

## Introduction

This is a summary guide to the water allocation method for the Gwydir regulated river water source. It is a concise document that aims to provide public information on the priorities for water sharing and how water is allocated to competing interests.

The Department of Planning, Industry and Environment periodically allocates water to water access licence (WAL) holders after assessing available water resources. This resource assessment identifies the volumes of water available to the different categories of WALs. The process is formally known as an Available Water Determination (AWD)<sup>1</sup>. 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 are normally published monthly until full allocation is made to all WAL categories. This summary guide presents key components of the resource assessment and water allocation process, followed by an example of past allocations.

## Water users

There are various types of water users including environmental, basic rights and WAL holders. The principles and hierarchy of allocating available water to the different categories of licences are prescribed in the *Water Management Act 2000* and the Water Sharing Plan for Gwydir Regulated River Water Sources 2016. The Act states<sup>2</sup> that sharing of water from a water source must protect the water source, its dependent ecosystems and basic landholder rights.

The maximum annual volumes assigned to rights and licence categories in megalitres (ML) per water year are listed below:

- |  |            |
|--|------------|
| • Basic landholder rights <sup>3,4</sup>           | 6,000 ML   |
| • Domestic and stock <sup>5</sup> WAL              | 4,245 ML   |
| • Local water utility <sup>6</sup> WAL             | 3,836 ML   |
| • High security <sup>7</sup> WAL                   | 19,293 ML  |
| • General security <sup>8</sup> WAL                | 509,500 ML |
| • Environmental contingency allowance <sup>9</sup> | 45,000 ML  |

There are also supplementary WALs with full entitlement of 178,000 ML. Supplementary water users can only access water in periods of announced supplementary flow, typically from surplus tributary inflow and/or dam spills.

<sup>1</sup> *Water Management Act (2000)*, Clause 59.

<sup>2</sup> Act, Clause 60 (3).

<sup>3</sup> Exempt use, Act, Clause 52.

<sup>4</sup> Water sharing plan, Clauses 16, 17 and 18.

<sup>5</sup> Water sharing plan, Clause 21.

<sup>6</sup> Water sharing plan, Clause 22.

<sup>7</sup> Water sharing plan, Clause 23.

<sup>8</sup> Water sharing plan, Clause 24.

<sup>9</sup> Water sharing plan, Clause 14 (c).

Supplementary water is not supplied from the regulated water source (storages), but from an unregulated supply, therefore; there is no adverse impact on regulated river water users.

Supplementary WAL usually receives full 100% allocation<sup>10</sup> at the beginning of each year unless reduction is necessary to comply with long-term average annual extraction limits.

## Opening allocation

Allocations open anew at the beginning of each water year as the balance of the previous year gets forfeited for all except general security and environmental contingency allowance (EAC) users who can carry their balance over in full.

Among licenced water users, priority is given to domestic and stock and local water utility users ahead of other licence categories typically used for commercial purposes such as irrigation and other industries<sup>11</sup>. The following AWDs are directed by the water sharing plan<sup>12</sup> for higher priority users at the beginning of each water year whenever possible:

- 100% of share component for domestic and stock access licences.
- 100% of share component for the local water utility license.
- 1 ML/unit share for regulated river (high security) access licences.

An allocation to general security licences cannot be made until the AWDs for all higher priority users listed above reach its maximum 100% allocation<sup>13</sup>.

## Major steps in water allocation process

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

- 1) Identifying the water in storages.
- 2) Accounting for future minimum inflow.
- 3) Deducting all existing commitments, inclusive of reserves for the following year's higher priority commitments.
- 4) Setting aside water for system operation and minimum releases.

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

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

In this system, once all higher priority commitments are met, any water for allocation is assigned to general security users and ECA at the same time and rate. For example, if general security licence holders are allocated 10%, then 45,000 ML x 10% or 4,500 ML is credited to the ECA.

The four items shown on the right hand side in Equation (1) are explained next.

<sup>10</sup> Water sharing plan, Clause 38 (5).

<sup>11</sup> Water sharing plan, Clause 36 (6).

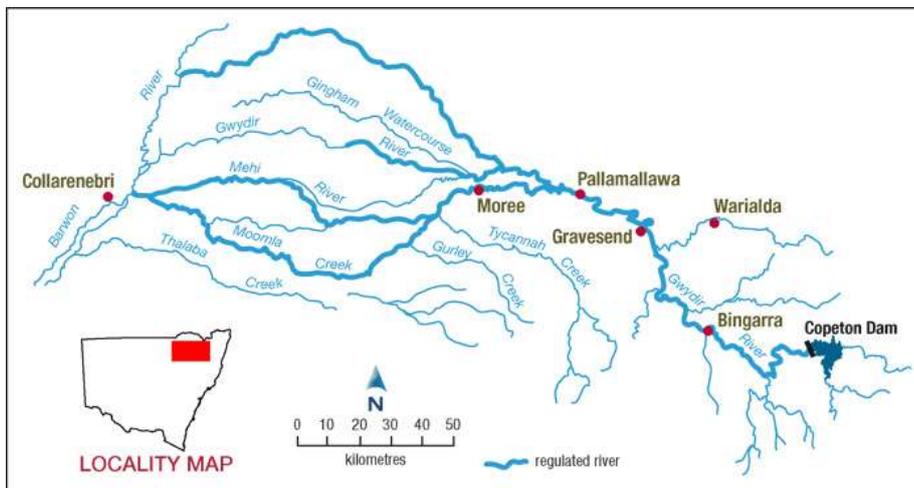
<sup>12</sup> Water sharing plan, Clauses 34 (3), 35 (3) and 36 (3).

<sup>13</sup> Water sharing plan, Clause 37 (3).

### Available resource

Copeton Dam is the major storage in the valley. The dam is located on the Gwydir River, approximately 35 km southwest of the city of Inverell. The dam has a catchment size of 5,360 km<sup>2</sup>, comprising mainly agricultural land. The dam has an active operating capacity of 1,361,720 ML, the volume above dead storage.

The available water behind Copeton Dam constitutes the main water resource for the allocation process. No other weirs or in-stream storages are of sufficient size to warrant inclusion.



### Future inflow

The resource assessment secures water through a repeat of the driest observed inflow period<sup>14</sup> prior to 1 July 2004 (the commencement of the inaugural water sharing plan). This is the agreed level of risk, specified in the water sharing plan, balancing water allocation for productive use versus water security for drought.

The two objectives are mutually exclusive. The department observes through the 126 years<sup>15</sup> of hydrological assessment that it is adequate to plan for 24 months ahead after which, the system is statistically expected to recover, based on historically inflow patterns.

The assessment budgets for a conservative future inflow. The inflow volume is the worst 24-month inflow observed within 1890 to 2004. The inflow time series is constructed by the hydrologic model Gwydir Integrated Quality Quantity Model (IQQM) version as of 2018.

The same Gwydir IQQM was used in developing the water sharing plan. The minimum inflow statistics from the IQQM model are included in **Table 1** showing 52.6 gegalitres (GL) minimum inflow over a 24-month period. Note: the recent 24 months from February 2018 to January 2020 experienced a similar low inflow of 54 GL.

**Table 1. Minimum inflow volume within 1890 to 2004 period<sup>16</sup>**

Months	Historical Period	Minimum Inflow (ML)
12 months	Dec 1918 to Nov 1919	9,300
18 months	Dec 1918 to May 1920	26,200
24 months	Feb 1918 to Jan 1920	52,600

<sup>14</sup> Water sharing plan, Clauses 17(3), 34(1), 35(1), 36(1).

<sup>15</sup> 1890 to 2016, available at the time of the study.

<sup>16</sup> Used available time series from 1890 to 2016, instead of 1890 to 2004, with no change in dry spell.

The resource assessment budgets for 52.6 GL of expected inflow to secure higher priority need for next 24 months.

### Commitments

Every monthly resource assessment sets aside all commitments for the following 24 months. This includes a reserve for higher priority requirement and the balance of already allocated water to general security users and ECA. The section below explains how the higher priority requirements for the next 24-month period is determined.

### Higher priority requirements

The higher priority requirements<sup>17</sup> are first secured before allocating to general security WALs and ECA. The resource assessment sets aside adequate reserve to secure the higher priority requirements (**Table 2**) for a 24-month drought.

**Table 2. Higher priority requirement budget for a 12-month period**

Items	Water sharing plan Ref*	Budget#
Domestic and stock licence <sup>18</sup>	4,245	3,124
LWU licence <sup>19</sup> except Inverell	3,836	836
High security licence <sup>20</sup>	19,293	20,200
Replenishment flows <sup>21, 22</sup>	21,000	11,000
Delivery loss <sup>23</sup> of the above (60%)		21,096
Domestic and stock rights <sup>24</sup>	6,000	8,500
LWU Inverell		3,000
<b>Total</b>		<b>67,800</b>

Notes: \* These amounts are estimated commitments at the start of the water sharing plan – refer footnotes.

# These amounts are from the latest licensing data, rounded up and used in the current resource assessment.

The reserve for next 24 months higher priority requirement is determined after budgeting for the minimum inflow of 52,600 ML arriving at the same period.

$$\text{Storage reserve} = 67,800 \times 2 - 52,600 (\text{min inflow}) = 82,900 \quad (2)$$

Therefore, every monthly assessment ensures that a reserve of 82,900 ML is maintained.

<sup>17</sup> Water sharing plan, Clause 51 (2).

<sup>18</sup> Water sharing plan, Clause 21, lower budget as per WAL data of June 2021.

<sup>19</sup> Water sharing plan, Clause 22, separate budget line entry of 3000 ML for Inverell.

<sup>20</sup> Water sharing plan, Clause 23, higher budget as per WAL data of June 2021.

<sup>21</sup> Water sharing plan, Clause 58.

<sup>22</sup> Lower budget as Gingham and Lower Gwydir are supplied by pipes now.

<sup>23</sup> Reflecting delivery loss during dry times. Inverell is supplied by a pipeline; no loss is budgeted.

<sup>24</sup> WSP, Clause 17, higher budget reflecting minimum release for river continuity.

The reserve is depleted by the volume supplied to the higher priority demands and actual associated delivery loss. This depletion is topped up first if new resource is identified, prior to any further allocation to other entitlements.

### System overheads

System overheads include water that is required to operate the regulated river. This includes water evaporated from the storage surface and water lost during delivery.

### Evaporation loss

Evaporation loss is a direct function of storage level and the drawdown pattern. The department uses Equation (3) to budget for evaporation from the water surface behind Copeton Dam for the next 24 months. The equation assumes that the climate and future demands will deplete the current volume of Copeton Dam to 60 GL<sup>25</sup> at the 24<sup>th</sup> month. The climate will be a repetition of evaporation and rainfall of February 1918 to January 1920, matching future minimum inflow consideration. These assumptions return the following empirical equation:

$$E = 8.62 + 94.4 \times 10^{-3} S - 26.7 \times 10^{-6} S^2 \quad (3)$$

Where:

**E** = Evaporation from Copeton Dam in GL over next 24 months.

**S** = Copeton Dam volume in GL at the assessment date.

### Delivery loss

Delivery loss is defined as additional water released to meet transmission and operational loss through the river system. It is often described as ‘water to run the river system’. The volume is the net of water losses through seepage, along with any gain from tributary inflows that meet the demand.

The Gwydir resource assessment budgets and tracks delivery loss in three groups. These are delivery loss for higher priority needs, delivery loss for general security users, and loss to deliver ECA water. The separate tracking of loss to deliver general security and ECA water is a recent introduction; previously these were tracked as a combined volume.

The delivery loss to higher priority requirements is a high 60%, reflecting the need to deliver a low volume of water in dry years. No separate account is kept for this item. This delivery loss budget is included in the reserve for higher priority requirements (see **Table 2**). Using a single account for the higher priority requirements, inclusive of losses, provides some flexibility for operation.

The Gwydir resource assessment allows for a 30% delivery loss for general security and ECA use, meaning that for every 10 ML delivered at the pump Copeton Dam releases 13 ML on average. This practice matches resource assessments of the neighbouring Namoi and Border Rivers. The department evaluated the budget against a rolling two water year basis from 2000 to 2016, the period available during the evaluation. We determined that the 30% budget was adequate for a 24-month total. Note that some dry summer months consumed higher losses.

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<sup>25</sup> Copeton was at its lowest 42 GL during the summer of 1994/95. Instead, we used the average 1994/95 Copeton volume of 60 GL, a higher target returning higher evaporation loss.

Every month, the estimate of monthly delivery loss is made first by proportioning the month's loss to:

- 1) Higher priority deliveries.
- 2) General security orders.
- 3) ECA orders.

Accordingly, the loss reserve for general security accounts and the ECA depletes as per the actual loss. This depletion of loss budget is topped up after the replenishment of higher priority requirements (discussed earlier, reserve of 82.9 GL).

## Water allocation example of 6 August 2021

The tables below show the water allocation computations behind the statement published on 6 August 2021. This is an example of an incremental increase to general security allocations that occurred during the water year.

The assessment returned an allocation of an additional 29.5% of entitlement to general security users. A summary of the computation to produce the volume for allocation is shown in **Table 3**.

The volume is distributed among eligible shares based on the formula shown at the bottom of the table. Eligible shares are the general security shares that have not reached its balance limit<sup>26</sup> of 150%. More detailed assessment is provided in **Table 4**.

**Table 3. Gwydir assessment summary for 6 August 2021**

Resource distribution	Volume (GL)
Copeton Dam active volume (as of 31/7/21)	870.5
<i>less</i>	
Storage Evaporation Loss (Equation 3)	71.5
Higher Priorities (Equation 2)	82.9
ECA Balance (31/7/21)	42.2
Delivery Loss ECA	12.7
GS Balance (31/7/21)	344.8
Delivery Loss GS	103.4
<i>equals</i>	
Available for Allocation (or deficit)	213.0

$$\begin{aligned}
 \text{General security and ECA Allocation} &= \text{Available for Allocation} / ((\text{Eligible GS shares} + \text{ECA}) \times \\
 & \quad 130\% \text{ Loss}) \\
 &= 213.0 / ((509.5 + 45.0) \times 1.3) = \mathbf{29.5\%}
 \end{aligned}$$

<sup>26</sup> Water sharing plan Clause 44(2).

**Table 4. Detailed Gwydir allocation computation for 6 August 2021**

Assessment items as of 31/07/21	Item volume (GL)	Balance (GL)
<b>Available resources</b>		
Copeton volume (31/7/21)	889.46	<b>870.46</b>
Dead storage	19.00	
Evaporation brought forward 1/7/21	59.56	
<b>Higher priority supplies</b>		
Brought forward from 1/7/21	82.90	729.67
Supplied inclusive of loss during 1/7/21 to 31/7/21	-1.67	
Allocation assignments OUT from HS to GS	-0.00	
Transfer of HS loss to GS delivery loss account	-0.00	
Current balance (31/7/21)	81.23	
<b>Environmental Contingency Allowance (ECA)</b>		
Brought forward from 1/7/21	42.23	687.45
Supplied during 1/7/21 to 31/7/21	-0.00	
Current balance (31/7/21)	42.23	
<b>General security (GS)</b>		
Brought forward from 1/7/21	344.77	342.68
Supplied during 1/7/21 to 31/7/21	-0.00	
Allocation assignments IN from HS to GS	+0.00	
Reconciliation of accounts	0.00	
Current balance (31/7/21)	344.77	
<b>GS+ECA Delivery Loss</b>		
Brought forward from 1/7/21	116.10	226.58
Losses since last assessment	-0.00	
Credit from HS Loss to GS Loss from assignment IN	+0.00	
Current balance (31/7/21)	116.10	
<b>Top ups</b>		
Evaporation 1/7 to 31/7	11.90	<b>213.08</b>
Higher Priority 1/7 to 31/7	1.67	

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

Assessment Items	Budget	Balance 31/7/21	Top Ups	Balance 1/8/21
Storage Evaporation Loss	71.46	59.56	11.90	71.46
Higher Priorities for next 24 months	82.90	81.23	1.67	82.90
Delivery Loss ECA+GS (256 GL max)	165.3	116.10	49.16	165.25
ECA (90 GL max)		42.23	13.29*	55.52
General Security (764.5 GL max or 150%)		344.77	150.56*	495.33
Additional Resources for sharing		226.59	-226.59	0.00
Total		870.46	-0.01	870.46

\*Note: 150.56GL and 13.29GL extra for GS and ECA respectively equates to 29.5% of entitlement.

### Disclaimer

Allocations are based on a very conservative assumed future inflows. However, during an extended dry period, inflows may be less than the budget, and, coupled with higher delivery losses, may create a shortfall in allocated resources. When this happens, there is less physical water available to match water in accounts. 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 can be imposed to prevent access to account water. This is one drought management tool, akin to a negative water allocation, used to protect supplies for high priority and critical needs.

The routine water allocation computation, while broadly following this guideline, may be 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	April 2020	V Gupta
Second edition	July 2020	V Gupta, S Chowdhury
This edition	August 2021	S Chowdhury, B Hazrati
Reviewed	October 2021	B. Graham

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## Annexure

### Example: Water Allocation Statement – 6 August 2021

6 August 2021

## Gwydir Regulated River Water Source

### Water allocation update

**General security (GS)** allocation has increased by **29.5%** of entitlement in the Gwydir Regulated River Water Source. This comes from significant inflows and improvement in headwater storage. It brings the total general security allocation to 40.6% of entitlement for this 2021-22 water year. The Environmental Contingency Allowance (ECA) also increases by the same percentage in accordance with the water sharing plan.

Rainfall in July was above average in the Gwydir catchment. Copeton Dam received about 126 mm of rainfall. Inflow into the storage in July was about 227 gigalitres (GL). Monthly dam inflows of greater magnitude in July have only been recorded on six occasions in the last century.

This resource assessment is based on information to 31 July 2021. Any Copeton Dam volume increases since that date will be captured in the next assessment.

### Current allocations

2021/22	High Security	General Security
Gwydir Regulated River	100%	40.6%

### Dam levels (as at 6 August 2021)

Copeton Dam is 70% full – rising – holding about 960 GL. This time last year, the storage was about 14% full.

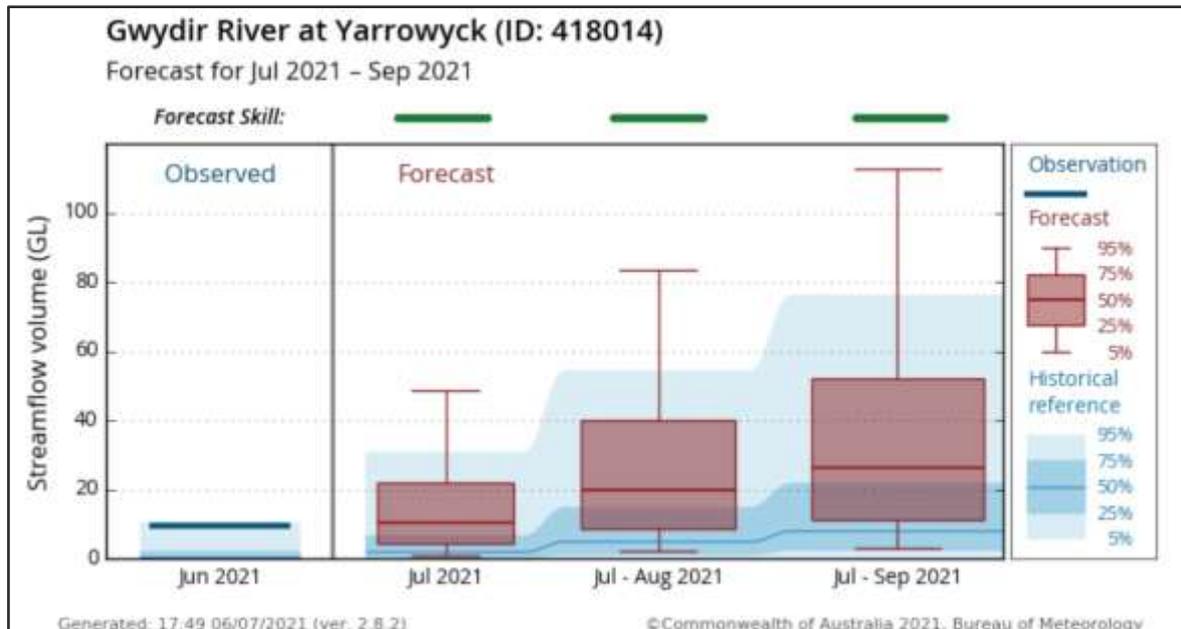
### Key information

- Inflow into storage in July was 227 gigalitres (GL) and downstream tributary flow was 75 GL.
- Releases from Copeton dam were low in July, at about 0.8 GL. Total essential supply demand was about 1.0 GL, little general security water demand (0.6 ML) and no ECA release in July.
- No water was transferred from high security to general security accounts in July.
- Supplementary water users diverted about 18.9 GL in July, about 10% of the total 181.4 GL of supplementary entitlement.

### Seasonal climate and inflow outlooks

The Bureau of Meteorology's seasonal outlook for August to October indicates that rainfall is likely to be above average across the catchment. Maximum temperatures are likely to be about average or less while minimum temperatures are very likely to be above average for August to October.

The Bureau of Meteorology issues a seasonal flow forecast for the Gwydir River at Yarrowyck, upstream of Copeton Dam (see the figure below). This may provide an indication of potential inflows into the dam. All forecast quartiles of total flow volume from July to September are higher than the historical quartiles, indicating potentially wetter than the historical conditions.



Details can be found in: <http://www.bom.gov.au/water/ssf/>

## Further information

The next monthly water allocation statement for the Gwydir Regulated River Water Source will be published on **Tuesday 7 September 2021**.

Information on available water determinations and water sharing plans is available on the Department of Industry website: [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water).

### Resource Assessment Data Sheet

Resource distribution (as at 31 July 2021)	Volume (GL)
Copeton Dam active volume	870.5
<i>less</i>	
Storage Evaporation Losses <sup>(1)</sup>	71.5
Essential Supplies <sup>(2)</sup>	82.9
Environmental Contingency Allowance (ECA)	55.5
Delivery Loss GS <sup>(3)</sup>	148.6
Delivery Loss ECA <sup>(3)</sup>	16.7
General Security Held Environmental Water (HEW) Account Balance <sup>(4)</sup>	114.8
General Security Irrigator Account Balance	380.5
Surplus (deficit) <sup>(5)</sup>	0.0

#### Notes:

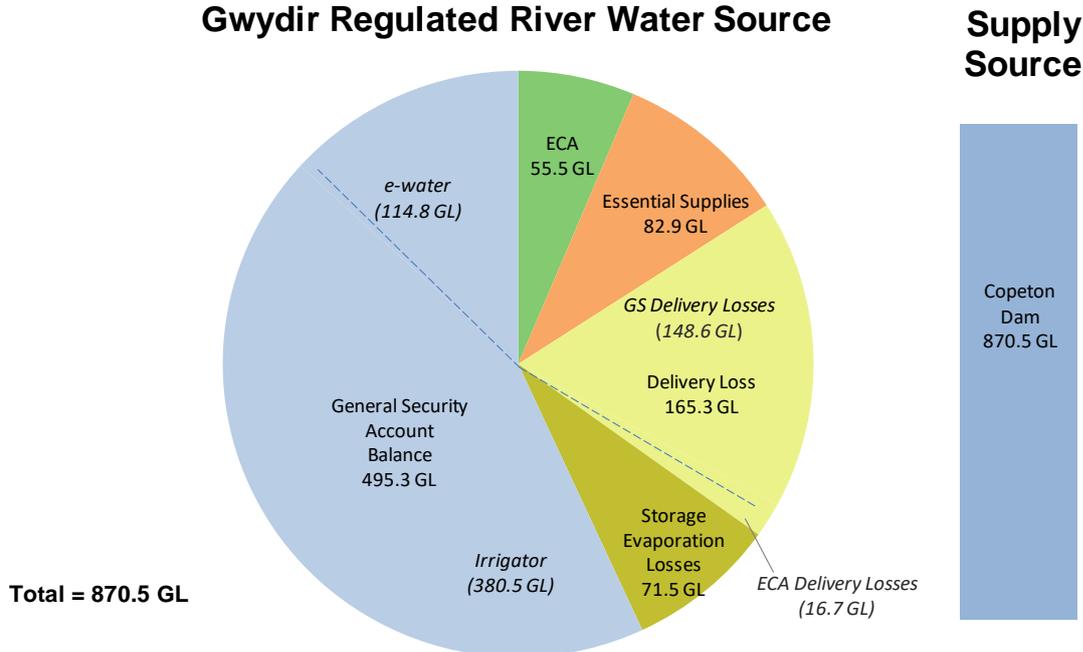
- (1) Storage Losses – evaporation is based on maximum historical rates for the next 24 months.
- (2) Essential Supplies – water required to be set aside under the water sharing plan to provide for Towns, Stock, Domestic, High Security and riverine environments for the next 24 months. It includes stock and domestic replenishments, delivery loss allowance and end-of-system flow requirements. This is offset by minimum forecast inflows to storage.
- (3) Delivery Losses - this account reflects the water needed to deliver general security and ECA water. Traditionally, a 30% delivery loss has been budgeted for this river system.
- (4) Held environmental water (HEW) – The reporting of held environmental water is indicative only. General Security HEW account balance estimated to be 114.8 GL and High Security HEW account balance is estimated to be 5.8 GL. These entitlements are held and/or managed either singly or jointly by various environmental holder groups, including the NSW environment water holder and the Commonwealth Environmental Water Holder (CEWH).
- (5) All available water resources have been fully allocated with no surplus left. The system is secure for next 24 months and beyond with no deficit.

# Water Allocation Statement

Water availability and allocation update



## Resource Distribution as at 31 July 2021 Gwydir Regulated River Water Source



## Resource assessment as at 31 July 2021

Volumes in GL	Budget	Current	Additional	Balance
Storage Evaporation Loss	71.46	59.56	11.90	71.46
Essential Supplies for next 24 months	82.90	81.23	1.67	82.90
Delivery Loss GS (229 GL max)	148.60	103.42	45.17	148.59
Delivery Loss ECA (27 GL max)	16.66	12.67	3.99	16.66
ECA (90 GL max)	-	42.23	13.29	55.52
General Security (764.5 GL max)	-	344.77	150.56	495.33
Additional Resource for Sharing	-	226.59	-226.59	0.00
<b>Total</b>	<b>-</b>	<b>870.46</b>	<b>-0.01</b>	<b>870.46</b>

General Security	Value	Unit
Incremental Increase CREDITED	150.56	GL
Available Water Determination	0.295	ML per unit share

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