Water Allocation Methodology

Peel Regulated River Water Source

Introduction

This is a summary guide to the water allocation method for the Peel regulated river. It is a concise document aiming to provide public information on the priorities for water sharing and in particular, how water is allocated to competing interests.

The Department of Planning, Industry and Environment (the department) 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 water access licences. The process 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 each category of WAL has been allocated and therefore; the volume of water credited to their respective water accounts. The water allocation statements are normally published monthly until full allocation is made to all licence categories. This summary guide presents key components behind water allocation followed by an example of past allocation on page 6.

Water users

There are various types of water users including environments, 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* (the Act) and the Water Sharing Plan for Peel Regulated River Water Source (2020). The Act states[2] 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 the Peel regulated river water source are listed below:

- Basic landholder rights[3,4] 300 megalitres (ML)
- Domestic and stock[5] WAL 163 ML
- Local water utility[6] WAL 16,400 ML
- High security[7] WAL 804 ML
- General security[8] WAL 30,335 ML
- Environmental contingency allowance[9] 5,000 ML

Allocations open anew at the beginning of each water year (1 July) as the balance of the previous year gets forfeited. Among licenced water users, priority is given to the domestic and stock and local water utility users, ahead of other licence categories typically used for commercial purposes

[1] *Water Management Act (2000)*, Clause 59
[2] Section 5(3)
[3] Exempt use, the Act, Clause 52
[4] Water sharing plan, Clause 20
[5] Water sharing plan, Clause 23
[6] Water sharing plan, Clause 24
[7] Water sharing plan, Clause 28
[8] Water sharing plan, Clause 29
[9] Water sharing plan, Clause 32.2(b)

such as irrigation and other industries. The following minimum AWDs are directed by the water sharing plan[10] for higher priority users at the beginning of each water year:

- 70% for domestic and stock licences
- 70% for the local water utility licence (in this instance - Tamworth City Council)
- 50% for high security licences

If additional water is available, further allocation must be made up to a maximum of 100%, with local water utility and domestic and stock being initially topped up concurrently, followed by high security licences. An allocation to general security licences cannot be made until the AWDs for local water utility and high security licences reach its maximum 100% allocation[11].

Major steps in water allocation

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

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

This is further illustrated using Equation (1) below.

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

In this system, assuming all higher priority allocations have been made, the water available for allocation to general security WAL and Environmental Contingency Allowance (ECA) is provided at the same time and rate. For example, if general security licence holders are allocated 10%, then 5000 ML x 10% (or 500 ML) is credited to the ECA account.

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

Available resource

The major in-stream storage within the Peel Valley is Chaffey Dam. The dam is located on the Peel River, approximately 40 km upstream from the city of Tamworth. The dam has an active operating capacity of 100,500 ML and has a catchment size of 420 km^2, comprising mainly agricultural land. Chaffey Dam is operated by WaterNSW and is mainly used for town water supply for Tamworth and for irrigation. The other storage in the valley is Dungowan Dam, located on the unregulated Dungowan Creek, approximately 50 km south-west of Tamworth. It can hold about 6,300 ML. This dam has a small, largely forested catchment with an area of 125 km^2. Dungowan Dam is operated by Tamworth Regional Council and is used solely for Tamworth water supply, except for some small water users on the Dungowan Creek with basic rights or unregulated WAL.

The available water currently behind Chaffey Dam constitutes the bulk of water in the resource assessment. Although not part of the regulated river water source, a conservative Dungowan Creek contribution is also included by adding the water held in Dungowan Dam above 50% full. No other weirs or instream storages are of sufficient size to warrant inclusion in the assessment.

[10] Water sharing plan, Clauses 48(1), 49(1) and 50(1)
[11] Water sharing plan, Clause 51(2)

Future minimum inflow

The resource assessment secures water through a repeat of the driest observed inflow period[12] prior to 1 July 2010 (the commencement of the inaugural water sharing plan). This is the agreed level of risk, specified in the plan, balancing water allocation for productive use, versus water security for drought. The two objectives are mutually exclusive. The department observes through 110 years of hydrological assessment, believing that it is adequate to plan for 24 months ahead, after which the system is statistically expected to recover based on historical inflow patterns.

The worst 24-month inflow within 1892 to 2008 is considered[13], while securing minimum allocation of 70% and 50% for higher priority users. The inflow time series is constructed by the hydrologic model - Peel Integrated Quality Quantity Model (IQQM) version E104. The same Peel IQQM was used in developing the water sharing plan. The minimum inflow statistics from the IQQM model are included in **Table 1**.

Table 1. Minimum inflow volume - period assessed (1892 to 2008)

Months	Historical period	Minimum inflow gigalitres (GL)
12 months	July 1946 to June 1947	4.0
24 months	November 1964 to October 1966	13.1

The inflow volume considered for the current year is 4 GL if assessed at 1 July, or less if assessed at a later month. The additional inflow expected to arrive during the second year is 9.1 GL (13.1 – 4.0 = 9.1).

Commitments

The commitments are grouped into two parts, first the higher priorities relating to the current year (Table 2) and the storage reserve relating to the demand on second year (Table 3).

Higher priority requirement

The higher priority requirements[14] are first secured before allocating to Peel's general security WAL. A typical budget is established at the start of the water year as shown in **Table 2.** The budget is adjusted progressively during the year as the remaining number of months reduces.

Table 2. Higher priority requirement budget on 1 July

Items	Volume
Domestic and stock licence[15]	163 ML
Local water utility licence[16]	16,400 ML

[12] Water sharing plan, Clause 37(1)
[13] Using available time series from 1892 to 2008 instead of required 1892 to 2010 has no impact on result.
[14] Water sharing plan, Clause 51(2)
[15] Water sharing plan, Clause 23
[16] Water sharing plan, Clause 24

Items	Volume
High security licence[17]	804 ML
Delivery loss of the above	Estimated 60% from past records[18]
Evaporation	Equation (2), page 5
Chaffey Dam minimum release	270 ML
Domestic and stock rights[19]	300 ML

Storage reserve

The resource assessment sets aside a reserve to secure the needs of higher priority water use in the second year of a two-year drought. Note: the analysis of 1892 to 2008 inflow time series shows the system will have enough inflow to cover critical needs by the third year without needing further reserves. The budgeted demand of next year is shown in **Table 3**. The assessment sets aside a reserve of 14,000 ML for the second year, prior to allocating water to general security water users in the current water year.

Table 3. Storage reserve for second year

Items	ML	Comment
Domestic and stock licence	114	163 ML x 70% AWD
Local water utility licence	11,480	16400 ML x 70% AWD
High security licence	402	804 ML x 50% AWD
Delivery loss 45%	5,400	Estimate of a dry year loss
Chaffey Dam minimum release[20]	270	Estimated 90 top-up days (3ML/day × 90 days)
Domestic and stock rights	300	
Evaporation	5,160	Estimated assuming 20 GL storage volume
Less, minimum second year inflow	(9100)	Second year of 24-month minimum inflow
Total per year	**14,026**	

The minimum release of 3 ML/day required under the water sharing plan is automatically met when releases for water orders are higher. Hence an estimated 90 days of actual top-up (instead of the entire 365 days) is budgeted, based on the river operators' estimates and past practice. Further, the minimum release requirement is halted if Chaffey Dam dips below 20% volume[21], as decided after building the new pipeline from Chaffey to Dungowan.

[17] Water sharing plan, Clause 28
[18] Average full year loss during 2015/16 to 2019/20. Estimated afresh for a part water year.
[19] Water sharing plan, Clause 20
[20] Water sharing plan, Clause 31(3)
[21] Chaffy Dam to Dungowan Village Pipeline Authorisation, 3/6/20, Section 8, *Water Supply (Critical Needs) Act 2019*

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 estimates the volume of water lost through evaporation from the water surface of Chaffey Dam over a 12-month period using the upper envelope of simulated[22] annual loss during 1892 to 2016, as was available during the analysis. This returns the following empirical equation relating loss to storage volume:

$$E = 3.7 + 0.073 \times S \qquad (2)$$

Where:

E = Annual evaporation from Chaffey Dam in GL

S = Annual average volume of Chaffey Dam in GL.

We assume at the end of a repeated worst drought year, Chaffey Dam will be depleted to 20 GL from its 1 July level. For simplicity, $S = \frac{1}{2}(S_{1-Jul} + 20)$ is used at the start of the water year as an annual average storage level for budgeting evaporation. Later, the evaporation loss is reduced proportionately as the year progresses.

A flat evaporation loss of 580 ML per annum is considered from Dungowan storage if it is included in the assessment.

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 delivery loss is net of any gain from tributary inflows utilised to meet demands.

Delivery losses are highly variable in time and space and are evaluated based on historical data and forecast water use. There is a general linear trend of increasing losses with increasing water deliveries. Delivery loss through the Peel River can be as high as 80% of release volume in a dry year (for example in 2013-14).

The average annual delivery loss measured from 2015-16 to 2019-20 was 60%. The high loss is reflective of sandy river bed reaches, alluvial soils, high connectivity to groundwater and the absence of re-regulating weirs. Prevailing loss conditions are considered in each resource assessment and water allocation announcement. The example below, while budgeting for May and June, used 30% loss for the cold months.

Any increment to general security allocation is net of additional delivery loss. It should be noted that no delivery loss is budgeted for the ECA volume – it is considered delivered once released and the account is debited when the water leaves the storage.

[22] Peel IQQM, version E104

Water allocation example of 11 May 2021

The tables below show the water allocation computations behind the statement published on 11 May 2021. This is an example of an incremental increase to general security allocations that occurred during the water year.

The assessment returned an additional 16% allocation to general security entitlements. A summary of computation is shown in **Table 4,** with a more detailed assessment provided in **Table 5**.

Table 4. Peel AWD Summary for 11 May 2021

Assessment Items	Volume (GL)
[Available Storage plus Inflow: May to June]	[61.4]
minus	*minus*
[Essential requirement from May to June]	[11.4]
[Reserve for 2021/22]	[14.0]
[General security balance]	[18.34]
[ECA balance]	[3.05]
[Evaporation, operational and transmission loss]	[7.2]
equals	*equals*
[Available for new allocation]	[7.4]

General security and ECA allocation = Available volume ÷ (Eligible GS shares + ECA + GS × Loss)

= 7.4 ÷ (30.3 + 5.0 + (30.3 × 0.30)) = 16%

Table 5. Detailed Peel AWD computation for 11 May 2021

Assessment items as of 1/5/21	Item volume (GL)	Resource balance (GL)
Available Storage and Inflow		
Chaffey Dam Volume	60.7	60.7
Dungowan Dam above 50%	3.0	63.7
Less dead storage of Chaffey	2.4	61.3
Minimum inflow budget for the remainder of water year (5/21 to 6/21)	0.1	61.4
Losses (5/21 to 6/21)		
Evaporation from Chaffey and Dungowan	1.4	
Transmission and operational loss	0.3	59.7

Assessment items as of 1/5/21	Item volume (GL)	Resource balance (GL)
Essential requirements (5/21 to 6/21)		
Local Water Utility -notional balance	7.8	51.9
High Security, Domestic & Stock -balance	0.9	51.0
Delivery Losses of above two items	2.6	48.4
Minimum Storage Releases	0.1	48.3
Reserve for next water year 2021/22	14.0	34.3
Current GS and ECA Commitments		
Existing ECA account balance	3.05	31.2
Existing GS account balances	18.34	12.9
Losses to deliver existing GS allocations	5.5	7.4
Available for Allocation (or deficit)		**7.4**
New GS allocations (30.3GL x **16%**)	=4.85 GL	
Delivery losses for new GS allocations	=1.4 GL	
Water for ECA (5GL x **16%**)	=0.8 GL	

Therefore; 7.4GL is enough for 16% extra GS (4.85GL) and ECA (0.8GL) plus increased delivery (1.4GL).

Disclaimer

Allocations are based on a very conservative assumed future inflow. However, during extended dry periods, inflow may be less than the budget with higher delivery loss creating a shortfall in allocated resources. 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, and if it is in the public interest to do so, temporary water restrictions have been imposed in the past to prevent access to account water, akin to a negative water allocation, to protect remaining water supplies for high priority and critical needs.

The routine water allocation computation, while broadly follows 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
Second edition	April 2021	M Kawun, S Chowdhury
This edition	August 2021	S Chowdhury, B Hazrati
Reviewed	October 2021	B. Graham

Annexure

Example: Water Allocation Statement - 11 May 2021

11 May 2021

Peel regulated river water source and Peel alluvium groundwater source

Water allocation update

There have been slight improvements in water availability in the Peel catchment since the last resource assessment allowing for the following allocation increases:

- **General security allocation to increase by 16%** resulting in a total allocation of 77% for the current water year.
- **Environmental Contingency Allowance (ECA) account to increase by 16%** to a total of volume of **3.8** GL.
- **Aquifer general security allocation to increase by 7.8%** resulting in a total allocation of 88.7% for the current water year.

All other categories of licence in the Peel Regulated River Water Source have been given full allocations and remain unchanged.

Table 1. Announced water allocations for the Peel Regulated River Water Source

Access licence type	2020-21	Drought Stage
Local Water Utility	100%	
Domestic and Stock	100%	Stage 1
High Security	100%	
General Security	77%	
Environmental Contingency Allowance	3.8 GL	

Table 2. Announced water allocations for the Peel alluvium groundwater source

Access licence type	2020-21
Aquifer (general security)	88.7%

General security water users are reminded that under certain circumstances they can order and take water from uncontrolled flows without a corresponding debit from their account. There has been about 6.6 gigalitres (GL) usage of uncontrolled flow for the current water year so far.

Water availability outlook 2021-22

This forecast information is not guaranteed and should be used at one's own risk. This outlook for the likely 1 July 2021 water availability is conservatively based on assumed historical minimum inflows for the remainder of this water year and into the future.

- **Town water, domestic and stock, and high security** entitlements are expected to receive full (100%) allocations on 1 July 2021.
- The allocation for **general security** entitlement holders and the ECA account will depend on factors including inflows and usage for the remainder of this water year. Nevertheless, Table 3 below is provided as a guide for water users in planning for the start of the new water year.

Table 3. Indicative general security allocation for a given Chaffey level on 1 July 2021.

Chaffey Dam (GL)	Indicative GS allocation (%)
50	0-5
60	15-25
80	50-65

Key facts

- As of 10 May 2021, Chaffey Dam is holding 61.2 gigalitres (GL) of water, about 58.4% full.
- Inflow into Chaffey Dam was about 1.7 GL in April. Any improvement in May will be included in the next assessment.
- With Chaffey Dam holding more than 20 per cent capacity, Phase 1 of the authorisation under the *Water Supply Critical Needs Act 2019* is currently in place meaning that water is being delivered by the river rather than the new pipeline.
- Chaffey Dam is currently releasing 3 megalitres (ML)/day as required by the water sharing plan.
- Normal regulated river operations and water ordering are available for the Peel river system.

Seasonal rainfall outlook

The Bureau of Meteorology's seasonal outlook for May to July indicates rainfall is likely to be around or above average across the catchment. Daytime and overnight temperatures are likely to be warmer than average.

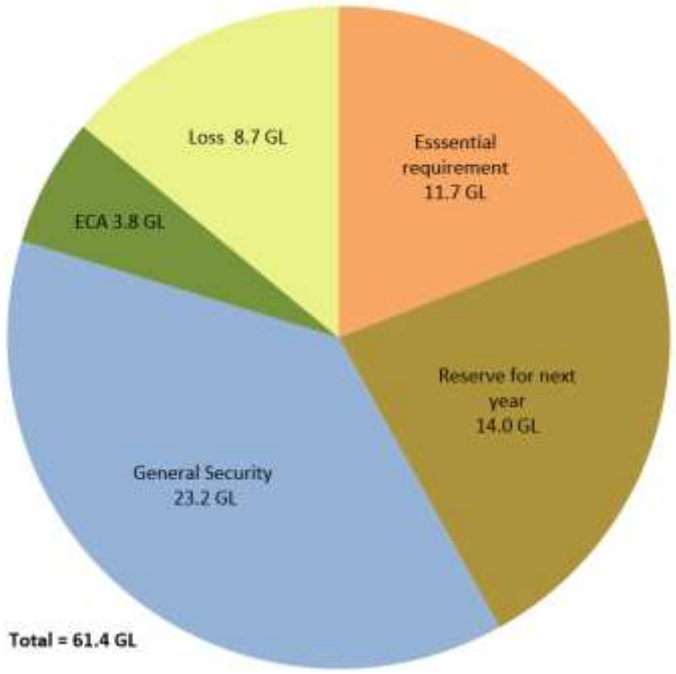
Details can be found at: www.bom.gov.au/climate/ahead/outlooks/

Resource assessment data sheet

Resource distribution (as at 1 May 2021)	Volume (GL)
Current and Future Resources [(1)]	61.4
less	
Essential Supplies [(2)]	11.7
Reserve for 2021-2022[(3)]	14.0
General security balance	23.2
ECA balance [(4)]	3.8
Evaporation, operational and transmission loss [(5)]	8.7
equals	
Uncommitted Resources	0.0

See notes below.

Resource Distribution (as at 1 May 2021)



Notes:

(1) Chaffey Dam above dead storage, Dungowan Dam above 50% and minimum inflow expected to June 2021.

(2) Water set aside to provide for basic landholder rights, domestic and stock (D&S), local water utility (LWU), high security (HS) and associated transmission loss plus minimum storage release. D&S entitlements have been allocated 100%, LWU entitlements have been allocated 100%, and HS entitlements have been allocated 100% for the current water year.

(3) Reserve set aside to meet the minimum allocation of 2021-22 under the water sharing plan (WSP) obligation at the repeat of the worst drought since the implementation of the WSP. This includes basic landholder rights, 70% domestic and stock, 70% local water utility, 50% high security and associated transmission loss plus minimum storage release. This also considers minimum inflow expected next year offset by evaporation over 2021-22.

(4) Total ECA account balance (GS allocation in ML/share multiplied by 5000).

(5) Evaporation budget assumes historical high evaporation rates. The transmission loss is to run the river to deliver water orders based on current conditions and forecasts. ECA water delivery is measured at the dam wall thus incurs no transmission loss.

Further information

The department will continue to closely monitor water availability in the Peel regulated river water source and will produce monthly statements while conditions are improving.

The next statement will be on **9 June 2021**, or earlier, if conditions change significantly beforehand.

Information on available water determinations and water sharing plans is available on the department's website at: www.industry.nsw.gov.au/water

Subscribe here to receive the department's monthly email update on water planning, management and reform in New South Wales.

You can also follow the department on Twitter: @NSWDPIE_Water