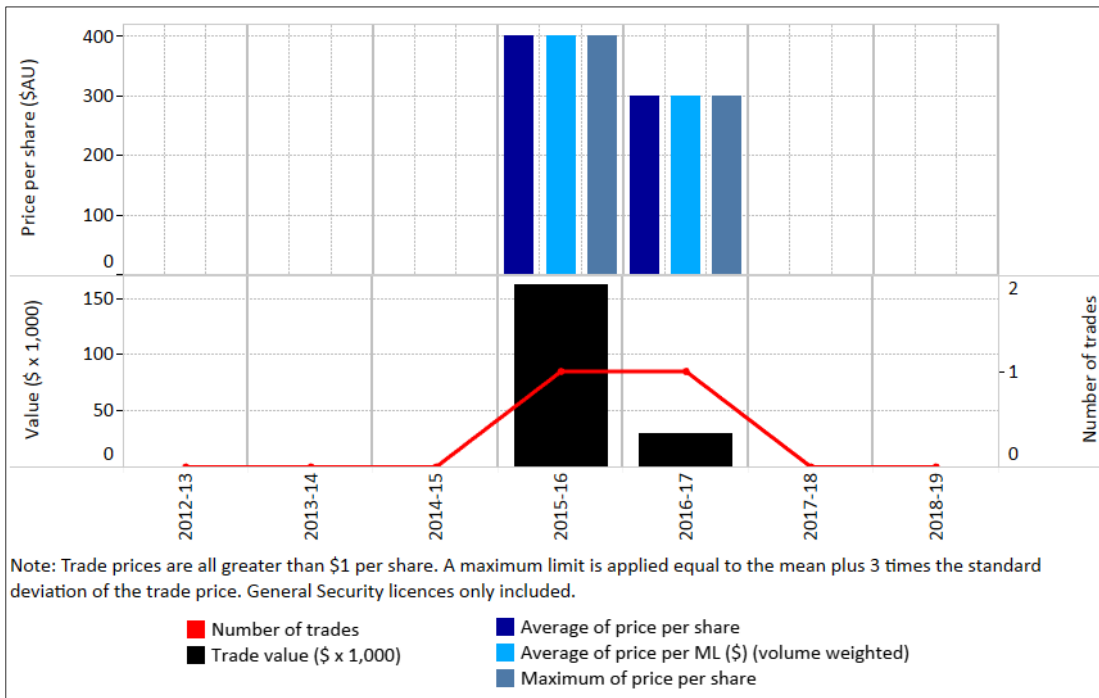
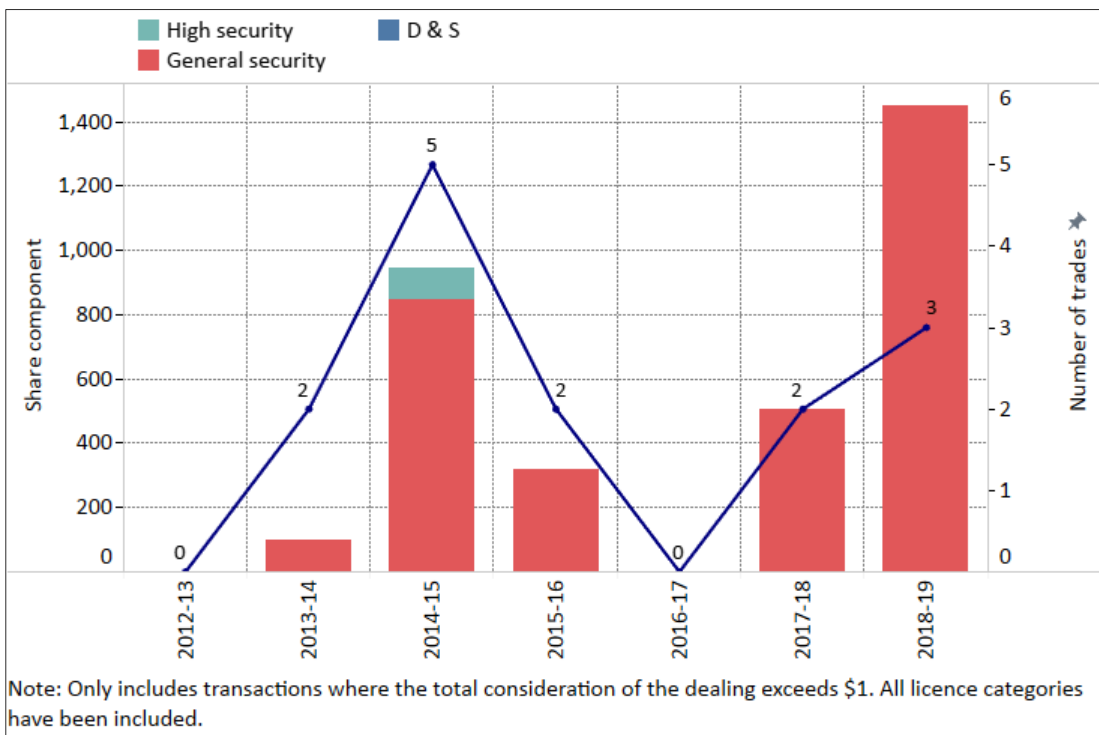


Figure 36: Change of holder commercial statistics, Belubula



Environmental Water

Planned environmental water

No translucent releases were triggered under the planned environmental provisions of the water sharing plan.

The inflows did not meet the required inflows of 250,000 megalitres to trigger a translucent event during the 2018–19 year.

The environmental contingency allowance (ECA) was credited with 10,000 megalitres on 1 July 2018. A total of 9,271 megalitres was released throughout the reporting period.

The ECA distributed:

- 952 megalitres to Booberoi Creek to support fish breeding and from the Lachlan River through the Booberoi Creek system—including the threatened freshwater catfish population
- 8,319 megalitres to the Lachlan river supporting lateral and longitudinal connectivity for fish outcomes, stream habitat and terminal wetland vegetation.

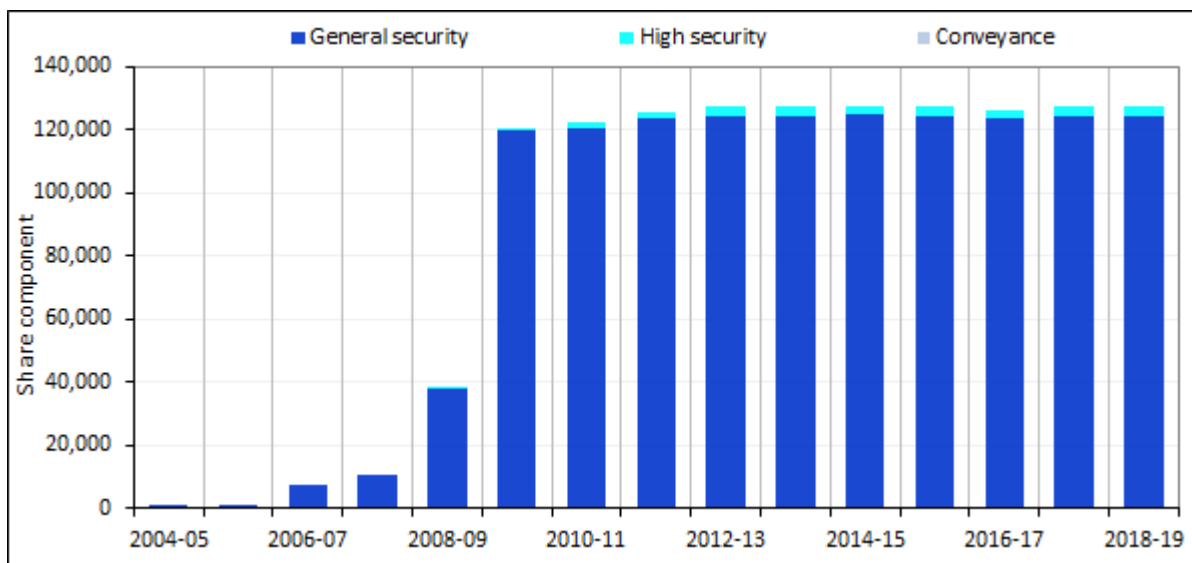
The water quality allowance (WQA) was credited with 20,000 megalitres on 1 July 2018. A total of 4,936 megalitres was used in the reporting period.

Further details on planned environmental water and historical accounting are available in Note 7 of this document.

Held environmental water

- Held environmental water share component remained constant throughout the reporting period.
- Total held environmental water consists of 124,518 shares general security and 2,728 shares high security as of 30 June 2019 (Figure 37).
- Total usage of held environmental water was 26,448 megalitres, which was a four-year low (Figure 38).
- Details on held environmental are available in Note 6 of this GPWAR.
- Utilisation of held environmental water available increased by 1 % to 28%, (Figure 39)

Figure 37: Held environmental water share in the Lachlan since commencement of the plan¹⁵



¹⁵ These represent the number of shares at the conclusion of the water year.

Figure 38: Held environmental account water used in the Lachlan since commencement of plan

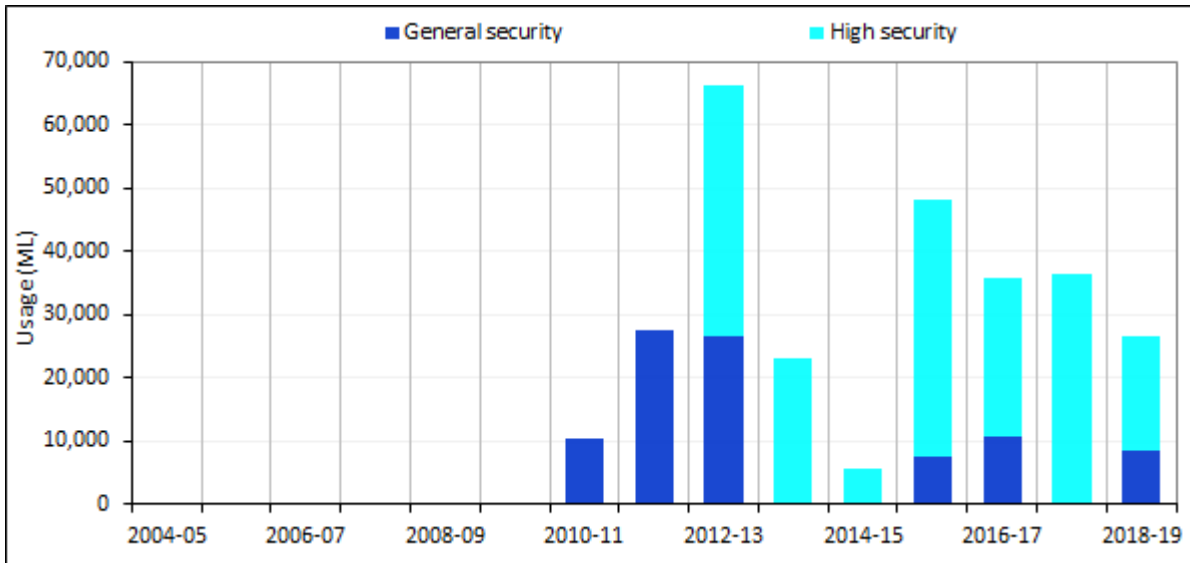
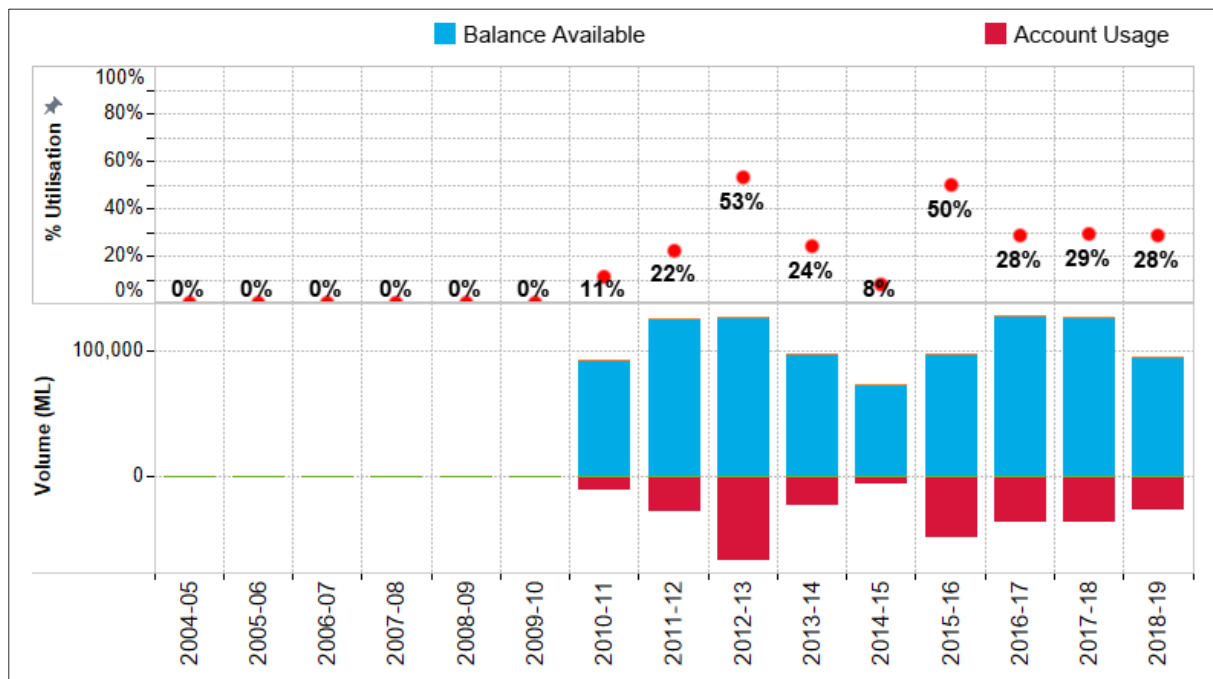


Figure 39: Held environmental utilisation in the Lachlan since commencement of plan



Water Accounting Statements

Significant water accounting policies

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

We have excluded the 'Statement of Physical Flows' from this GPWAR as all transactions have been presented 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 more clearly depict those accounting processes associated with physical flow movement.

For general information on how to interpret the NSW Department of Planning, Industry and Environment, water accounting statements refer to the *Guide to General Purpose Water Accounting Reports* available for download on from the department's website (industry.nsw.gov.au/water).

Quantification of data

Data accuracy

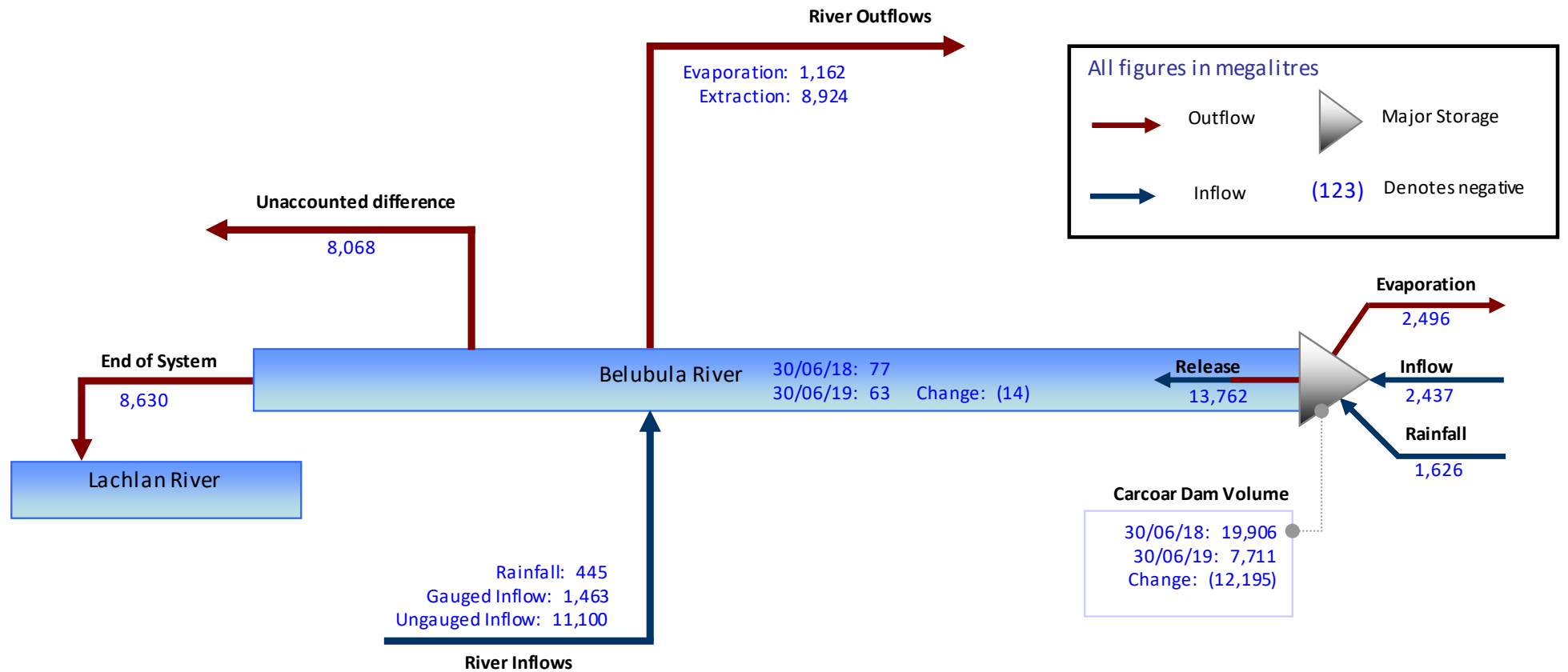
It is important to recognise that the data used to account for water movement and management in the reporting entity has been obtained from a variety of sources and systems. The data ranges from observed values where a high accuracy would be anticipated through to modelled results and estimates where accuracy can be highly variable depending on a range of factors. To address the inconsistencies in accuracy and prevent misuse of the data in the accounts, all figures in the water accounting statements will be accompanied by an assessment of accuracy (Table 8).

Table 8: Water account data accuracy estimates key

Accuracy	Description
A1 ¹⁶	+/- 0% Data is determined rather than estimated or measured. Therefore, the number contains no inaccuracies.
A	+/- 10%
B	+/- 25%
C	+/- 50%
D	+/- 100%

¹⁶ Non-physical administration items, such as available water determinations, trading and carryover volumes, are assumed to have no inherent error for the purposes of this report. Items are reported as extracted from the NSW Department of Planning, Industry and Environment corporate database.

Belubula 2018–19 physical flows mass balance diagram



Belubula catchment—Statement of water assets and liabilities

For the year ended 30 June 2019

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

Surface water assets

1. Surface water storage	Accuracy	Notes	30 June 19	30 June 18
Carcoar Dam	A	8	7,711	19,906
River	B	9	63	77
Total Surface water storage (Asws)			7,774	19,983
<i>Change in Surface Water Storage</i>			(12,209)	(12,782)

Surface water liabilities

2. Allocation account balance	Accuracy	Notes	30 June 19	30 June 18
Domestic and Stock (Stock)	A1	1	(2)	0
General Security	A1	1	8,221	15,463
High Security	A1	1	0	0
Total allocation account balance (Lsws)			8,219	15,463
<i>Change in Allocation Account Balance</i>			(7,243)	(6,450)

Surface water net changes

3. Net changes	30 June 19	30 June 18
Net surface water assets (Asws – Lsws)	(445)	4,520
<i>Change in Net Surface Water Assets</i>	(4,966)	(6,332)

Belubula catchment—Changes in water assets and liabilities

For the year ended 30 June 2019 (1 of 2)

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

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

Surface water storage increases	Accuracy	Notes	2018–19	2017–18
Carcoar Dam				
Inflow	A	10	2,437	2,137
Rainfall	B	12	1,626	2,468
River				
Rainfall	C	13	445	403
Gauged Inflow	A	14	1,463	1,658
Ungauged Inflow	C	15	11,100	20,400
River inflow from Carcoar Dam release	A	16	13,762	13,085
Total surface water storage increases (Isws)			30,833	40,151

Surface water storage decreases	Accuracy	Notes	2018–19	2017–18
Carcoar Dam				
Evaporation	B	12	2,496	4,231
Storage Releases	A	16	13,762	13,085
River				
Evaporation	C	13	1,162	1,262
Flow Leaving	A	18	8,630	14,910
Basic Rights Extractions	C	20	70	70
Extractions from River	A	19	8,854	8,378
Total surface water storage decreases (Dsws)			34,974	41,936
Unaccounted volume—balancing item (Usws)	D	24	8,068	10,997

Net surface water storage changes	2018–19	2017–18
Net surface water storage inflow (Isws – Dsws – Usws)	(12,209)	(12,782)

Belubula catchment—Changes in water assets and liabilities

For the year ended 30 June 2019 (2 of 2)

2. Changes in allocation accounts

Allocation account increases	Accuracy	Notes	2018–19	2017–18
Available Water Determinations	A1	2		
Domestic and Stock			170	170
Domestic and Stock (Domestic)			8	8
Domestic and Stock (Stock)			44	44
General Security			0	0
High Security			1,095	1,095
Supplementary Demand	A	21	0	0
Internal Trade - Buyers	A1	4	4,896	4,355
Uncontrolled Flow Taken			0	832
Total Allocation Account Increases (Iaa)			6,212	6,504

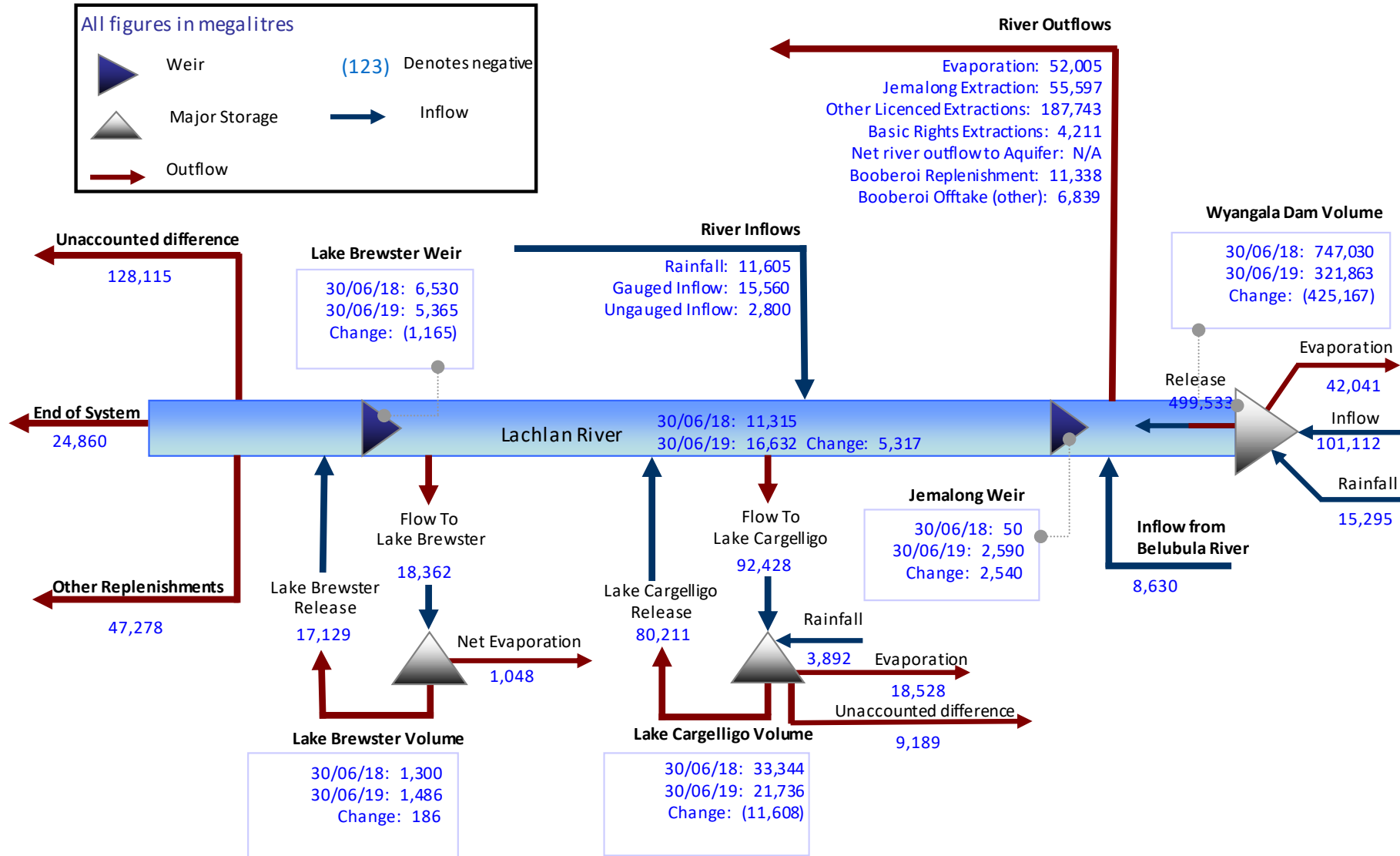
Allocation account decreases	Accuracy	Notes	2018–19	2017–18
Account forfeiture	A1	1		
Domestic and Stock			152	150
Domestic and Stock (Domestic)			8	8
Domestic and Stock (Stock)			34	44
General Security			0	0
High Security			1	0
Account usage	A	3		
Domestic and Stock			18	21
Domestic and Stock (Domestic)			0	0
Domestic and Stock (Stock)			12	0
General Security			8,029	7,204
High Security			307	321
Supplementary			0	0
Uncontrolled Flow			0	832
Adjusting account entry—decrease			0	20
Internal trade—sellers	A1	4	4,896	4,355
Total allocation account decreases (Daa)			13,456	12,955

Net change in allocation accounts			2018–19	2017–18
Net allocation account balance increase (Iaa – Daa)			(7,243)	(6,450)

3. Overall changes

Surface water assets	2018–19	2017–18
Change in net surface water assets (Isws – Dsws – Usws – Iaa + Daa)	(4,966)	(6,332)

Lachlan 2018—19 physical flows mass balance diagram



Lachlan catchment—Statement of water assets and liabilities

For the year ended 30 June 2019

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

Surface water assets

1. Surface water storage	Accuracy	Notes	30 June 2019	30 June 2018
Wyangala Dam	A	8	321,863	747,030
Lake Cargelligo	A	8	21,736	33,344
Lake Brewster	A	8	1,485	1,300
Lake Brewster Weir	A	8	5,365	6,530
Jemalong Weir	A	8	2,590	50
River	B	9	16,632	11,315
Total surface water storage (Asws)			369,671	799,569
<i>Change in surface water storage</i>			(429,898)	(434,336)

Surface water liabilities

2. Allocation account balance	Accuracy	Notes	30 June 2019	30 June 2018
Domestic and Stock	A1	1	(15)	(10)
High Security (HS)	A1	1	(25)	(5)
General Security	A1	1	154,819	368,902
Total allocation account balance (Lsws)			154,780	368,888
<i>Change in allocation account balance</i>			(214,108)	(269,596)

Surface water net changes

3. Net change	30 June 2019	30 June 2018
Net surface water assets (Asws – Lsws)	214,891	430,681
<i>Change in net surface water assets</i>	(215,790)	(164,741)

Lachlan catchment—Changes in water assets and liabilities

For the year ended 30 June 2019 (1 of 2)

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

Surface water storage increases	Accuracy	Notes	2018-2019	2017-2018
Wyangala Dam				
Inflow	A	10	101,112	177,638
Rainfall	B	12	15,295	22,664
Lake Cargelligo				
Inflow	A	11	92,428	62,566
Rainfall	B	12	3,892	3,830
Lake Brewster				
Inflow	A	11	18,362	33,093
River				
Rainfall	C	13	11,605	11,308
Inflow from storage releases	A	16	596,873	620,501
Tributary inflow				
Belubula inflow	A	14	8,630	14,910
Gauged tributaries	A	14	15,560	36,977
Ungauged runoff estimate	C	15	2,800	37,600
Total surface water storage increases (Isws)			866,557	1,021,087

Surface water storage decreases	Accuracy	Notes	2018-2019	2017-2018
Wyangala Dam				
Storage releases	A	16	499,533	463,417
Evaporation	B	12	42,041	61,665
Lake Cargelligo				
Storage releases	A	16	80,211	53,262
Evaporation	B	12	18,528	19,434
Lake Brewster				
Storage releases	A	16	17,129	103,822
Net evaporation	B	12	1,048	23,557
River				
Evaporation	C	13	52,005	52,661
Flows leaving				
End of system	A	18,22	24,860	19,168
Booberoi offtake (other)	A	18	6,839	3,359
Booberoi replenishment	A	18,22	11,338	12,068
Other replenishment flows	A	18	47,278	57,448
Regulated effluent				
To Brewster	A	11	18,362	33,093
To Cargelligo	A	11	92,428	62,566
Net river outflow to aquifer	D	23	0	38,150
Extractions				
Basic rights extractions	A	20	4,211	4,211
Licensed extractions from river	A	19	243,340	302,684
Account balance adjustment				
Account balance adjustment Lake Brewster			0	10,563
Total surface water storage decreases (Dsws)			1,159,151	1,321,129
Unaccounted volume (balancing item) (Usws)	D	24	137,304	134,295

Net surface water storage changes	2018-2019	2017-2018
Net surface water storage inflow (Isws – Dsws – Usws)	(429,898)	(434,336)

Lachlan catchment—Changes in water assets and liabilities

For the year ended 30 June 2019 (2 of 2)

2. Changes in allocation accounts

Allocation account increases	Accuracy	Notes	2018-2019	2017-2018
Available water determinations	A1	2		
Domestic and Stock			12,760	12,760
General Security			0	11,843
High Security			27,680	27,680
Local Water Utility			15,545	15,545
Conveyance			16,657	17,911
Internal Trade - Buyers	A1	4	161,720	243,309
Environmental Contingency Allowance Increase	A1	7	10,000	20,000
Water Quality Allowance Increase	A1	7	20,000	20,000
Total allocation account increases (Iaa)			264,362	369,047

Allocation account decreases	Accuracy	Notes	2018-2019	2017-2018
Allocation account usage	A	3		
Domestic and Stock			5,559	5,563
General Security			182,794	217,175
High Security			56,423	90,740
Local Water Utility			8,354	7,805
Conveyance			16,657	17,911
Environmental contingency allowance usage	A1	7	9,271	17,295
Water quality allowance usage	A1	7	4,936	0
Account forfeiture	A1	1		
Domestic and Stock			7,200	7,207
General Security			184	242
High Security			2,382	952
Local Water Utility			7,191	7,740
Conveyance			0	0
Environmental contingency allowance	A1	7	729	2,705
Water quality allowance	A1	7	15,064	20,000
Storage spill forfeit	A1	5		
General Security			0	0
Licences cancelled	A1	1		
Domestic and Stock			6	0
Domestic and Stock (Domestic)			0	0
General Security			0	0
Internal trade—sellers	A1	4	161,720	243,309
Account balance adjustment	A1	25	0	0
Total allocation account decreases (Daa)			478,470	638,643

Net change in allocation accounts	2018-2019	2017-2018
Net allocation account balance increase (Iaa-Daa)	(214,108)	(269,596)

3. Overall changes

Surface water assets	2018-2019	2017-2018
Change in net surface water assets (Isws – Dsws – Usws – Iaa + Daa)	(215,790)	(164,741)

Note Disclosures

Reconciliation and future prospect descriptions

This section contains reconciliation and future prospect descriptions for the Belubula and Lachlan regulated water sources. In all tables (..) denotes a negative value.

Belubula catchment: Reconciliation of change in net water asset to net change in physical water storage	2018–19 (ML)	2017–18 (ML)
Change in net surface water assets	(4,966)	(6,332)
Non-physical adjustments		
Net change in allocation accounts	(7,243)	(6,450)
Net change in physical surface water storage	(12,209)	(12,782)

Belubula catchment: Reconciliation of closing water storage to total surface water assets	30 June 2019 (ML)	30 June 2018 (ML)
Closing water storage		
Surface water storage	7,774	19,983
Adjustments for non-physical assets	0	0
Total surface water assets	7,774	19,983

Lachlan catchment: Reconciliation of change in net water asset to net change in physical water storage	2018—19 (ML)	2017—18 (ML)
Change in net surface water assets	(215,790)	(164,741)
Non-physical adjustments		
Net change in allocation accounts	(214,108)	(269,596)
Net change in claims to water: EWA		0
Net change in physical surface water storage	(429,898)	(434,336)

Lachlan catchment: Reconciliation of closing water storage to total surface water assets	30 June 2019 (ML)	30 June 2018 (ML)
Closing water storage		
Surface water storage	369,671	799,569
Adjustments for non-physical assets	0	0
Total surface water assets	369,671	799,569

Note: All figures can be derived from or found directly in the Water Accounting Statements of the General Purpose Water Accounting Report.

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 Lachlan and Belubula water sources. This includes carryovers and available water determinations at the time of reporting, along with probability information about the Lachlan and Belubula systems' reliability.

Latest Water Availability

You can find the latest information on water availability, including water allocation statements, water allocations summaries and 2018-19 available water determinations, on the NSW Department of Planning, Industry and Environment webpage at industry.nsw.gov.au/water/allocations-availability/allocations

You can also subscribe to receive the latest updates.

Allocations



How water is allocated

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



Summary of current water allocations

A listing of current water allocation for major regulated rivers.



Water allocation statements

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



Available water determinations

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



Outlook & forecasts

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

Latest storage volumes

See real-time information on storage volumes at realtimedata.watnsw.com.au

Significant events since the reporting period

The Lachlan and Belubula catchments have experienced a continuation of extremely dry conditions. At the time of writing (February 2020), Wyangala was at 12% of full supply capacity (rising trend) and Carcoar was at 12% of full supply capacity (steady trend).

A temporary water restriction on use of General Security allocation carried forward in the Lachlan (43% of account balance restricted) was enforced on 1 July 2019.

A temporary water restriction on use of General Security allocation carried forward in the Belubula (60% of account balance restricted) was enforced on 1 July 2019.

System reliability/long-term water availability

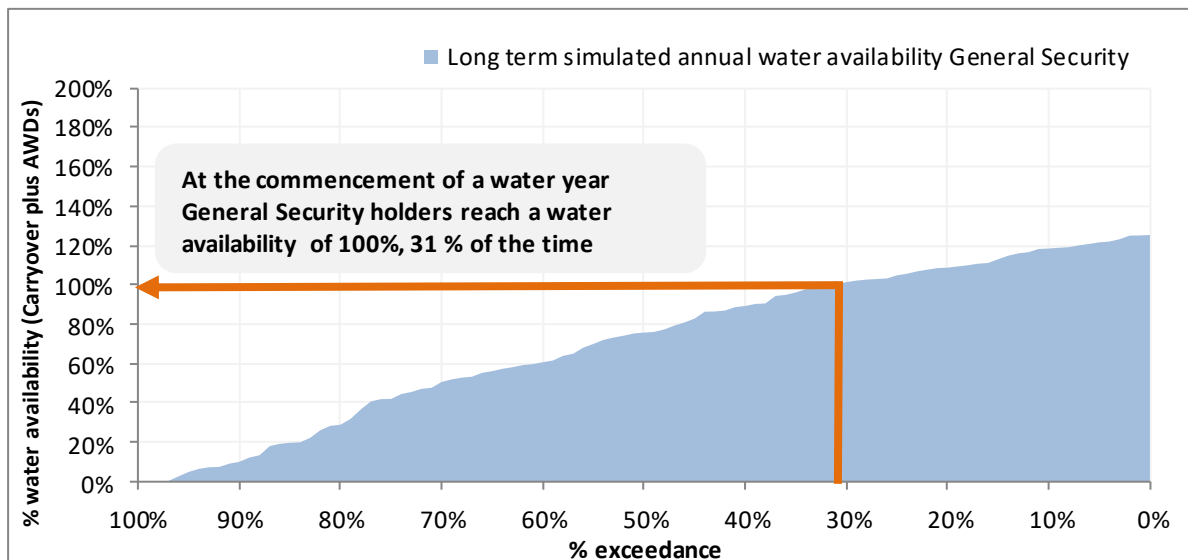
The latest long-term planning model (IQQM) reflecting a water sharing plan management scenario in the Lachlan and Belubula provide indicative system reliability information for the commencement and closure of a watering season¹⁷.

In any given year, the simulation indicates high security entitlements are likely to have full allocation at 100% of the time for both Lachlan and Belubula water sources.

At the commencement of the water year, the simulation shows that, over the long-term, the Lachlan General Security licence holders equal or exceed 100% of their entitlement 31% of the time (Figure 40). For the Belubula water source, the simulation indicates that the General Security licence holders will fail to reach 100% of their entitlement at the beginning of the year, but equal or exceed 66% of entitlement 50% of the time (Figure 41).

Availabilities significantly increase throughout the water year as storages are supplemented from new inflow. By the end of the water year, the simulation results indicate a water availability of 100% of entitlement or greater 61% of the time in the Lachlan (Figure 42) and 83% of entitlement or greater, 50% of the time in the Belubula (Figure 43).

Figure 40: Lachlan start of water year simulated availability for General Security access licences



¹⁷ Modelled data simulated as July to June water year. Simulation period 1 June 1892 to 30 June 2017

Figure 41: Belubula start of water year simulated availability for General Security access licences

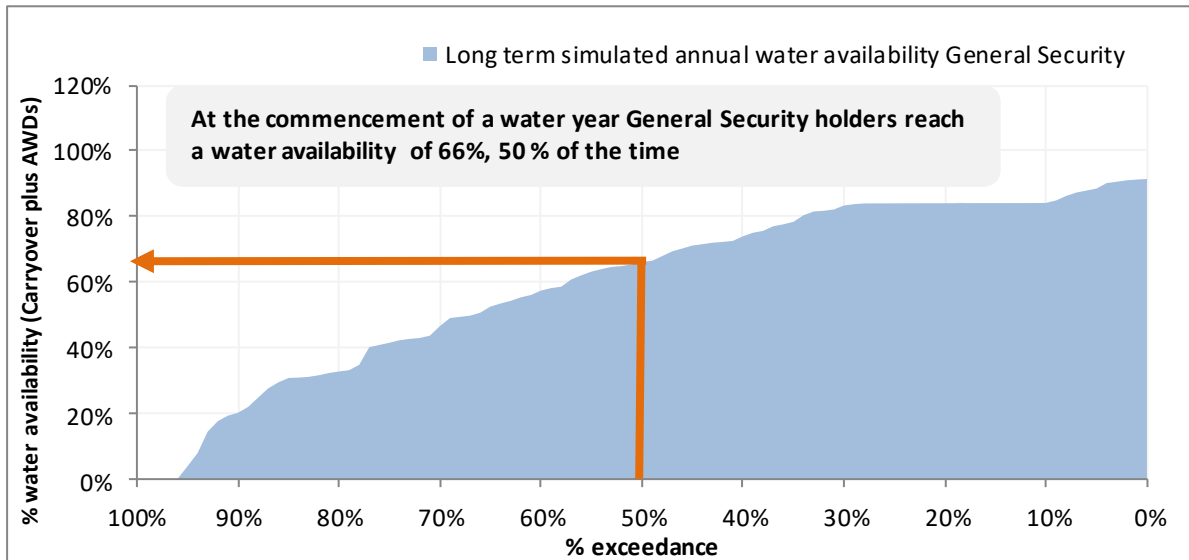


Figure 42: Lachlan end of water year simulated availability for General Security access licences

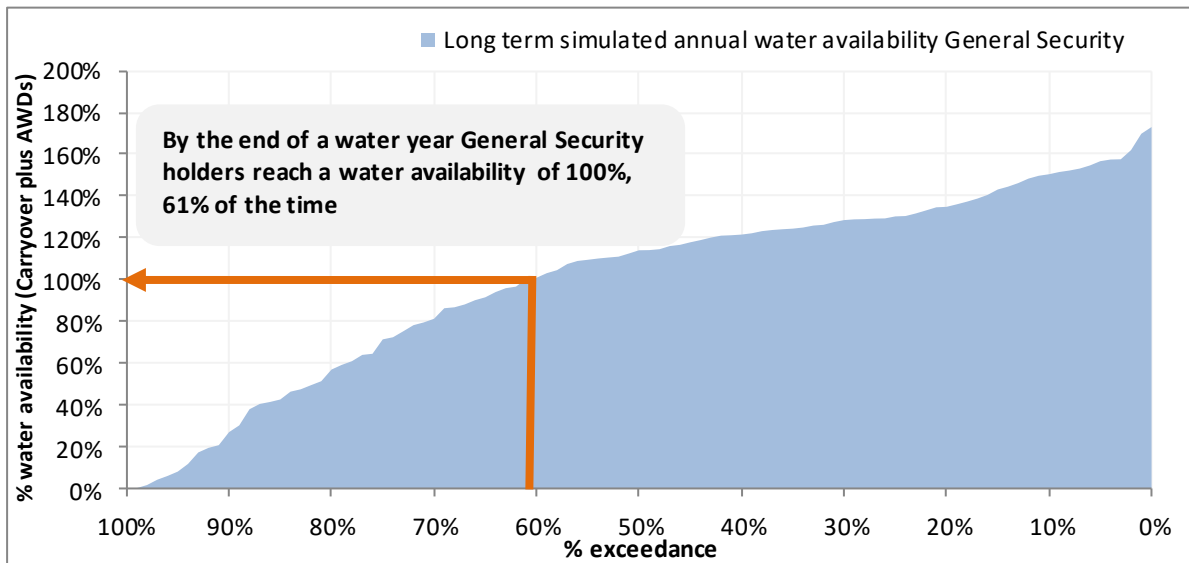
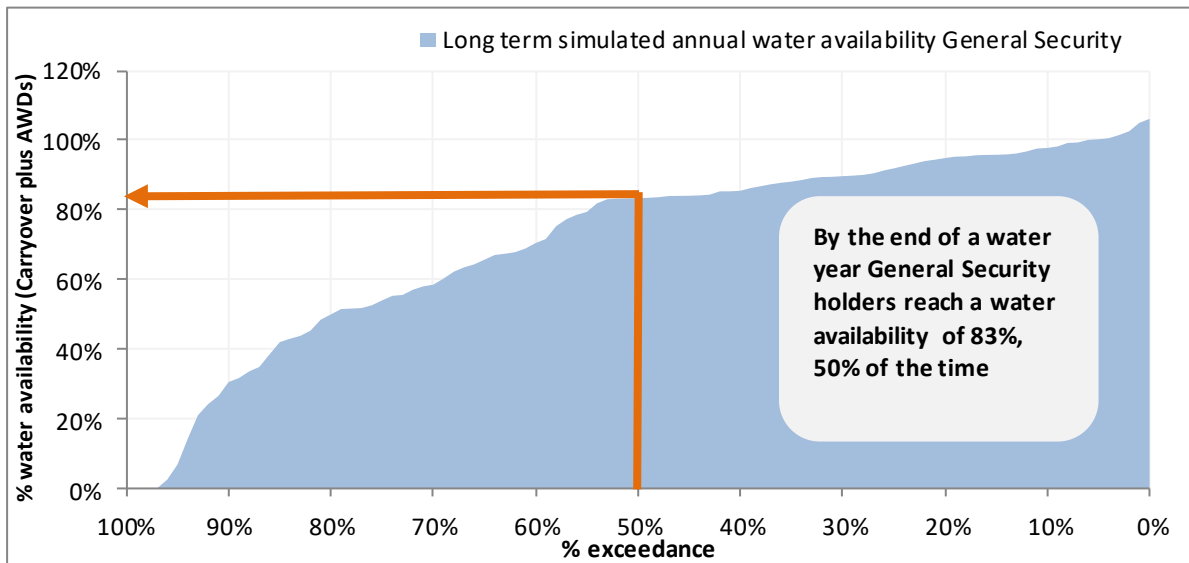


Figure 43: Belubula end of water year simulated availability for General Security access licences



Lachlan carryovers and available water determinations 2019–20 (as of January 2020)

Date	Individual Announcement	Share Component	Allocation Volume (ML)	Cumulative Volume (ML)	Allocation Volume (%)	Cumulative Volume (%)	Balance Available (ML)	Balance Not Available (ML)	Balance Total (ML)	Balance Available (%)	Balance Total (%)
Domestic and stock											
1-Jul-19	Opening	10,974			0.0%	0.0%	(12)	0	(12)	(0.1)%	(0.1)%
1-Jul-19	AWD 100.0 %	10,974	10,974	10,974	100.0%	100.0%	10,962	0	10,962	99.9%	99.9%
Domestic and stock (domestic)											
1-Jul-19	Opening	181			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 100.0 %	181	181	181	100.0%	100.0%	181	0	181	100.0%	100.0%
Domestic and stock (stock)											
1-Jul-19	Opening	1,599			0.0%	0.0%	(2)	0	(2)	(0.1)%	(0.1)%
1-Jul-19	AWD 100.0 %	1,599	1,599	1,599	100.0%	100.0%	1,597	0	1,597	99.9%	99.9%
Local water utility											
1-Jul-19	Opening	15,545			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 100.0 %	15,545	15,545	15,545	100.0%	100.0%	15,545	0	15,545	100.0%	100.0%
Regulated river (conveyance)											
1-Jul-19	Opening	17,911			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 0.3886 ML per Share	17,911	6,960	6,960	38.9%	38.9%	6,960	0	6,960	38.9%	38.9%
General security											
1-Jul-19	Opening	592,801			0.0%	0.0%	146,759	8,353	155,111	24.8%	26.2%
1-Jul-19	AWD 0.0 ML per Share	592,801	0	0	0.0%	0.0%	146,759	8,353	155,111	24.8%	26.2%
1-Jul-19	Drought Suspension 43.0 %	592,801			0.0%	0.0%	92,003	63,108	155,111	15.5%	26.2%
High security											
1-Jul-19	Opening	27,680			0.0%	0.0%	(31)	0	(31)	(0.1)%	(0.1)%
1-Jul-19	AWD 0.87 ML per Share	27,680	24,083	24,083	87.0%	87.0%	24,052	0	24,052	86.9%	86.9%

Belubula carryovers and available water determinations 2019–20 (as of January 2020)

Date	Individual Announcement	Share Component	Allocation Volume (ML)	Cumulative Volume (ML)	Allocation Volume (%)	Cumulative Volume (%)	Balance Available (ML)	Balance Not Available (ML)	Balance Total (ML)	Balance Available (%)	Balance Total (%)
Domestic and stock											
1-Jul-19	Opening	170			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 100.0%	170	170	170	100.0%	100.0%	170	0	170	100.0%	100.0%
Domestic and stock (domestic)											
1-Jul-19	Opening	8			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 100.0%	8	8	8	100.0%	100.0%	8	0	8	100.0%	100.0%
Domestic and stock (stock)											
1-Jul-19	Opening	44			0.0%	0.0%	(2)	0	(2)	(4.1)%	(4.1)%
1-Jul-19	AWD 100.0%	44	44	44	100.0%	100.0%	42	0	42	95.9%	95.9%
General security											
1-Jul-19	Opening	22,454			0.0%	0.0%	7,663	575	8,237	34.1%	36.7%
1-Jul-19	AWD 0.0ML per Share	22,454	0	0	0.0%	0.0%	7,663	575	8,237	34.1%	36.7%
1-Oct-19	Drought Suspension 60.0%	22,454			0.0%	0.0%	4,401	4,100	8,501	19.6%	37.9%
High security											
1-Jul-19	Opening	1,095			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 1.0ML per Share	1,095	1,095	1,095	100.0%	100.0%	1,095	0	1,095	100.0%	100.0%
Supplementary water											
1-Jul-19	Opening	3,125			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 1.0ML per Share	3,125	3,125	3,125	100.0%	100.0%	3,125	0	3,125	100.0%	100.0%

Detailed item notes

Note 1—Allocation accounts

This note is reference for the volume held in the allocation accounts at the time of reporting and is also relevant for the various processes that occur to 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 the relevant licence category and represents that 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.

A negative number for the carryover figure indicates that more usage has occurred than has been allocated to the account, and the deficit must be carried forward to the next season.

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 presented is relevant to licence category and is therefore inclusive of licences held by environmental holders (these are also detailed separately in Note 6).

Data type

Derived from measured data

Policy

- *Water Act 1912*
- Water Sharing Plan for the Lachlan Regulated River Water Source 2016
- Water Sharing Plan for the Belubula Regulated River Water Source 2012

Available on the department's website at <https://www.industry.nsw.gov.au/water>

Data accuracy

A1—Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning, Industry and Environment)

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. Below is list of typical transactions that can apply to an allocation account:

- AWD (detailed in Note 2)
- Licensed account usage (see Note 3)
- Forfeiture due to:
 - Carryover rules
 - Account spillage as a result of AWD
 - Licence conversions

- Licence conversion
- Trade of allocation water between accounts (detailed in Note 4)

Additional information

Table 10 and Table 11 provide a balanced summary of the water allocation accounts for each category of access licence for the Lachlan and Belubula respectively. Table 9 provides a description of each of the table components.

Table 9: Explanatory information for allocation account summary

Heading		Description
Share		This is the total volume of entitlement in the specific licence category.
Opening balance		The volume of water that has been carried forward from previous years allocation account.
AWD		The total annual volume of water added to the allocation account as a result of allocation assessments. This figure includes additional AWD made as a result of a storage spill reset as defined in the water sharing plan.
Licences	New	Increase in account water as a result of either issuing new access licences or increasing the volume of licensed account water.
	Cancelled	Decrease in account water as a result of licence cancellation or decrease in the volume of licensed account water.
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.
Uncontrolled Flow Usage		Volume of water that is taken under high flow conditions that is not accountable against a licence. This differs from supplementary water in that it becomes accountable once specific allocation levels are exceeded.
Forfeits	Storage spill	When Wyangala Dam spills general security accounts forfeit all remaining water in the general security accounts. The accounts are then reset via an AWD to a level as defined in the water sharing plan. Under operational rule for Carcoar Dam under the <i>Water Act 1912</i> a spill of the storage will result in the spill volume reducing the volume of carryover until it is all forfeited.
	During Year	Account water forfeited throughout the year as a result of the accounting rules specified in the water sharing plan. Forfeited water may occur due to account limits being reached, conversions between licence categories and various types of other licence dealings.
End of year balance	Available	Account balance that is available to be taken at the conclusion of the water year.
	Non available	That part of the remaining account balance that is not available to be taken at the conclusion of the water year. This is water in accounts that is in excess of the annual take limit.
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 10: Allocation account balance summary for the reporting period—Lachlan regulated river

Category	Share 30 June 2019	Opening Balance	AWD	Licences		Assignments		Account Usage	Forfeit During Year	End of Year Balance		End of Year Forfeit	Carry Forward
				New	Cancelled	In	Out			Available	Not Available		
Domestic and Stock	10,980	0	10,980	0	6	0	0	5,255	0	5,719	0	5,731	(12)
Domestic and Stock [Domestic]	181	0	181	0	0	0	0	4	0	177	0	177	0
Domestic and Stock [Stock]	1,599	(10)	1,599	0	0	0	0	300	0	1,290	0	1,292	(2)
Local Water Utility	15,545	0	15,545	0	0	0	0	8,354	0	7,191	0	7,191	0
Regulated River (Conveyance)	17,911	0	16,657	0	0	0	0	16,657	0	0	0	0	0
Regulated River (General Security)	592,801	368,903	0	0	0	92,673	123,777	182,794	184	133,938	20,882	0	154,820
Regulated River (High Security)	27,680	(5)	27,680	0	0	69,047	37,942	56,423	0	2,357	0	2,382	(25)

Table 11: Allocation account balance summary for the reporting period—Belubula regulated river

Category	Share 30 June 2019	Opening Balance	AWD	Licences		Assignments		Acc. Usage	Un- controlled Flow Usage	During Year Forfeit	End of Year Balance		End of Year Forfeit	Carry Forward
				New	Cancelled	In	Out				Available	Not Available		
Domestic And Stock	170	0	170	0	0	0	0	18	0	0	152	0	152	0
Domestic And Stock(Domestic)	8	0	8	0	0	0	0	0	0	0	8	0	8	0
Domestic And Stock(Stock)	44	0	44	0	0	0	0	12	0	0	32	0	34	(2)
Regulated River (General Security)	22,454	15,463	0	0	0	4,796	4,009	8,029	0	0	7,056	1,165	0	8,221
Regulated River (High Security)	1,095	0	1,095	0	0	100	887	307	0	0	1	0	1	0
Supplementary Water	3,125	0	3,125	0	0	0	0	0	489	0	2,636	0	2,636	0

Note 2—Available water determination (allocation announcement)

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 is to be added 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. Under the *Water Management Act 2000* the announcements are termed available water determinations (AWD).

Additional AWD for the Lachlan River are also permitted in the event of a storage spill when general security accounts are reset. For additional details see Note 5.

Data type

Derived from measured data.

Policy

Water Management Act 2000 (NSW).

- Chapter 3—Part 2 Access Licences.
 - Clause 59—Available Water Determinations.

Water Sharing Plan for the Lachlan Regulated River Water Source 2016.

- Part 7—Limits to the availability of water
 - Division 2—Available Water Determinations.

Water Sharing Plan for the Belubula Regulated River Water Source 2012.

- Part 7—Limits to the availability of water
 - Division 2—Available Water Determinations.

Available on the NSW Department of Planning, Industry and Environment website at industry.nsw.gov.au/water

Data accuracy

A1—Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning, Industry and Environment.

Data source

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning, Industry and Environment)

Available Water Determination Register—NSW Department of Planning, Industry and Environment website at industry.nsw.gov.au/water

Methodology

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

Table 12: Priority of access licence categories

Licence Category	AWD Priority
General Security	Low
High Security	High
Conveyance	Low
Domestic and Stock ¹⁸	Very High
Local Water Utility	Very High

Available Water Asset 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 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 include things such as town water supplies, stock and domestic requirements, industrial use and permanent plantings (e.g. orchards, vineyards) and environmental allowances
- undelivered account water is the water that is already in accounts that is yet to be provided
- end of system flow requirement is an estimate of the flow that to pass through the system as a result of operation of the system
- 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.

¹⁸ Domestic and Stock is further broken down into three sub categories: Domestic and Stock, Domestic and Stock (Domestic) and Domestic and Stock (Stock). For the purposes of this report and the general purpose water account they were all treated as Domestic and Stock.

Additional information

Table 14 and

Table 15 provide allocation summary reports for the reporting period, for the Lachlan and Belubula respectively. Table 13 provides notes to help interpret these reports.

Table 13: Allocation summary report notes

Heading	Description
Opening	Remaining allocation account balances at the conclusion of the previous season that is allowed to be carried forward to this season.
AWD announced	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 volume	Volume of water credited to accounts within a licence category as a result of the announcement made.
Cumulative volume	Cumulative total of the announced volumes for the water year and licence category.
Allocation % entitlement	This is the announced volume expressed as a percentage of the entitlement applicable on the particular date.
Allocation cumulative %	This is the cumulative volume expressed as a percentage of the entitlement applicable on the particular date.
Balance available	Sum of water available in allocation accounts that has been made available to be taken during the season.
Balance not available	Water allocated that is not accessible at this point in time.
Balance total	Sum of the total volume of account water in accounts.
Balance available %	Balance available expressed as a percentage of the entitlement.
Balance total %	Balance total expressed as a percentage of the entitlement

Table 14: Allocation announcements for the reporting period—Lachlan regulated river water source

Date	Individual Announcement	Share Component	Allocation Volume (ML)	Cumulative Volume (ML)	Allocation Volume (%)	Cumulative Volume (%)	Balance Available (ML)	Balance Not Available (ML)	Balance Total (ML)	Balance Available (%)	Balance Total (%)
Domestic and stock											
1-Jul-18	Opening	10,980			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	10,980	10,980	10,980	100.0%	100.0%	10,980	0	10,980	100.0%	100.0%
Domestic and stock (domestic)											
1-Jul-18	Opening	181			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	181	181	181	100.0%	100.0%	181	0	181	100.0%	100.0%
Domestic and stock (stock)											
1-Jul-18	Opening	1,599			0.0%	0.0%	(10)	0	(10)	(0.6)%	(0.6)%
1-Jul-18	AWD 100.0 %	1,599	1,599	1,599	100.0%	100.0%	1,589	0	1,589	99.4%	99.4%
Local water utility											
1-Jul-18	Opening	15,545			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	15,545	15,545	15,545	100.0%	100.0%	15,545	0	15,545	100.0%	100.0%
Regulated river (conveyance)											
1-Jul-18	Opening	17,911			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 0.93 ML per Share	17,911	16,657	16,657	93.0%	93.0%	16,657	0	16,657	93.0%	93.0%
General security											
1-Jul-18	Opening	592,801			0.0%	0.0%	347,863	21,062	368,925	58.7%	62.2%
1-Jul-18	AWD 0.0 ML per Share	592,801	0	0	0.0%	0.0%	347,863	21,062	368,925	58.7%	62.2%
High security											
1-Jul-18	Opening	27,680			0.0%	0.0%	(5)	0	(5)	0.0%	0.0%
1-Jul-18	AWD 1.0 ML per Share	27,680	27,680	27,680	100.0%	100.0%	27,675	0	27,675	100.0%	100.0%

Table 15: Allocation announcements for the reporting period—Belubula regulated river

Date	Individual Announcement	Share Component	Allocation Volume (ML)	Cumulative Volume (ML)	Allocation Volume (%)	Cumulative Volume (%)	Balance Available (ML)	Balance Not Available (ML)	Balance Total (ML)	Balance Available (%)	Balance Total (%)
Domestic and stock											
1-Jul-18	Opening	170			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	170	170	170	100.0%	100.0%	170	0	170	100.0%	100.0%
Domestic and stock (domestic)											
1-Jul-18	Opening	8			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	8	8	8	100.0%	100.0%	8	0	8	100.0%	100.0%
Domestic and stock (stock)											
1-Jul-18	Opening	44			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	44	44	44	100.0%	100.0%	44	0	44	100.0%	100.0%
General security											
1-Jul-18	Opening	22,454			0.0%	0.0%	15,483	0	15,483	69.0%	69.0%
1-Jul-18	AWD 0.0 ML per Share	22,454	0	0	0.0%	0.0%	15,483	0	15,483	69.0%	69.0%
High security											
1-Jul-18	Opening	1,095			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 1.0 ML per Share	1,095	1,095	1,095	100.0%	100.0%	1,095	0	1,095	100.0%	100.0%
Supplementary water											
1-Jul-18	Opening	3,125			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 1.0 ML per Share	3,125	3,125	3,125	100.0%	100.0%	3,125	0	3,125	100.0%	100.0%

Note 3—Allocation account usage

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

Data type

Measured data

Policy

Not applicable

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning, Industry and Environment)

NSW Department of Planning, Industry and Environment—Water Ordering and Usage database

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 required 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 (note there are no supplementary licences in the Lachlan)
- 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

- Table 16. The prioritising is based on the nature of and rules around each of the licence categories.

Table 16 provides the order in which extractions are apportioned to access licence categories. In the table following licensed extractions are apportioned in order of priority 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 the categories.

Table 16: 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 General Security
6	Conveyance
7	Local Water Utility
8	Major Water Utility

Additional Information

Table 17 provides a summary of usage for both the Lachlan and Belubula catchments broken up into licence categories for the reporting period

Table 17: Allocation account usage

Account usage	Lachlan	Belubula
Domestic and Stock	5,255	18
Domestic and Stock [Domestic]	4	0
Domestic and Stock [Stock]	300	12
Local Water Utility	8,354	N/A
Regulated River (Conveyance)	16,657	N/A
Regulated River (General Security)	182,794	8,029
Regulated River (High Security)	56,423	307
Supplementary Water	N/A	489
Total account usage	269,788	8,854

Note 4—Internal trading (allocation assignments)

This represents the temporary trading (allocation assignments) of water between allocation accounts within the regulated Lachlan and Belubula water sources.

Data type

Administration

Policy

Water Sharing Plan for the Lachlan Regulated River Water Source 2016

- Part 10 Access licence dealing rules
 - Clause 61 assignments of water allocations dealings
 - Available on the NSW Department of Planning, Industry and Environment website at industry.nsw.gov.au/water

Water Sharing Plan for the Belubula Regulated River Water Source 2012

- Part 10 Access licence dealing rules
 - Clause 53 assignment of water allocations dealings
 - Available on the NSW Department of Planning, Industry and Environment website at industry.nsw.gov.au/water

Data accuracy

A1—Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning, Industry and Environment)

Methodology

Trading data is extracted from the Water Accounting System.

Trading is permitted between certain categories of access licences and between certain water sources. This is detailed in the water sharing plan or stipulated under the licence holder's conditions. There are also limits in place on the amount of water that can be interchanged upstream and downstream of Cargelligo Weir. Trading is not permitted between the Lachlan and Belubula water sources.

The net internal trade for each licence category is zero for a water year. As such, trades occur as both a water liability decrease (sellers of water) and a water liability increase (buyers of water).

Additional information

Table 18 and Table 19 provide the internal trading figures between licence categories for the Lachlan and Belubula respectively. All figures represent a volume in megalitres.

Table 18: Lachlan regulated river internal trade summary

From	To General security	To High security	Total
General security	61,150	62,627.4	123,777.4
High security	31,522.9	6,419.2	37,942.1
Total	92,672.9	69,046.6	161,719.5

Table 19: Belubula regulated river internal trade summary

From	To General security	To High security	Total
General security	3,908.6	100	4,008.6
High security	886.9	0	886.9
Total	4,795.5	100	4,895.5

Note 5—Spill reset and forfeiture

Wyangala Dam

As set out in the water sharing plan this refers to the resetting of the general security allocation accounts to level as defined in the water sharing plan when Wyangala Dam either spills or releases water to maintain airspace and both Lake Brewster and Lake Cargelligo are full. When this occurs all remaining water in the general security accounts is withdrawn and an AWD up to 1.36 megalitres per share (value deemed to be the maximum that general security accounts can hold) is made to reset the accounts.

Carcoar Dam

With the *Water Act 1912*, when Carcoar Dam spills the volume of spill progressively reduces any carryover water until such time as all carryover water is withdrawn from accounts. In 2012–13 the spill and reset volumes applied occurred while operating under the rules of the *Water Act 1912*. There is no spill reset process however set out in the *Water Sharing Plan for the Regulated Belubula River 2012*.

Data type

Administration

Policy

- *Water Act 1912*
- Water Sharing Plan for the Lachlan Regulated River Water Source 2016.
- Part 9 Rules for Managing Access Licences
 - Clause 56 Withdrawals from water allocation accounts for regulated river (high security) access licences, regulated river (general security) access licences and regulated river (conveyance) access licences

Available from the NSW Department of Planning, Industry and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A1—Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

Water Accounting System

Methodology

Data is extracted directly from the corporate databases which results in a reduction and/or increase in the associated general security account.

For Carcoar Dam the carryover account is reduced by the volume of spill recorded (only applicable under the *Water Act 1912*).

Additional information

Total forfeitures and available water determination volumes resulting from spill transactions in the reporting period are provided in Table 20.

Table 20: Storage Spill forfeitures and resets

Storage	Spill Forfeiture	Spill AWD Reset
Wyangala Dam	0	0

Note 6—Held environmental water

This represents that environmental water that is held as part of a licensed volumetric entitlement. These licences are either purchased on the market by environmental agencies or issued as a result of water savings achieved through investment by those relevant agencies.

These licences are held within the same licence categories as all other water access licences hence are subject to the same operating rules. Therefore they are subject to the following key 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 water requirements of, a specific environmental events or incidents.

Data type

Measured

Policy

Water Management Act 2000

- Dealings with access licences (Division 4)
 - 71T Assignment of water allocations between access licences.
- Water Sharing Plan for the Lachlan Regulated River Water Source 2016
- Water Sharing Plan for the Belubula Regulated River Water Source 2012

Available on the NSW Department of Planning, Industry and Environment website at industry.nsw.gov.au/water

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

NSW Department of Planning, Industry and Environment Environmental Water Portal (internal system)

Available Water Determination Register—NSW Department of Planning, Industry and Environment website at industry.nsw.gov.au/water

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 a 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 of entitlements, and volume.

Additional information

Information on how environmental agencies manage their entitlements can be obtained from:

- www.environment.nsw.gov.au
- www.mdba.gov.au
- www.environment.gov.au

Table 22 provides a summary of held environmental water for the reporting period. Table 21 provides a description of each component presented. Table 23 presents the changes in environmental holdings relative to the previous reporting period. Table 24 provides a summary of temporary trading associated with the environmental water holdings. The trade is presented from the perspective of purpose of use, whereby a trade to a consumptive holder for the delivery of environmental water is considered to be an environmental to environmental movement.

Table 21: Explanatory information for environmental account summary

Heading		Description
No. licences		This is the number of environmental licences held.
Share		This is the total volume of entitlement in the specific licence category.
Opening balance		The volume of water that has been carried forward from previous years 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.
Forfeits	Storage spill reset	When Wyangala Dam spills general security accounts firstly forfeit carryover based on the volume of the spill until it is all gone and then forfeits all remaining general security accounts and rests them to a level as defined in the water sharing plan.
	During Year	Account water forfeited throughout the year as a result of the accounting rules specified in the water sharing plan. Forfeited water may occur due to account limits being reached, conversions between licence categories and various types of other licence dealings.
End of year balance	Available	Account balance that is available to be taken at the conclusion of the water year.
	Not available	Account balance that is currently not available for use (e.g. restricted due to drought conditions or annual use limit restrictions)
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 22: Lachlan regulated river environmental account summary

Category	Share 30 June 2019	Opening Balance	AWD	Licences		Assignments		Account Usage	During Year Forfeit	End of Year Balance		End of Year Forfeit	Carry Forward
				New	Cancelled	In	Out			Available	Not Available		
General security	124,518	101,085	0	0	0	21,938	42,741	8,548	0	62,016	9,719	0	71,734
High security	2,728	0	2,728	0	0	30,000	14,615	17,900	0	213	0	213	0

Table 23: Lachlan regulated river environmental licence changes for the reporting period

Category	Volume 30 June 2018	Volume 30 June 2019	Volume Difference	No. Licences 30 June 2018	No. Licences 30 June 2019	No. Licence Difference
General security	124,518	124,518	0	10	10	0
High security	2,728	2,728	0	7	7	0

Table 24: Lachlan regulated river environmental trade summary¹⁹

Environmental allocation assignments summary			To				Total
			Enviro		Non-Enviro		
			General security	High security	General security	High security	
From	Enviro	General security	7,735	30,200	4,206	600	42,741
		High security	14,615				14,615
Total			22,350	30,200	4,206	600	57,356

¹⁹ This table considers that water traded from environmental licences to a consumptive licence for environmental delivery the same as trading between two environmental licences. Note: No environmental licences or environmental trade are in the Belubula.

Note 7—Environmental provisions

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

Environmental contingency and water quality allowances

The Wyangala Environmental Contingency Allowance (WECA) and the Lake Brewster Environmental Contingency Allowance (LBECA) are credited up to a maximum of 10,000 megalitres (each) based on triggers linked to general security allocation account volumes. These trigger levels are:

1. If on 1 July the total water held in allocation accounts exceeds 50% of general security share component.
2. If 50% not achieved on 1 July then if carryover plus AWD volume exceeds 75% at any time during the year

The water can be called upon for release by NSW Office of Environment and Heritage (OEH) for ecological purposes, including, but not limited to, completion of waterbird breeding events, promotion of fish breeding, promotion of fish passage, wetland watering and increasing flow variability.

Any water remaining in the WECA or LBECA at the end of the water year must be forfeited. For the purposes of this GPWAR the WECA and LBECA, have been represented as one allowance and termed the Environmental Contingency Allowance (ECA).

The plan also states the requirement for a Water Quality Allowance (WQA) to be used for any water quality management purpose, but in particular for reduction of salinity levels and mitigation of blue-green algae impacts. This account is to be credited 20,000 megalitres on 1 July each year. The balance remaining at the end of a water year must be forfeited.

Translucent flows

The water sharing plan sets out to improve natural variation in the flow regime by passing a proportion of inflows through Wyangala Dam (called 'translucent' releases) and prohibiting the extraction of tributary inflows or diversions into Lakes Brewster or Cargelligo. The rules apply from 15 May to 15 November at Wyangala once a total of 250,000 megalitres of inflows have entered the dam after 1 January.

Translucent releases are made when the combination of dam inflows and downstream tributary inflows are sufficient to produce target flows in the range of 3,500 to 8,000 megalitres per day at Brewster Weir. The rules also prohibit the extraction of some tributary inflows or the diversion of flows into Lakes Brewster or Cargelligo from 1 June to 30 November. The plan provides for a total volume of translucent and tributary flows of up to 350,000 megalitres per year measured at Brewster Weir.

Long-term extraction limit

Lachlan River extractions must be limited to a long-term average of 305,000 megalitres while the Belubula River extractions are limited to a long-term average of 7,370 megalitres. All water in excess of these limits are reserved for environmental benefits

Environmental Release Rules Carcoar Dam

The water supply system in the Belubula water source must be managed to maintain a flow at the Helensholme gauge (412033) of 10 megalitres per day. Carcoar releases must be made when necessary to meet this requirement.

Data type

Measured/Administration

Policy

Water Sharing Plan for the Lachlan Regulated River Water Source 2016.

- Part 4 Environmental Water Provisions

Water Sharing Plan for the Belubula Regulated River Water Source 2012.

- Part 4 Planned Environmental Water Provisions
 - Part 6 System Operation Rules
 - Clause 26 Environmental Release rules for Carcoar Dam

Available on the NSW Department of Planning, Industry and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A1—Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

WaterNSW Annual Compliance Report (internal document)

Methodology

Credits and debits to the environmental provisions were adopted from the WaterNSW annual compliance report.

Additional Information

Performance against the minimum flow requirement for the reporting period is presented in Figure 44. A summary of the water quality allowance (WQA) and environmental contingency allowance (ECA) account balances are provided in Table 25. The end of system target was temporarily relaxed in January 2019 to ensure that high security and essential supplies could be maintained throughout the worsening drought conditions and depleting resources.

Figure 44: Belubula performance against environmental end of system target

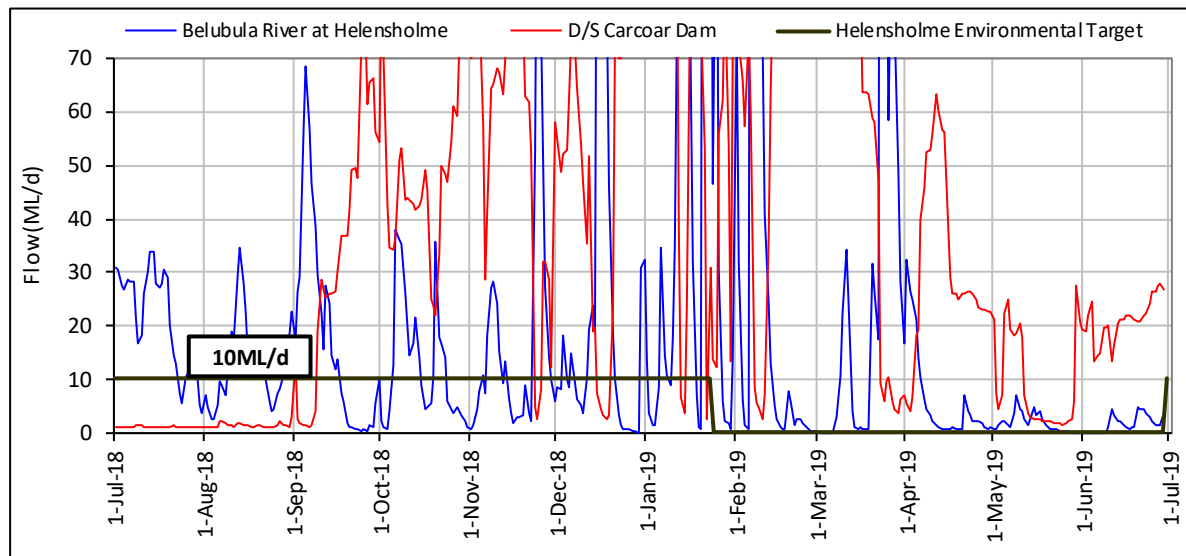


Table 25: Summary of ECA account balance (figures in ML)

Provision	Water Year	Water Credited	Usage	Forfeit	Balance
WQA	2009–10 ²⁰	0	0	0	0
	2010–11	20,000	9,600	10,400	0
	2011–12	20,000	0	20,000	0
	2012–13	20,000	0	20,000	0
	2013–14	20,000	0	20,000	0
	2014–15	20,000	0	20,000	0
	2015–16	20,000	0	20,000	0
	2016–17	20,000	16,027 ²¹	3,973	0
	2017–18	20,000	0	20,000	0
	2018–19	20,000	4,936	15,064	0
ECA	2009–10 ²⁰	0	0	0	0
	2010–11	20,000	20,000	0	0
	2011–12	20,000	0	20,000	0
	2012–13	20,000	0	20,000	0
	2013–14	20,000	0	20,000	0
	2014–15	0	0	0	0
	2015–16	0	0	0	0
	2016–17	20,000 ²²	5,084 ²³	14,916	0
	2017–18	20,000	17,295	2,705	0
	2018–19	10,000	9,271	729	0

²⁰ No credits occurred in 2009-10 due to the plan being switched off for the entire period and the system being operated through critical drought planning.

²¹ 15,000 delivery and 1,027 evaporation losses applied

²² No opening credits, 20,000 was credited when the storage spilled in August 2016

²³ Usage of 3,571 and 1,513 evaporation losses applied

Note 8—Surface water storage

This is the actual volume of water stored in the individual surface water storages 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 which can't be accessed under normal operating conditions e.g. volume below low level outlet. It is assumed that the dead storage can be accessed if required via alternative access methods e.g. syphons.

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

NSW Department of Planning, Industry and Environment—HYDSTRA

Methodology

Storage volumes are calculated by processing a gauged storage elevation through a rating table that converts it to a volume.

Additional information

Storage capacity and dead storage volumes for the main storage in the Lachlan and Belubula are presented in Table 26.

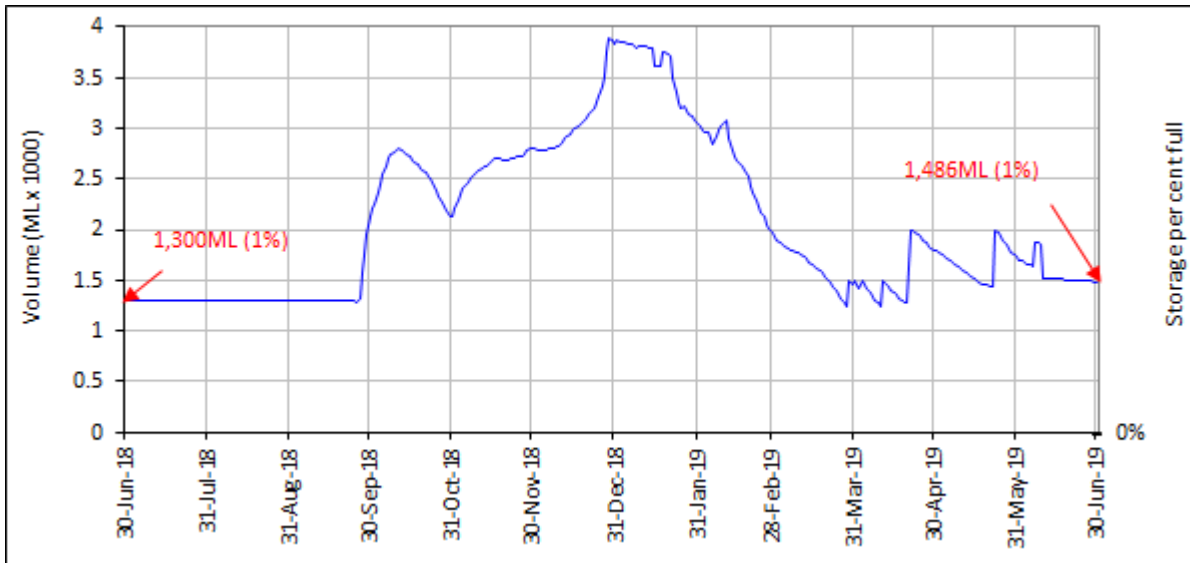
Daily storage volumes and percentages for Lake Brewster are provided in Figure 45. A storage trace has not been provided for Lake Cargelligo due to significant gauging issues in flood events. For plots of Wyangala and Carcoar storages refer to section 'Surface water resources and management' earlier in this report.

Table 26: Capacity and dead storage summary table

Storage	Capacity (ML)	Dead storage (ML)
Carcoar Dam	36,130	214
Wyangala Dam	1,217,670	728
Lake Cargelligo	36,550	6,350
Lake Brewster	153,610	4,550
Jemalong Weir ²⁴	2,780	-
Lake Brewster Weir ²⁴	7,190	-

²⁴ Operated as a re-regulatory weir to improve day to day water delivery.

Figure 45: Lake Brewster storage volume and per cent full



Note 9—River channel storage

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

Policy

Not applicable

Data type

Derived from measured data

Data accuracy

B—Estimated in the range +/- 25%

Providing agency

NSW Department of Planning, Industry and Environment

Data sources

NSW Department of Planning, Industry and Environment: HYDSTRA, CAIRO

Methodology

For each river section S(n):

$$V = Q \times T$$

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

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

Descriptions of each component in this calculation are presented in Table 27.

Table 27: Summary of river channel storage calculation components

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

Assumptions and approximations:

- Travel times are estimated to the nearest day.
- Daily flow change between gauging sites assumed to be linear.

Note 10—Storage inflow—Carcoar and Wyangala

Storage inflow refers to the volume of water flowing into the major headwater storages—Carcoar Dam and Wyangala Dam.

Policy

Not applicable

Data type

Derived from measured data

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data sources

NSW Department of Planning, Industry and Environment: HYDSTRA, SILO (Queensland government climatic information)

Methodology

In most of the major storages in NSW there is no direct measurement of inflows. However, it is possible to calculate inflows by using a mass balance approach (based on balancing the change in storage volume) where inflow is the only unknown (seepage assumed as zero). This is referred to as a back-calculation of inflows.

The back-calculation figures were derived using a one-day time step with the inflow calculated according to the equation below. Descriptions of each component in this calculation are presented in Table 28.

$$I = \sum_{i=1}^n \left(\Delta S_i + O_i + Se_i + \frac{(E_i - R_i) * A_i}{100} \right)$$

Table 28: Components for back-calculation of inflow

Symbol	Variable	Unit
I	Inflow	ML/day
ΔS	Change in storage volume	ML
O	Outflow	ML/day
Se	Seepage	ML/day
R	Rainfall	mm/day
E	Evaporation (Mortons shallow lake estimation, SILO)	mm/day
A	Surface area—derived from height to surface areas lookup curve	ha

Note 11—Storage inflow—Lake Cargelligo and Lake Brewster

This is the estimated total annual inflow to Lake Cargelligo or Lake Brewster.

Policy

Not applicable

Data type

Measured data

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data sources

NSW Department of Planning, Industry and Environment/WaterNSW: CAIRO

Methodology

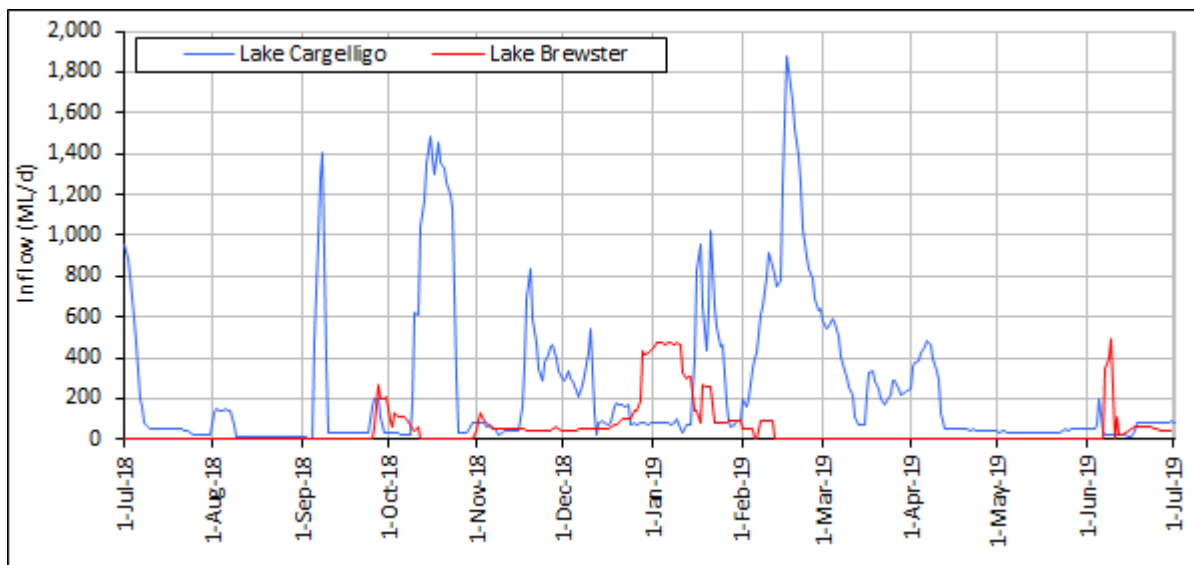
The inflow to Lake Cargelligo used in these accounts is the gauged (measured) flow indicated in the operations database (CAIRO), which is obtained from the gauging site 412101 (Lake Cargelligo Intake upstream Lake Cargelligo Weir)

The inflow to Lake Brewster used in these accounts is the gauged (measured) flow indicated in the operations database (CAIRO), which is obtained from the gauging site 412102 (Lake Brewster Intake downstream Lake Brewster Weir Pool Regulator)

Additional information

Daily storage inflows for Lake Cargelligo and Lake Brewster off river storages are presented in Figure 46.

Figure 46: Lake Cargelligo and Lake Brewster storage inflow



Note 12—Storage evaporation and storage rainfall

This refers to the volume of water effective on Carcoar and Wyangala Dams that is either lost as a result of evaporation or gained as a result of rainfall.

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

B—Estimated in the range +/- 25%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

NSW Department of Planning, Industry and Environment—HYDSTRA, SILO (Queensland government climatic information)

Methodology

Wyangala and Carcoar

Daily rainfall and mortons shallow lake evaporation data (accessed via SILO) are applied to storage surface area time-series from HYDSTRA to achieve a volume in megalitres which is then aggregated to an annual figure. The rainfall and evaporation data utilised is equivalent to the data used in the storage inflow backcalculation (note 10). Descriptions of each component in this calculation are presented in Table 29.

Rainfall:

$$\sum_{i=1}^n V_i = \frac{R_i \times A_i}{100}$$

Evaporation:

$$\sum_{i=1}^n V_i = \frac{E_i \times A_i}{100}$$

Table 29: 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	Ha
E	Evaporation (Mortons shallow lake estimation, SILO)	mm/day

Lake Cargelligo

Similarly the rainfall and evaporation volumes for Lake Cargelligo were estimated by using the storage surface area, and observed evaporation and rainfall readings. For rainfall the data collected at the storage was used, whereas for evaporation data at Lake Cargelligo Airport (75039) was used, as the storage data had a large range of erratic data.

Lake Brewster

As Lake Brewster is physically compartmentalised for operation (resulting in saving water to evaporation), calculating an individual rainfall and evaporation volume is a much more difficult task which would include operational information and multiple storage rating curves. For the purpose of this GPWAR a more simplistic approach was adopted whereby only net evaporation is reported, and this net-evaporation is the balancing (unknown) component of the storage mass-balance.

Net Evaporation = Inflow – Change in Storage – Outflow

(all figures are in megalitres)

Note 13—River evaporation and river rainfall

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

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

C—Estimated in the range +/- 50%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

NSW Department of Planning, Industry and Environment: HYDSTRA, ARCGIS

QLD Department of Natural Resources: SILO

Methodology

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

Area (m²) = Average W (m) x L (m)

Where 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 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. Descriptions of each component in this calculation are presented in Table 30.

Rainfall:

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

Evaporation:

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

Table 30: 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)	-

Note 14—Gauged tributary inflow

The inflow into the regulated river that occurs downstream of the headwater storages that is measured at known gauging stations.

Policy

Not applicable

Data type

Measured data

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data sources

NSW Department of Planning, Industry and Environment: HYDSTRA

Methodology

The flows are obtained by measuring river heights at gauging stations along the river, and then passing these heights through a rating table that converts them to a daily flow volume.

Additional information

The total gauged inflow for the reporting period is the sum of the inflows for the gauged tributaries defined in Table 31.

Table 31: Summary of gauged tributary inflow—(Annual volume in megalitres)

Station	Station name	Area (km ²)	Volume (ML)
Belubula			
412080	Flyers Creek At Beneree	98	1,463
Total		98	1,463
Lachlan			
412030	Mandagery Creek U/S Eugowra (Smithfield)	1,630	4,801
412029	Boorowa River At Prossers Crossing	1,530	8,140
412033	Belubula River At Helensholme	2,560	8,630
412192	Booberoi Creek At Return (Cannons Bridge)	N/A	2,619
Total		5,720	24,190

Note 15—Ungauged runoff estimate

The inflow into the river that occurs downstream of the headwater storages that is not measured.

Policy

Not applicable

Data type

Estimated

Data accuracy

C—Estimated in the range +/- 50%

Providing agency

NSW Department of Planning, Industry and Environment

Data sources

NSW Department of Planning, Industry and Environment, WaterNSW: CAIRO

Methodology

To derive an estimate a simple mass balance approach was adopted whereby known inflows and outflows were combined with an assumed loss factor. No estimate was made for the areas below Lake Cargelligo for the Lachlan or below the Helensholme gauging station for the Belubula, however these contributions are likely to be negligible.

$$UI = EoS - SR - GI + E + LE$$

Where:

UI = Ungauged Inflow Estimate

EoS = Gauged Flow at the point in the system where no further inflow is estimated downstream for the purposes of this ungauged calculation (Helensholme in the Belubula and Lake Cargelligo in the Lachlan)

SR = Storage Release

GI = Gauged Inflows

E = Extractions (excluding any that are below the nominated 'EoS')

LE = Estimated Losses. These were assumed to be 25% for Lachlan in 2018–19 and 10% in Belubula of the measured flows (gauged flow plus storage releases) entering the system.

Additional information

The estimate of river inflow resulting from ungauged tributary contributions for the reporting period are presented in Table 32.

Table 32: Summary of ungauged inflow estimate for the reporting period

Station name	Volume (ML)
Belubula	11,100
Lachlan	2,800

Note 16—Dam releases, river inflow from dam releases

The volume of water released from Wyangala Dam, Carcoar Dam, Lake Brewster or Lake Cargelligo. In the GPWAR accounting process this release volume decreases the relative storage asset, while increasing the river asset volume.

Policy

Not applicable

Data type

Measured data

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data sources

NSW Department of Planning, Industry and Environment: HYDSTRA

Methodology

The flows are obtained by measuring river heights at a gauging station downstream of the dam wall or lake storage, and then passing these heights through a rating table that converts them to a daily flow volume.

Additional information

A summary of the release components for the reporting period is presented in Table 31. Daily releases from Wyangala Dam, Carcoar Dam, Lake Cargelligo and Lake Brewster for the reporting period is presented in Figure 47, Figure 48, Figure 49 and Figure 50 respectively.

Table 33: Summary of releases (ML)

River system	Storage	Release (ML)	Increase to river asset (ML)
Belubula regulated river	Carcoar	13,762	13,762
Lachlan regulated river	Wyangala	499,533	596,873
	Lake Brewster	17,129	
	Lake Cargelligo	80,211	

Figure 47: Wyangala Dam storage releases

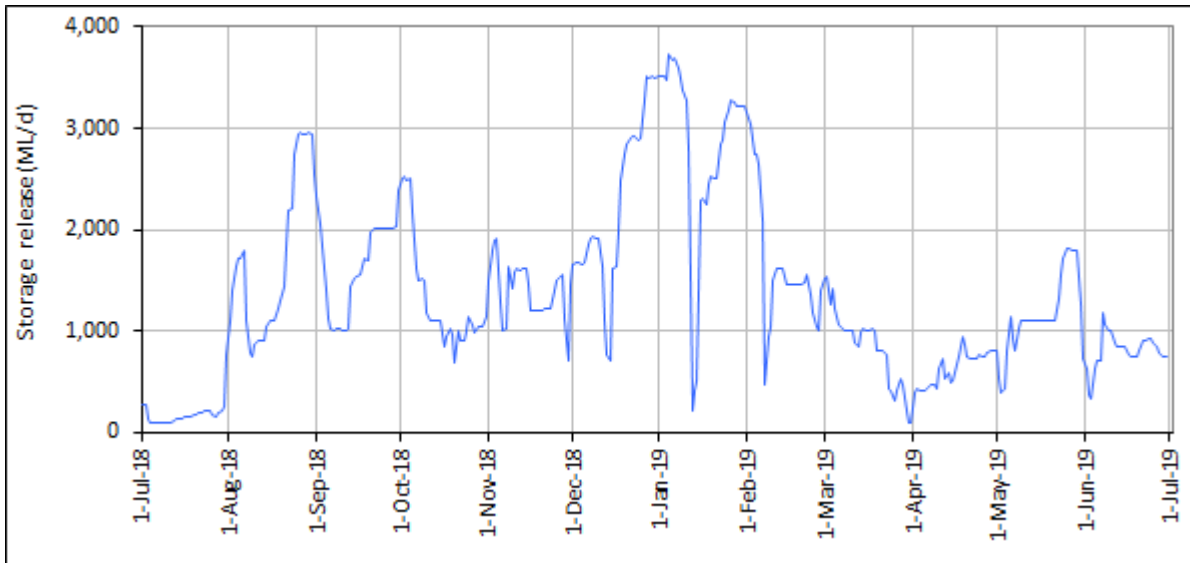


Figure 48: Carcoar Dam storage releases

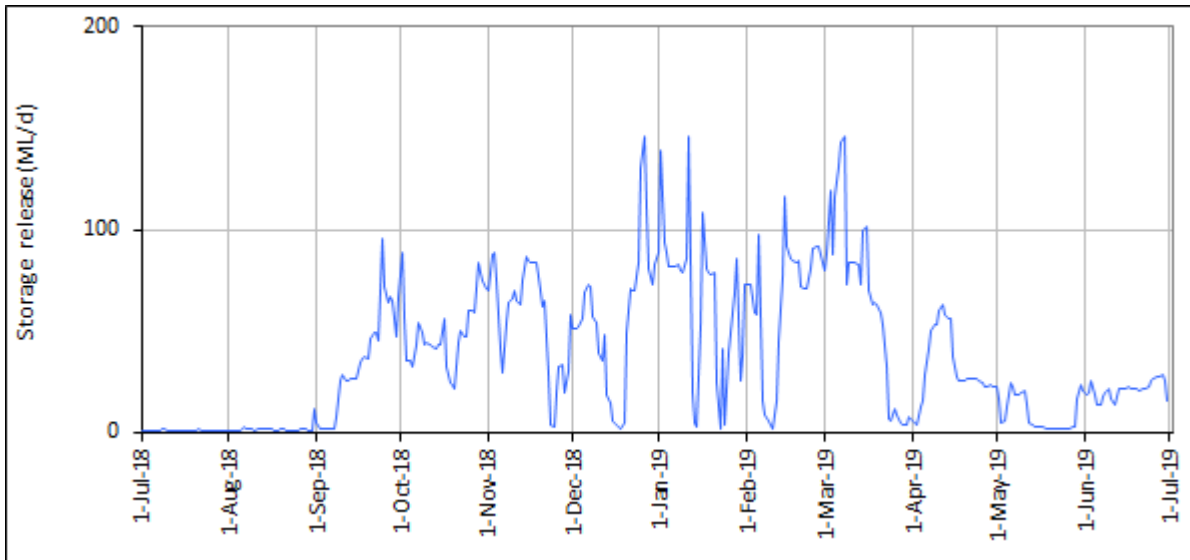


Figure 49: Lake Cargelligo storage releases

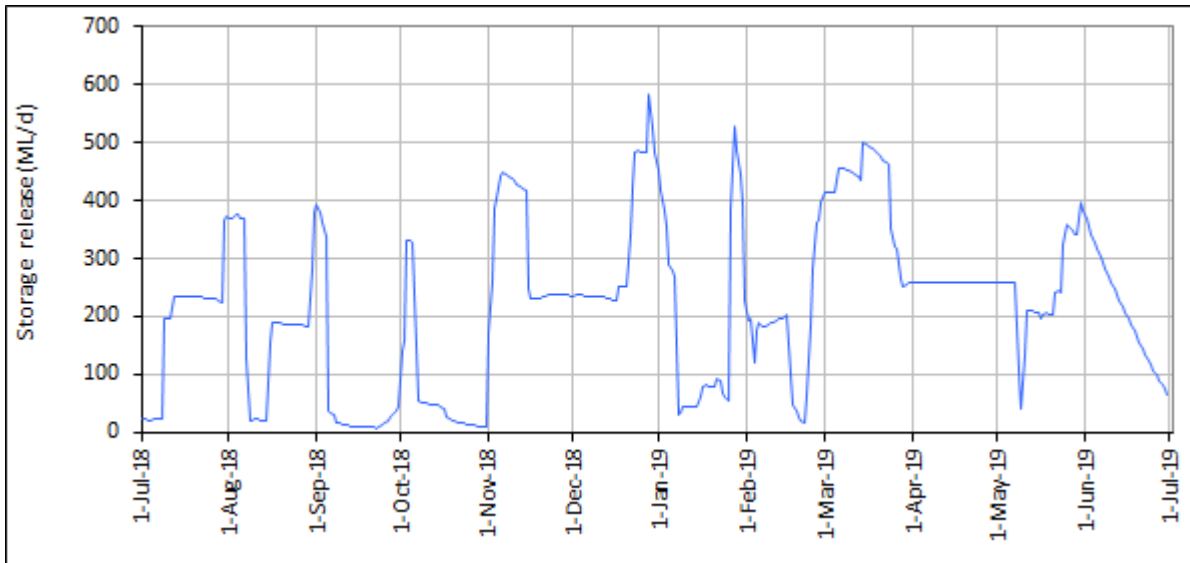
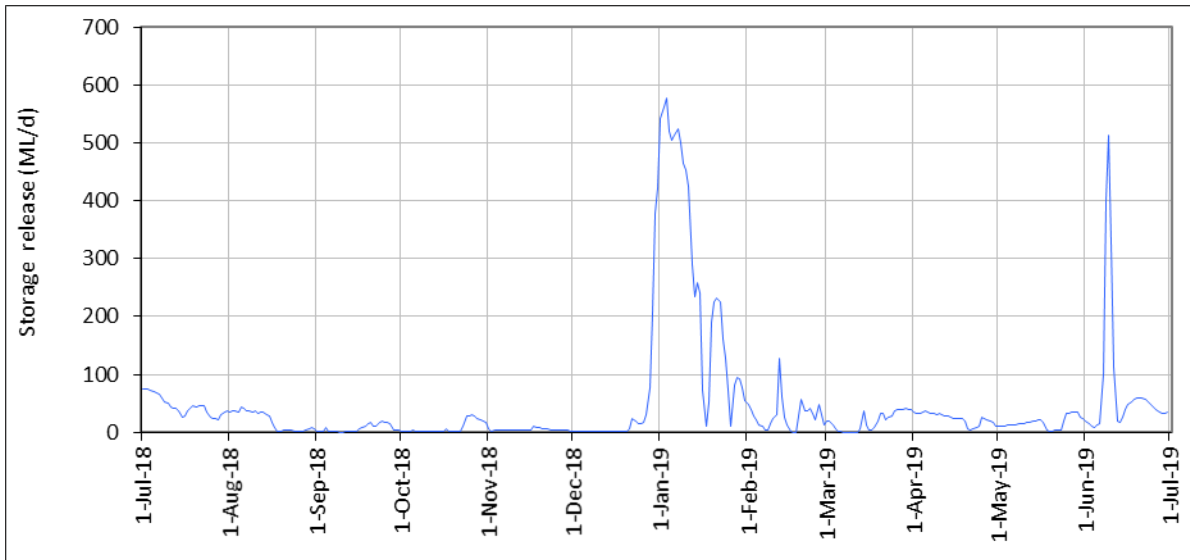


Figure 50: Lake Brewster storage release



Note 17—Regulated effluents

This refers to flow that leaves the river via regulated effluents. Specifically, this is the regulated offtake that divert water to be stored in the off-river storages of Lake Cargelligo or Lake Brewster. The effluents to Lake Cargelligo and Lake Brewster are represented as both a decrease to the river asset volume and an increase to the relative storage asset.

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

NSW Department of Planning, Industry and Environment—HYDSTRA

Methodology

Flows were extracted at gauging sites situated within the channel of the effluent flow. The gauges record the time series of heights which are converted to a volume of water based on a derived height to flow conversion relationship (rating table).

Additional information

Regulated effluents from the river during the reporting period are presented in Table 34.

Table 34: Summary of regulated effluents (ML)

Station name	Station code	River outflow (storage inflow) (ML)
Lake Cargelligo Intake Upstream Lake Cargelligo Weir	412101	92,428
Lake Brewster Inlet D/S Lake Brewster Weir Pool Regulator	412102	18,362
Total Decrease to River Asset		110,790

Effluent outflows other than those defined in this note have not been included in this GPWAR and as such form part of the unaccounted difference presented in the statements, except for regular water diverted:

- to Jemalong irrigation scheme (55,597 megalitres) which forms part of the allocation account usages and river extraction volume
- out of the system for replenishment purposes which is accounted for as replenishment 'flows leaving'.

Note 18—Flow leaving

This refers to flow that leaves the entity and does not return to the entity. The line item includes regulated water leaving the defined accounting extent for replenishment purposes and licensed environmental water ordered to flow beyond the accounting extent to achieve environmental benefits. More information on licensed held environmental water is available in Note 6 of this GPWAR.

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

NSW Department of Planning, Industry and Environment—HYDSTRA

Methodology

The end of system flow is calculated by adding the flows at the specified end of system gauging stations. Replenishment flows detailed below are as advised by WaterNSW in the operational data, while the held environmental water is separated based on orders. There are no replenishment or environmental flows leaving the Belubula System. A summary of flow leaving the regulated accounting extent for the reporting period are presented in Table 35 and Table 36. Daily time series plots of flow leaving for the Belubula and Lachlan accounting extents are presented in Figure 51 and Figure 52 respectively.

Table 35: Belubula flows leaving summary

Station	Location	Total flow (ML)
412033	Belubula River at Helensholme	8,630
Total		8,630

Table 36: Lachlan flows leaving summary

Station	Location	Total flow (ML)
412163	Merrowie Creek Downstream Of Offtake Weir	12,138
412122	Merrimajeel Creek At Cobb Highway	2,390
412124	Mugtabah Creek At Cobb Highway	2,751
412042	Willandra Creek At Willandra Homestead	10,797
412005	Lachlan River At Booligal	44,063
412189	Booberoi Creek At Offtake No.2	18,177
Total		90,316

Figure 51: Belubula flow leaving chart

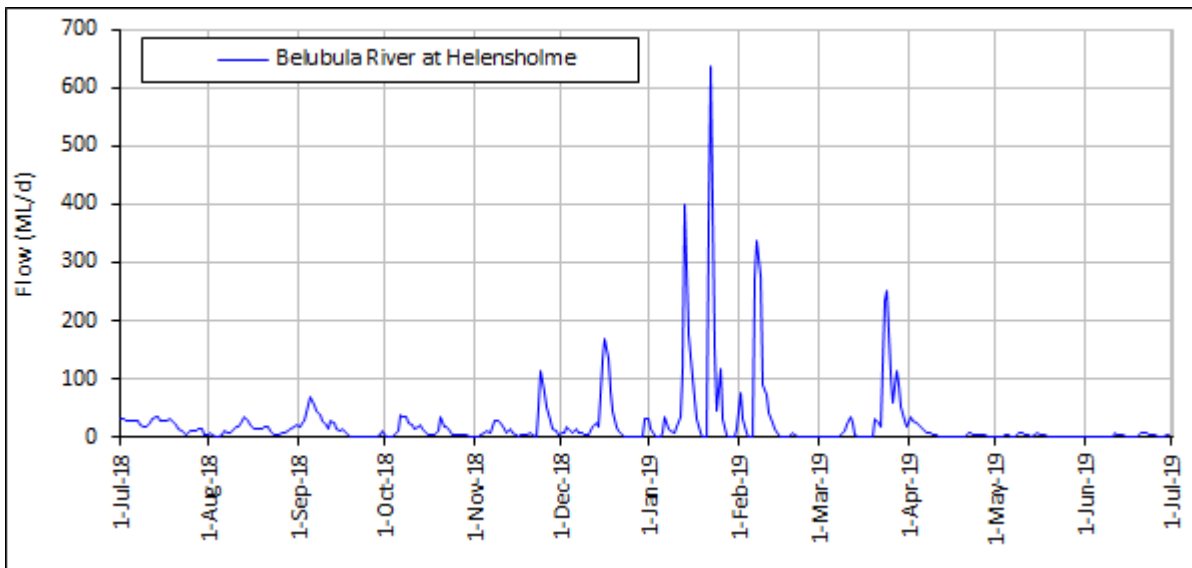
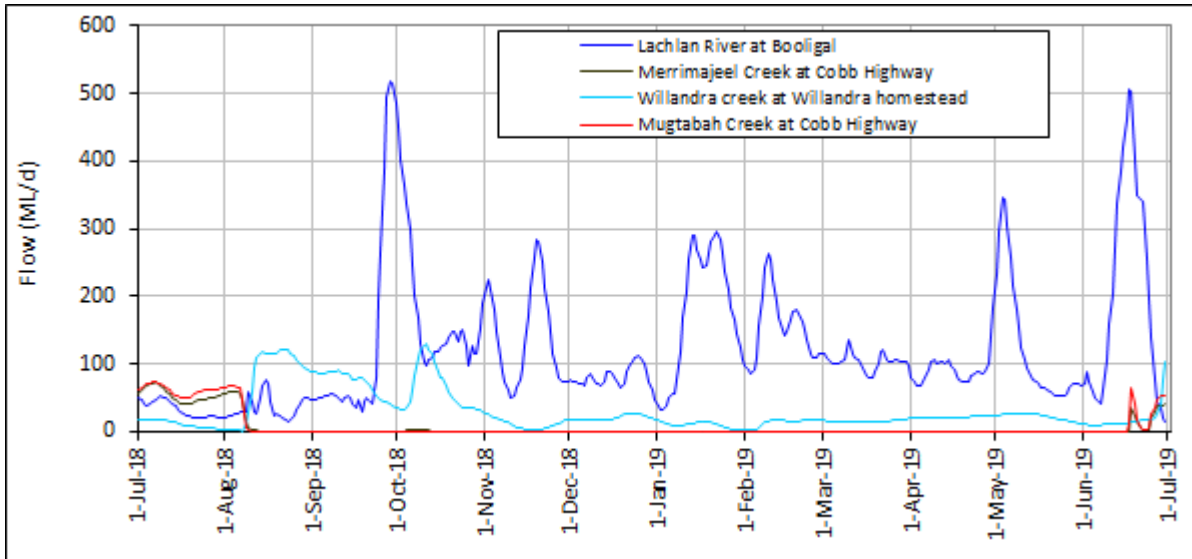


Figure 52: Lachlan flow leaving chart



Note 19—Extractions from river

This is the actual volume of water directly pumped or diverted from the 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 targets. As such the volume reported to be physically extracted from the river will not always be equal to the amount of water debited against accounts for usage, which has been described in Note 3. The figure also excludes basic rights extractions, which is reported as a separate line item and detailed in Note 20.

Data type

Measured data

Policy

Not applicable

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning, Industry and Environment)

NSW Department of Planning, Industry and Environment—Water Ordering and Usage database

Methodology

For the purposes of this GPWAR extraction from the river is considered to be the total volume metered and debited to the allocation accounts minus any licensed account water that can be identified as being used within the system or ordered to be passed through the system. These volumes are generally associated with environmental water orders and have already been accounted for in other line items.

Extractions from river includes that diverted to an irrigation corporation for distribution (i.e. Jemalong Irrigation diversion).

Additional information

The calculation to estimate the physical extractions from river is presented in Table 37.

Table 37: Reconciliation of physical extraction to account usage

Calculation	Lachlan (ML)	Belubula (ML)
Estimated licensed extractions from river (1)	235,160	8,366
plus		
Licensed flow leaving System (2)	8,548	0
plus		
In stream licensed usage (3)	26,080	0
equals		
Total account usage (4)	269,788	8,366

- (1) Direct licensed extractions from the river excluding basic rights usage estimate.
- (2) Licensed water ordered to leave the accounted Lachlan extent for environmental benefits.
- (3) Water ordered and used within the accounted system for environmental benefit (not extracted from the river).
- (4) The total amount of water accounted for usage against the allocation accounts.

Note 20—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 Lachlan Regulated River Water Source 2016

Part 5 Requirements for water

- Division 2 Requirements for water for basic landholder rights
 - Clause 18 Domestic and stock rights

Water Sharing Plan for the Belubula Regulated River Water Source 2012

Part 5 Requirements for water

- Division 2 Requirements for water for basic landholder rights
 - Clause 17 Domestic and stock rights

Available on the NSW Department of Planning, Industry and Environment website at www.industry.nsw.gov.au/water

Data accuracy

C—Estimated in the range +/- 50%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

- Water Sharing Plan for the Lachlan Regulated River Water Source 2016
- Water Sharing Plan for the Belubula Regulated River Water Source 2012

Methodology

In this GPWAR the annual extraction for domestic and stock rights for the Lachlan is assumed to be the estimated figure stated in the Water Sharing Plan for the Lachlan Regulated River Water Source 2016 (4,211 megalitres). For the Belubula the annual extraction for domestic and stock rights is assumed to be the estimated figure stated in the Water Sharing Plan for the Belubula Regulated River Water Source 2012 (200 megalitres). These figures are produced from 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.

Note 21—Supplementary/Uncontrolled flows extractions

This is the volume of water extracted or diverted under supplementary access licences during announced periods of supplementary water. Supplementary flow events are announced periodically during the season when high flow events occur with the period of extraction and volume of water to be extracted determined based on the rules as set out in the water sharing plans. It is important to note that supplementary access licences differ from other categories of access licence in that the volume of water in the account refers to an annual upper limit for extractions and its provision is totally reliant on the occurrence of high flow events.

Uncontrolled flow refers to a specific volume of non-debit water that is pumped or diverted from the river by general and high security licence holders under specific licence and river flow conditions defined in the water sharing plan. The Water Sharing Plan also defines rules by which the non-debit uncontrolled flow that has been taken is to be debited back to the general and high security licence accounts.

Data type

Measured data

Policy

Water Sharing Plan for the Belubula Regulated River Water Source 2012

Part 7 Limits to the availability of water

- Division 2—Available water determinations
 - Clause 43—Available water determinations for supplementary water access licences

Part 9 Rules for managing access licences

- Division 2—Daily access rules
 - Clause 49—Taking of water under supplementary water access licences—
Clause 46

Refer to applicable Water Sharing Plan on the NSW Department of Planning, Industry and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning, Industry and Environment)

Methodology

Supplementary and uncontrolled water extraction and diversion data is collected by either on farm meters that measure extraction or gauges on diversion works. 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 supplementary water and

uncontrolled flow being extracted through the same pumps as those extracting water under other categories of access licences additional information is required to separate out the supplementary and uncontrolled flow extractions. Licence holders are therefore required to provide notification of their intention to pump prior to pumping or diverting water during the declared supplementary or uncontrolled flow events and provide meter readings both at the commencement and conclusion of pumping. This enables the supplementary and uncontrolled flow extraction to be assessed independent of other extractions.

The Lachlan has no access to supplementary water or uncontrolled flow.

Additional Information

Supplementary access in the Belubula was available in the reporting period during the period indicated in Table 38. Supplementary or uncontrolled flow access is not available in the Lachlan.

Table 38: Belubula supplementary event announcements and usage for the reporting period

Announcement Date	Percentage use limit	Section	Section Start Date	Section End Date	Supplementary Usage
2-Sep-18	100	Carcoar Dam To Needles (Gs412056)	2-Sep-18	5-Sep-18	0
23-Nov-18	100	Carcoar Dam To Needles (Gs412056)	23-Nov-18	25-Nov-18	37
14-Dec-18	100	Carcoar Dam To Needles (Gs412056)	14-Dec-18	21-Dec-18	110
12-Jan-19	100	Carcoar Dam To Needles (Gs412056)	12-Jan-19	15-Jan-19	21.5
21-Jan-19	100	Carcoar Dam To Needles (Gs412056)	21-Jan-19	27-Jan-19	97
7-Feb-19	100	Carcoar Dam To Needles (Gs412056)	7-Feb-19	11-Feb-19	105
23-Mar-19	100	Carcoar Dam To Needles (Gs412056)	23-Mar-19	29-Mar-19	118.2
1-Apr-19	100	Carcoar Dam To Needles (Gs412056)	1-Apr-19	3-Apr-19	0

Note 22—Replenishments flows

This refers to water that is set aside as part of the essential requirements for the provision of flows to Willandra Creek, Merrowie Creek, Muggabah Creek, Merrimajeel Creek and Booberoi Creek. The water is to supply water for households, town use and stock and for accounting purposes is treated as water leaving the system/entity. The annual limits to be delivered are detailed in the water sharing plan.

Data type

Calculated from measured data

Policy

Water Sharing Plan for the Lachlan Regulated River Water Source 2016.

Part 6 System operation requirements

- Division 2 General system operations rules
 - Clause 30 Replenishment flows

Available on the NSW Department of Planning, Industry and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A—Estimated in the range +/- 10%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

NSW Department of Planning, Industry and Environment—WaterNSW Compliance Report (Internal document)

Methodology

Replenishment flows are delivered at certain times of the year and the volume can be assessed by the flow recorded at the gauging station for that period. For Booberoi creek water may return to the Lachlan River and as such the replenishment is considered to be the outflow minus any return flow.

The following table summarises the assessed replenishment flows for the reporting period.

Additional Information

A summary of replenishment flows for the reporting period is illustrated in Table 39.

Table 39: Replenishment flow summary

Station	Area of replenishment	Annual regulated replenishment limit (ML)	Delivered in reporting period (ML)
412042	Willandra Creek at Willandra Homestead	Up to 12,000	9,605
412163	Merrowie Creek downstream from offtake weir	Up to 9,000	9,926
N/A	Muggabah and Merrimajeel creeks	Up to 9,000	5,329
412189	Booberoi Creek at Offtake No.2	Up to 12,500	11,338
TOTAL			36,198

Note 23—River and groundwater interaction

This note refers to water that has been identified as either flowing from the connected alluvium to the accounted river extent (increase in water asset), or alternatively from the accounted river extent to the alluvium aquifer (decrease in water asset). The estimate covers the area of the Upper and Lower Lachlan groundwater management areas (GMA). Any interaction outside of these areas is excluded and would therefore form part of the unaccounted difference.

Data type

Modelled

Policy

Not applicable

Data accuracy

D—Estimated in the range +/- 100%

Providing agency

NSW Department of Planning, Industry and Environment

Data source

NSW Department of Planning, Industry and Environment MODFLOW (Data inputs from HYDSTRA, GDS)

NSW Department of Planning, Industry and Environment Method B—Water Table Fluctuation Method (Data inputs from HYDSTRA, GDS)

Methodology

The river interaction estimate for the lower Lachlan GMA was obtained from the NSW Department of Planning, Industry and Environment groundwater MODFLOW model for the lower Lachlan alluvium (for the purposes of water accounting this method is termed 'Method A'). The river interaction estimate for the upper Lachlan GMA and the Lower Murrumbidgee GMA was obtained from the NSW Department of Planning, Industry and Environment, water table fluctuation method, which for the purposes of water accounting is termed 'Method B'. Information on both these methods is available in the publication *NSW General Purpose Water Accounting Reports—Groundwater Methodologies*, available for download from the NSW Department of Planning, Industry and Environment website.

Additional information

Groundwater modelling information on river fluxes for 2018–19 was unavailable at the time of publication and has not been quantified for the reporting period. The process therefore forms a component of the stated unaccounted difference within the physical flow balance of the river. Figures will updated retrospectively in future GPWAR releases.

Note 24—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 due to 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. As technology progresses and accuracy improves in the account estimates, it is anticipated that relatively, this figure will reduce in future accounts.

Data type

Not applicable

Policy

Not applicable

Data accuracy

D—Estimated in the range +/- 100%

Providing agency

Not applicable

Data source

Not applicable

Methodology

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 9.

Surface Water unaccounted difference:

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

Where:

UVSW = 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, return flows, dam releases)

In addition to the unaccounted river asset volume an unaccounted difference was also required to be applied to the Lake Cargelligo storage to achieve mass balance. With the storage balance estimates were made for evaporation and rainfall volumes, while observed readings were used for inflow, release, and storage volume. With all these processes combined there was an unexplained mass balance error. To achieve the correct storage balance an unaccounted difference was therefore applied (Table 39).

Table 40: Unaccounted Difference Breakdown

Process	Unaccounted difference
River (Lachlan)	128,115
Lake Cargelligo (Lachlan)	9,189
Lachlan total	137,304
River (Belubula)	8,068

Note 25—Adjusting entry

As opposed to the unaccounted difference which corrects the physical balance of the river (detailed in Note 24), this is a line item that is used to correct non-physical balances of the accounts. The double entry accounting being utilised to produce this GPWAR is a continuous process whereby the opening balance of one year is the closing balance for the preceding year. Occasionally corrections are required for a variety of reasons including:

- when an error has been identified in a prior year of the published GPWAR report
- when a figure in the corporate database has changed since the publication of the GPWAR as a result of an error being identified, or improved information becoming available
- when a process that had previously been reported is unable to be supplied and the associated asset or liability must be removed to maintain the integrity of the statements.

Data type

Calculated

Accuracy

A1—Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning, Industry and Environment.

Data source

Not applicable

Methodology

A double entry journal transaction in the prior reporting period under the line item adjusting entry (account corrections) that ensures the correct opening balance for the current reporting period is achieved.

Additional information

A significant error was identified in the storage capacity curve used to estimate volume held in Lake Brewster. An adjusting entry was necessary to reduce the accounted storage volume to 1,300 megalitres from the previously reported 11,863 megalitres on 30 June 2018 (a reduction of 10,563 megalitres).