

Water Allocation Methodology - NSW Border Rivers Regulated River Water Source

Introduction

This is a summary guide to the water allocation method for the NSW Border Rivers regulated river water source (hereafter, the Border Rivers). This concise document aims to provide public information on how water is allocated according to water licence and entitlement priority.

The rules and processes described in this guide implement the legislative requirements of the *Water Sharing Plan for the NSW Border Rivers Regulated River Water Source 2021* (hereafter, WSP). The catchments of the Border Rivers extend into Queensland. The water resource is therefore shared with Queensland based on the *New South Wales - Queensland Border Rivers Intergovernmental Agreement 2008* (hereafter, IGA). The relevant elements of the WSP comply with the IGA. Under the IGA, the Dumaresq-Barwon Border Rivers Commission (the BRC) periodically determines bulk water availability for NSW and Queensland. The Department of Planning and Environment (the department) distributes the NSW bulk share to NSW to water users including water access licence (WAL) holders in accordance with the WSP.

The process of allocation is formally known as an Available Water Determination (AWD)¹. The results of the resource assessment and allocation process are advised through water allocation statements published on the department's website.

The water allocation statement sets out the percentage of entitlement that each category of WAL has been allocated and therefore the volume of water credited to respective accounts. The water allocation statements in this river system are normally published quarterly, or whenever there are resource improvements in the system and the BRC advises of a new bulk water availability. To benefit from new water availability, water account balances must be below their maximum limit. This summary guide presents the key components behind the water allocation assessment followed by an example of a past allocation (26 July 2021) on page 8.

Water users

There are various types of water users including environment, basic rights as well as WAL holders. The principles and hierarchy of allocating available water to the different categories of licences are prescribed in the *Water Management Act 2000* (hereafter, the Act) and the WSP. The Act states² that sharing of water from a water source must protect the water source, its dependent ecosystems, and basic landholder rights.

The maximum volumes equivalent to full (100%) allocation to basic landholder rights and licence categories in megalitres (ML) per water year are listed below:

¹ *Water Management Act (2000)*, Clause 59

² The Act, Section 5(3)

- Basic Land Holders rights³ 8,000 ML
- Domestic and Stock⁴ 1,275 ML
- Local Water Utilities⁵ 620 ML
- High Security (HS)⁶ 1,500 ML
- General Security (GS)⁷ - A Class 22,007 ML
- General Security (GS)⁸ - B Class 241,211 ML

There are also supplementary WALs⁹ with full entitlement of 120,000 ML. Supplementary water users can only use their entitlement to access water in periods of announced supplementary flow, typically from surplus tributary inflow and/or spillage from dams. Supplementary water is surplus to all other needs and cannot be ordered from storages (regulated water) therefore does not compete for allocations with regulated licence categories.

Opening allocation

Allocations open anew at the beginning of each water year on 1 July as the unused account balance of the previous year is forfeited for all except for GS (A class) and GS (B class) licenses. Among licenced water users, priority is given to domestic and stock and local water utility users ahead of other licence categories. The following AWDs are directed by the WSP¹⁰ for higher priority users at the beginning of each water year whenever possible:

- Full (100%) allocation for domestic and stock access licences.
- Full (100%) allocation the local water utility license.
- Full (100%) allocation for regulated river (high security) access licences.
- Full 4 GL credit to stimulus flow account.

If a year starts with insufficient water to make these high priority allocations, then they are met with the next available resource improvements. Only when these opening allocations have been made, can allocations then be made to general security licences, first A class then B class.¹¹

Supplementary WALs usually receive full 100% allocation¹² at the beginning of each year unless a reduction is necessary to address exceedance of long-term average annual extraction limits. For example, on 1 July 2021 supplementary users received a reduced allocation of 75% of their entitlement, resulting from the implementation of growth-in-use rules.¹³

³ WSP, Clause 18

⁴ WSP, Clause 20

⁵ WSP, Clause 21

⁶ WSP, Clause 22

⁷ WSP, Clause 23

⁸ WSP, Clause 24

⁹ WSP, Clause 25

¹⁰ WSP, Clauses 35, 36, 37 and 55(2)

¹¹ WSP, Clause 38 and 39

¹² WSP, Clause 40.

¹³ WSP, Clause 33(1)(a)

Major steps in water allocation

The major steps in the resource assessment resulting in a water allocation include:

- 1) Identifying the accessible water in storages.
- 2) Add minimum (design) future inflows.
- 3) Deduct all existing commitments, including water for future higher priority needs.
- 4) Set aside water for system overheads, including evaporation and transmission loss.
- 5) Distribute unassigned water for allocation as directed by the WSP.

This can be further illustrated using Equation (1) below.

$$\text{Water for Allocation} = \text{Current Resource} + \text{Future Inflow} - \text{Commitments} - \text{System Overheads (1)}$$

Water allocation is based on a very conservative budget of future inflow. As the year progresses, regular assessments of water availability are undertaken. Improvements, usually from greater than budgeted inflows and less than forecast transmission losses, allow for the allocation to increment.

Additional available water in Equation (1) first goes to meet any shortfall for higher priority users in opening allocation. Once all higher priority allocations have been made, allocation to GS (A class) users commences. Once GS (A class) allocation reaches 100%, then allocation to GS (B class) commences. There is no limit to announcing GS (B class) allocation, however users have an account limit of 100% of entitlement in both GS classes at any time, and an annual use of 1 ML/share.

The line items of the balance sheet for the Border Rivers are shown in Table 5. In broad terms, the balance sheet conforms Equation (1). The four items shown in Equation (1) are explained next.

Current resource

The major water storage in the New South Wales portion of the valley is Pindari Dam which is on the Severn River (Figure 1). This dam was completed in 1969 and upgraded in 1995. The Dam has a full storage capacity of 312,000 ML. The Queensland portion of the valley has two major storages, namely, Glenlyon Dam on Pike Creek which stores up to 254,000 ML, and Coolmunda Dam on the Macintyre Brook, which stores up to 69,000 ML.

Water resources in Pindari Dam are solely for New South Wales use. The incremental volumes behind Glenlyon Dam are shared between New South Wales and Queensland. NSW gets 57% of the increment (see IGA 31-iii). Water stored in Coolmunda Dam is available for Queensland users only. Furthermore, any tributary flows utilised to meet regulated orders is also shared between the two states in the ratio of 57:43 for NSW:QLD, respectively. However, unregulated flow is shared equally between the two states.

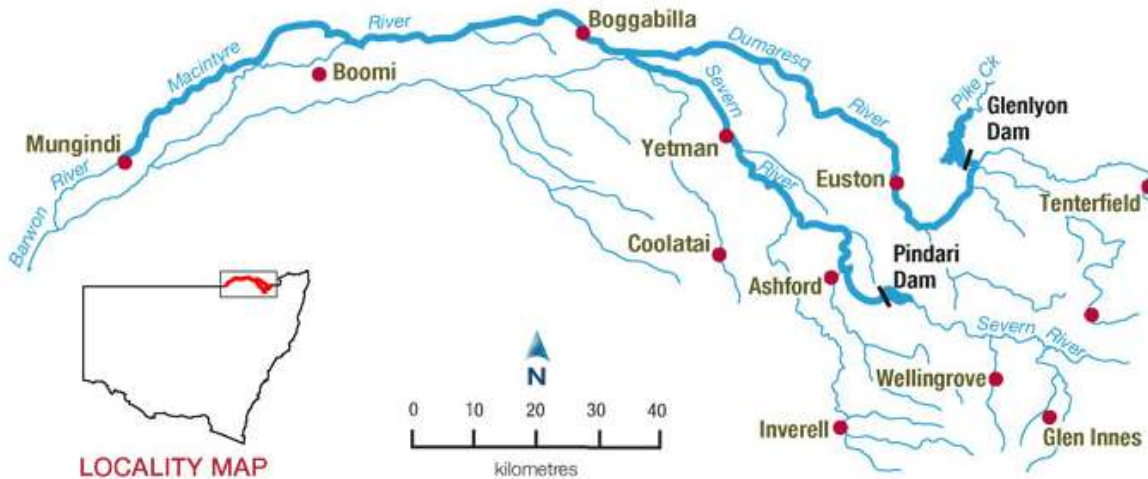


Figure 1: Map of the Border Rivers catchment (regulated river is shown in bolded blue)

Future inflow

The resource assessment budgets for a future inflow which has yet to accrue in storage. The budget conservatively mimics a repeat of the driest inflow period¹⁴ observed prior to 1st July 2009 (the commencement of the inaugural WSP). The possibility of getting less inflow reflects the current risk level that is set in the water sharing plan. The risk balances water allocation for productive use, with reserving water in storage for security against future drought.

We first analyse the inflow time series used in the Integrated Quality Quantity Model (IQQM) version as of 30/11/2009. The same hydrologic model was used in developing the WSP for the valley. The minimum inflow statistic within 1890 to 2009 period of flows into Pindari Dam and Glenlyon Dam are listed in Table 1 and Table 2 respectively.

Table 1. Minimum inflow volume into Pindari Dam (1890 to 2009)

Months	Historical Period	Inflow (ML)
12 months	Dec 1964 to Nov 1965	9,100
18 months	Dec 1979 to May 1981	26,900
24 months	Apr 1918 to Mar 1920	45,100

Table 2. Minimum inflow volume into Glenlyon Dam (1890 to 2009) and its NSW share

Months	Historical Period	Inflow (ML)	57% Inflow (ML)
12 months	Jan 2002 – Dec 2002	2,400	1,368
18 months	Jan 2002 – Jun 2003	3,600	2,052
24 months	Jan 1992 – Dec 1994	7,300	4,161

¹⁴ WSP, Clause 57

The department observed that continuously securing high priority needs for 24 months ahead was adequate because beyond that the system has historically began to recover. However, it has chosen to use the more severe 18 month period and assume 26.9 GL will be received in the next 18 months into Pindari Dam. Similarly, 2.1 GL is budgeted as NSW inflow into Glenlyon Dam for the next 18 months. Note that there is considerable increase from 18 month to 24 months inflow volumes, meaning that designing for the continuous 18 month outlook safely protects for the 24 month design scenario as well.

Commitments

Every resource assessment attempts to set aside water in the storages to meet all existing commitments for the next 24 months. These include a reserve for higher priority requirements and the balance of already allocated water to GS (A class) and then to GS (B class) users. The next section explains further the concept of storage reserve for the next 24 months.

Higher priority reserve

Higher priority requirements are secured first before making water available for GS (A class) and then to GS (B class) WALs, along with their estimated delivery losses. The resource assessment sets aside a reserve to secure the needs of higher priority water use for next 24 months. The reserve was initially set at 62.2 GL in the nineties and later revised down to 41.1 GL in June 2004. The revision required concurrence from the Queensland government and the Border Rivers Commission. The reserve volume of 41.1 GL has remained unchanged despite the advent of the WSP in 2009 and subsequent remake in 2021. Table 3 below shows the original breakdown of the 41.1 GL reserve.

Table 3. Higher priority reserve as of 2004 estimate

Description	Budget (ML)	Line Item (ML)
Consumptive use		
Stock and domestic rights	13,200	
Stock and domestic usage	1,600	
Local water utilities usage	800	
High security usage	1,600	
Storage evaporation for 2 nd 12 months	7,500	24,700
Delivery loss to consumptive use (60%)		10,300
Minimum Releases		
Pindari Dam	5,300	
Glenlyon Dam	800	6,100
Total		41,100

The 41.1 GL historical reserve is considered adequate to meet the requirements of the 2021 WSP and the intent of the Act. It has been mapped in Table 4 below to reflect the current WSP.

Table 4. Higher priority reserve matched to current plan for next 24-month

Items	WSP Ref (ML)	Budget (ML)
Domestic and stock rights (implicit, explained below)	8,000 x 2	
Domestic and stock WAL	1,275 x 2	2,000*

Local water utilities WAL	620 x 2	1,280*
High security licence	1,500 x 2	3,000
Replenishment flows to Boomi ¹⁵	10,000 x 2	20,000
Delivery loss of the above (80%)		21,020
Storage evaporation for 2 nd 12 months		11,500
Stimulus release ¹⁶ (explained below)		8,000
Minimum release net of re use (explained below)		3,250
Less, Pindari minimum inflow		(26,900)
Less, NSW share of Glenlyon minimum inflow		(2,050)
Total		41,100

*using latest database information

Domestic rights: In the table above, no explicit volume is set aside for basic landholder rights (BLR). The volume required to supply BLR is implicit within several line items in the reserve. The line items are 20,000 ML for Boomi replenishment, a conservatively high 21,020 ML assumed delivery loss to keep the river running and reuse of 8,000 ML of stimulus flow. Further, BLR is not considered to have a delivery right, rather a right to take water for riparian purposes without a licence if the water is available at the extraction point.

Stimulus flow: The assessment is reserving 8,000 ML for Pindari stimulus flow regardless of the release potential. This is in line with the plan (clause 55) that requires crediting the stimulus account at every water year. Stimulus release only triggers if inflow exceeds 1,200 ML/day during April to August hence this water accrues when an inflow event sets the trigger for a release. The water is debited upon release. The current practice of maintaining a reserve ahead of the required inflow event adds conservatism to the essential supplies volume but reduces potential early season general security allocation.

Minimum release: Pindari dam provides transparent release of up to 50 ML/d all year except in June to August when the target climbs to 200 ML/d. In addition, a release of at least 10 ML/d is to be maintained, even if inflow is lower. In the event of a repeat of the 24-month minimum inflow of 45,100 ML observed during 4/1918 to 3/1920 (see Table 1), these rules would require 21,900 ML of additional release. The plan rule allows re-use of this water when this release moves downstream of Frazers Creek junction. Hence, the reserve of 41,100 ML is inclusive of a lesser volume of 3,250 ML (or 15% of 21,900 ML) that is conservatively assumed will be available downstream.

Every assessment aims to ensure that a reserve of 41,100 ML is maintained. The reserve is consumed by volumes supplied to the higher priority demands and actual associated delivery loss, however, is replenished as a priority as new water becomes available, before making new allocations. The reserve is tracked against three major line items; 24.7 GL, 10.3 GL and 6.1 GL (see in Table 3).

¹⁵ WSP, Clause 58

¹⁶ WSP, Clause 55

System overheads

System overheads comprise of water that is required to operate the regulated river. This includes water evaporated from the storages, water lost during delivery including operational losses.

Storage evaporation loss

Evaporation loss is the estimated volume of water that would be lost from the storage due to evaporation and seepage. The amount of loss will vary by season, water temperature and surface area of the storage. The evaporation loss budgets of two storages are based on two legacy polynomial functions that can be traced back to 2000. The models return maximum evaporation of 18 GL and 10.26 GL when Pindari and Glenlyon (NSW share) are full respectively; with lesser volume when the storage is lower (see Figure 2). When full this amounts to an annual 1,780 mm evaporation from the lake surface behind Pindari Dam. The typical annual evaporation from Glenlyon Dam surface area varies from 325 mm to 1036 mm depending on storage height. The budget is estimated to be the evaporation loss for the next 12 months. In addition, a fixed evaporation volume of 11.5 GL from Pindari and Glenlyon (NSW share) storages is reserved for the second 12 months (see Table 4) assuming that the storages have been drawn to about half full.

The models for evaporation loss are due to be reviewed and updated based on more recent data, noting that any revision of the Glenlyon evaporation model will require concurrence from BRC.

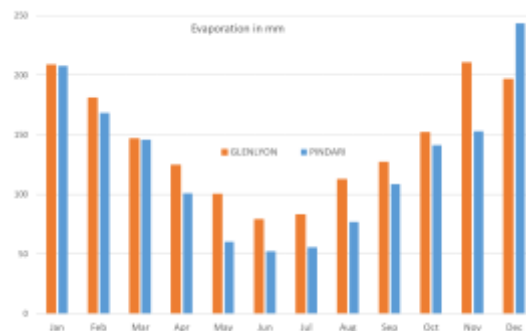
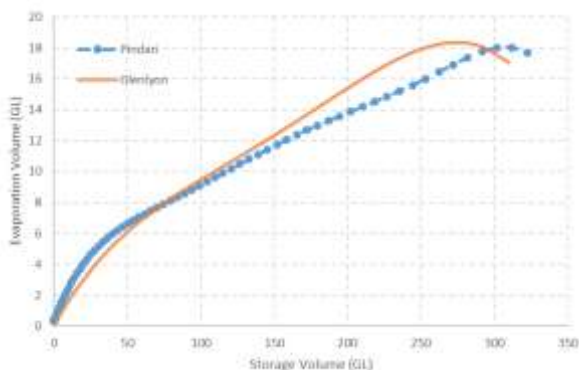


Figure 2: Evaporation budget for next 12 months (GL)

Figure 3: Notional observed evaporation (mm)

At each resource assessment the evaporation overhead is first depleted by a notional monthly evaporation in the absence of observed evaporation since last assessment. The notional maximum monthly evaporation (see Figure 3) aggregates to 1,514 mm from Pindari and 1,723 mm from Glenlyon storage surface annually. While these values are considered safe, their original source is unclear, and a review that incorporates recent data is warranted. The budget for evaporation is topped-up with each assessment, along with other higher priority requirements (essential supplies) prior to making new general security allocation.

Delivery loss

Delivery loss is defined as additional water released to meet transmission and operational loss through the river system. It is sometimes described as 'water to run the river system'. The resource assessment allows for two delivery loss accounts; one for losses associated with delivering higher priority needs, and one for delivery loss associated with delivering general security water.

The delivery loss budget for higher priority requirements is set at 80% of the delivery volume, reflecting the 'expense' of potentially needing to deliver low volumes of water in dry years. This delivery loss budget is incorporated in the consolidated reserve of 41.1 GL for higher priority needs (see Table 4 earlier), providing flexibility to the river operators in managing higher priority needs.

The delivery loss to general security users is budgeted at 30% of the outstanding volume to be delivered. This is a long-standing historical practice consistent with resource assessments of neighbouring catchments, such as the Gwydir and Namoi systems.

Water allocation example of 26 July 2021

The table below shows the water allocation computations behind the statement published on 26 July 2021. This is an example of an incremental increase to general security (A class) and general security (B class) allocations that occurred during the 2021-22 water year. The assessment returned an allocation of an additional 63% of entitlement to general security (A class) users and an allocation of an additional 4.7% of entitlement to general security (B class) users. A summary of the computation to produce the volume for allocation is shown in Table 5.

Table 5. Border Rivers assessment summary for 26 July 2021

Distribution of NSW Resources (as at 1 July 2021)	(GL)	Balance (GL)
Dam volume (Pindari + Glenlyon NSW share)		264.24
<i>less</i>		
Evaporation loss (Pindari + Glenlyon NSW share)	19.95	
Higher priority reserve	41.10	
General Security (A class & B class) Account Balance	132.66	
General Security (A class & B class) Delivery Loss (30%)	39.80	
Water for allocation		30.74
General Security (A class) x 63.0%	12.33	
General Security (B class) x 4.7%	11.31	
Loss budget of 30% to deliver new allocation	7.09	
Surplus (or deficit)		0.00

The plan limits allocation to GS A class to 100% of entitlement in a water year. Here, the GS A class had received 37% prior 26/7/21, therefore this allocation could provide a maximum of 63% more. Note that the plan also limits the GS A class account balance to 100% inclusive of water carried over from earlier years. Therefore accounts with carryover water could receive less allocation than 63% so the total volume to achieve full (100%) was reduced by the carryover volumes in accounts.

With GS A class allocation reaching its maximum limit of 100% for this water year, the additional water could be allocated to GS B class licenses, in this case 4.7% of entitlement.

Table 6. Detailed allocation computation for 26 July 2021

Assessment Items as of 1/07/21	Volume (GL)	Balance (GL)
NSW Share of storage volume		
Pindari active storage (1/7/21)	182.19	
NSW share of Glenlyon active storage	82.05	264.24
Evaporation loss		
Pindari budget brought forward (1/6/21) [Figure 2]	11.46	
Notional evaporation (1/6 to 1/7) [Figure 3]	-0.36	
Current balance (1/7/21)	11.10	253.14
NSW Glenlyon budget brought forward (1/6/21)	6.62	
Notional evaporation (1/6 to 1/7) [Figure 3]	-0.54	
Current balance (1/7/21)	6.08	247.06
Higher priority reserve [Table 3]		
Consumptive budget brought forward from 1/6/21	24.70	
Consumptive use (1/6 to 1/7)	-0.02	
Current consumptive balance (1/7/21)	24.68	222.38
Delivery loss budget brought forward from 1/6/21	10.31	
Delivery loss (1/6 to 1/7)	-0.01	
Delivery loss reserve balance (1/7/21)	10.30	212.08
Minimum release budget brought forward (1/6/21)	6.08	
Minimum release used (1/6 to 1/7)	0.00	
Minimum release reserve balance (1/7/21)	6.08	206.00
General Security		
Brought forward from 1/7/21	132.66	
General security used (1/6 to 1/7)	-0.00	
Current balance (1/7/21)	132.66	73.34
Delivery loss budget brought forward 1/7/21	39.80	
Delivery loss (1/6 to 1/7)	-0.00	
Current balance (1/7/21)	39.80	33.54
Top Ups		
Pindari evaporation	1.99	
Glenlyon evaporation	0.78	
Higher priority consumptive	0.02	
Higher priority delivery loss	0.01	
Minimum release reserve	0.00	
	2.80	30.74

Summary balance sheet of the key items (volumes in GL)

Assessment Items	Budget	Balance 30/6/21	Top Ups	Balance 1/7/21
Storage Evaporation Loss [Figure 2]	19.95	17.18	2.77	19.95
Higher Priorities for next 24 months [Table 3]	41.10	41.06	0.04	41.10
General Security A+B		132.66	23.64*	156.30
Delivery Loss A+B (30%)		39.80	7.09	46.89
Additional Resources for sharing		33.55	-33.55	
Total resource		264.24		264.24

*Note: 23.64 GL resulted in allocations of 63% for GS (A) and 4.7% for GS (B).

Disclaimer

Allocations are based on a very conservative future inflow budget. However, during extended dry periods, inflow may be less, and delivery losses could be higher than that budgeted, creating a shortfall in being able to meet the allocated resources. The management of an allocation deficit during extreme drought is beyond the scope of this summary guide. Readers are referred to the NSW Extreme Events Policy for details.

For example, in the unlikely event of a shortfall where there is insufficient physical water to match all water in accounts, and if it is in the public interest to do so, a temporary water restriction may be imposed to prevent access to account water. This is one drought management tool, akin to a negative water allocation, used to protect and prioritise supplies for critical needs.

The routine water allocation computation, while broadly following this guideline, is subject to wider hydrological considerations not covered in this summary document. This is a guide only and subject to improvements and changes over time. Water users should use this information with caution and are encouraged to seek their own expert advice as needed.

Version History

First edition	July 2020	M Kawun
This edition	May 2022	S Chowdhury, P Jayakody, V Gupta

© State of New South Wales through Department of Planning, Industry and Environment 2022. The information contained in this publication is based on knowledge and understanding at the time of writing (May 2022). However, because of advances in knowledge, users should ensure that the information upon which they rely is up to date and to check the currency of the information with the appropriate departmental officer or the user's independent adviser.

ANNEX
WATER ALLOCATION STATEMENT EXAMPLE
26 July 2021

26 July 2021

NSW Border Rivers Regulated Rivers Water Source

Water allocation update

General Security (A class) entitlement holders had received an opening allocation of 37% of entitlement on 1 July 2021. Both Pindari and Glenlyon have been steadily rising. Accordingly, an increase in allocations to **General Security (A class)** entitlement holders by **63%** is possible this time, bringing the total to 100% for this water year. Allocation to General security (B class) begins once General Security (A class) reaches 100%. There was additional water for **General security (B class)** entitlement holders to receive **an allocation of 4.7%**, their first allocation for this water year.

All high priority licence categories received full allocations this water year. Supplementary licence holders received a reduced allocation of 75%, resulting from implementation of growth-in-use rules.

2021-22	High Security	General Security (A Class)	General Security (B Class)
Border Rivers	100%	100%	4.7%

Drought recovery year 2020-21

Significant rainfall in the catchment resulted the river system returning to normal operations by April 2021. During the 2020-21 water year, Glenlyon Dam increased in volume by 106,170 megalitre (ML) and Pindari Dam increased in volume by 142,530 ML. General security (A class) users extracted about 11 gigalitre (GL) and General security (B class) users extracted about 6 GL over the 2020-21 water year.

The 2020-21 water year experienced a good number of supplementary flow events. Supplementary water users extracted about 83 GL. This is about 69% of the total 120 GL of entitlement.

Storage levels (as at 23 July 2021)

- Pindari Dam is 98.1% full - holding 306,260 ML
- Glenlyon Dam is 69.9% full - holding 177,220 ML

Key facts

- Continued improvements throughout June caused distribution to the bulk general use account of 23.64 GL.
- This allocation is based on resource balance as of 1 July 21. Improvements after 1 July will be accounted in next assessment.
- Inflows up to 200 ML/d into Pindari will be passed during winter months as per the transparency flow rules under the water sharing plan.
- Pindari Dam have experienced days with inflows greater than 1,200 ML/day. The high inflow has met the plan rule for accrual of 4 GL for stimulus release in next four months.
- The intended use of stimulus flow is to mirror a naturally occurring hydrograph, target pre-season cues for fish breeding and to regularly wet and inundate interconnected riparian areas.

Seasonal Climate Outlooks

The Bureau of Meteorology's seasonal outlook for the August to October three-month period indicates that rainfall is likely to be above average across the catchment. Daytime temperatures are equally likely to be above or below average and overnight temperatures are likely to be above average.

Details can be found in: <http://www.bom.gov.au/climate/ahead/outlooks/>

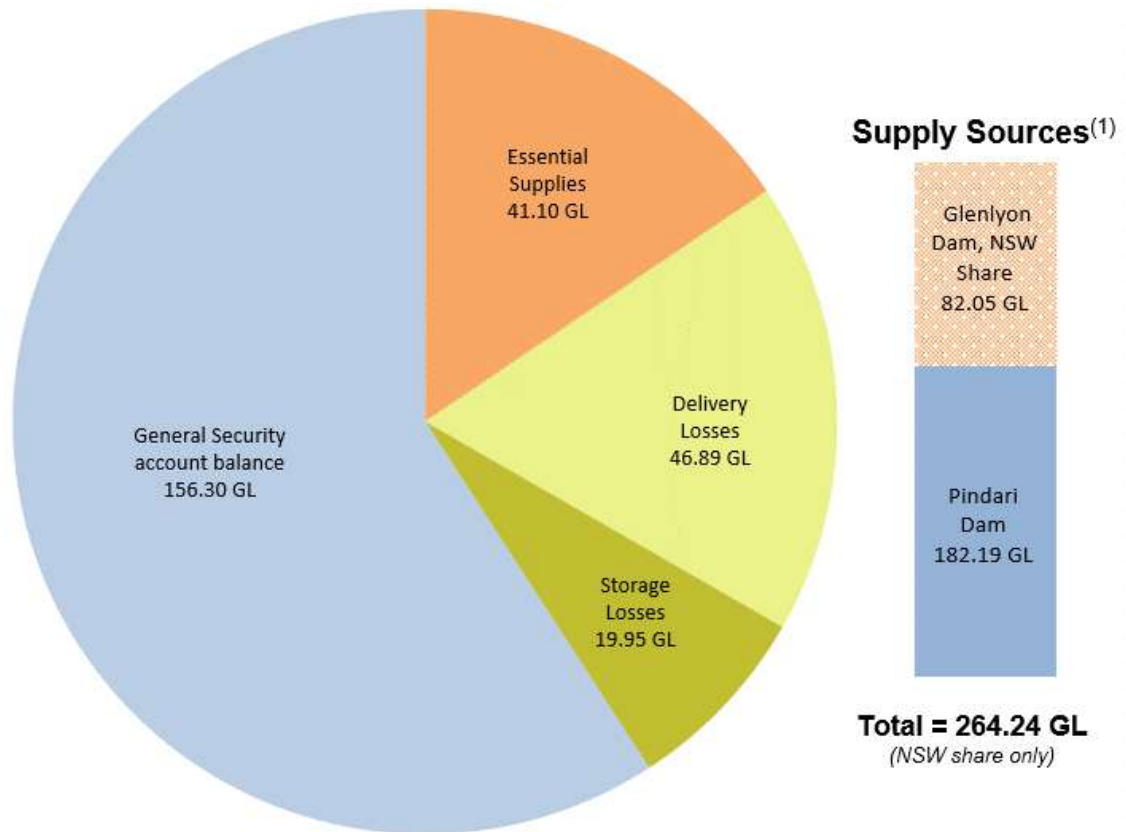
NSW Border Rivers Resource Assessment

Distribution of NSW Resources (as at 1 July 2021)	Volume (GL)	Volume (GL)
Total available resource (NSW) ⁽¹⁾		264.24
<i>less</i>		
Storage losses ⁽²⁾	19.95	
Essential supplies ⁽³⁾	41.10	
General security account balance ⁽⁴⁾	156.30	
General security delivery losses ⁽⁵⁾	46.89	
Surplus (deficit) ⁽⁶⁾		0.00

Notes:

- (1) This includes Pindari Dam and the NSW share of Glenlyon Dam, at the time of the assessment. In accordance with the *New South Wales - Queensland Border Rivers Intergovernmental Agreement 2008* NSW has access to 57% of net inflows into Glenlyon Dam.
- (2) Storage evaporation loss is based on forecast storage depletion over the next 24 months.
- (3) Water required to be set aside under water sharing plans to provide for domestic, stock, towns, high security, replenishment, stimulus release (4GL), delivery loss and operational requirements. This commitment is assisted by the minimum forecast inflows to storage.
- (4) The general security account balance is inclusive of about 1.3 GL of held environmental water (HEW) administered by environmental water holder/s. The HEW volume is indicative only and prior to reconciliation of usage and net trade. These environmental entitlements are held and/or managed either singly or jointly by various environmental water holder groups including the NSW environmental water holder - Environment, Energy and Science (EES), and the Commonwealth Environmental Water Holder (CEWH).
- (5) General security delivery losses – budgeted at 30 per cent of remaining general security account water.
- (6) All available water resources have been fully allocated with no surplus left. The system is secure to June 2022 and beyond with no deficit.

Distribution of NSW Resources as at 1 July 2021



Further information

The next Border Rivers water allocation statement will be published soon after the receipt of the next assessment from the Border Rivers Commission.

Information on available water determinations and water sharing plans is available on the Department of Planning, Industry and Environment website - www.industry.nsw.gov.au/water

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