Application and assumptions used for deriving the BDL-based 2024 LTDLE factors for the Macquarie

Introduction

The NSW Government is responsible for updating the 2018 LTDLE factors when the water resource plan (WRP) is accredited in a river valley or the BDL model is revised with agreed-upon corrections and refinements. The Macquarie River WRP was accredited in February 2024. A revised NSW BDL model that merged appropriate model updates and increased model resolution features was used in the WRP. This report details how NSW has updated 2024 LTDLE factors for the Macquarie River Valley.

LTDLE factors reference:

- *Consultation paper: NSW updated factors for water recovery (June 2018)*
- *Water reform technical report: Derivation of LTDLE factors in NSW (May 2018)* (refer to this document for all inputs related to calculating the LTDLE factors including the reference files)

Supporting files for the updates

- Confluence Reference (with working notes) https://nswwmmi.atlassian.net/wiki/spaces/WMM/pages/3299180545/Macquarie+2024+LTDLE

Data Sources

Entitlements

The entitlements under BDL conditions (development conditions as at 30 June 2009) were reviewed considering sources from the BDL scenario report of 'Macquarie River Surface WRP' (Attachment A to Schedule F) and the previous Derivation of LTDLE factors in NSW (May 2018) report.

The Water Information Reporting & Extraction (WIRE) system and General Purpose Water Accounting Report (GPWAR), were used to correct known errors and movement of entitlements in the first water year of the water-sharing plan. Decisions have been made that the WIRE system has the longest historical records from 2004–05 to current, and already have corrected known errors found in previous reports, therefore, entitlements in WIRE will be used in the calculation of updated LTDLE factors in the Macquarie River, shown in Table 1.

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Table 1. Macquarie River entitlements (BDL current conditions)

Entitlement type	2004 (BDL*) Shares[1]	2024 Shares
Domestic and stock	5,812	5,928
Local water utility	19,205	20,045
High Security	16,775	17,873
General Security	631,314	632,466
Supplementary water	51,000	49,998
Floodplain harvesting (including non-exempt rainfall runoff harvesting)	–	48,911
Total	721,106	775,222

Macq_LTDLE_Working.xlsx (Sheet "ObservedData") from WIRE

**INT20 376183 FINAL Attachment A to Schedule F. Macquarie-Castlereagh SW WRP -Modelling - BDL Scenario Report - update.docx*

BDL Diversions

The revised NSW BDL model was used in the Macquarie River WRP. The new model has been recalibrated and redeveloped in IQQM. The BDL model was adopted as the primary data source to describe long-term (1895–2009) diversions in the Macquarie River Valley (Table 2). The representation of stock and domestic and local water utility in the model is a fixed daily extraction. The average of recorded historical diversions was used instead because this is a better representation of usage by these types of entitlement. The net change between these entitlement types when swapping from modelled to historic is zero so there are no unintended side effects for other entitlement types.

Table 2. Macquarie River BLD diversions 1895–2009

Entitlement type	Diversions 1895–2009 (ML/y)	Source of water usage data used to LTDLE calculation
Domestic and stock	1,700	Used average historical diversion from WIRE (2004–2024)
Local water utility	12,600	Used average historical diversion from WIRE (2004–2024)
High security	9,600	Modelled estimate from BDL WRP model
General security	277,700	Modelled estimate from BDL WRP model
Supplementary water	13,700	Modelled estimate from BDL WRP model
Floodplain harvesting (including non-exempt rainfall runoff harvesting)	27,500	Modelled estimate from BDL WRP model
Total	342,800	–

Macq_LTDLE_Working.xlsx (Sheet "Corrected")

Historical utilisation rates

The historical utilisation rate is calculated by taking the average available determination for each class of entitlement to give the total allocation account volumes available by class. The recorded usage by each entitlement class is divided by the total allocation account volume available to that class to give the level of activation by that class. The historical allocation account balance summary was from the WIRE. Table 3 showed the details of average historical account usage and the activation factors. The historical period was extended to 2004–05 to 2023–24 for better demonstration of the diversions over a wider range of climate conditions.

Table 3. Macquarie River allocation account balance summary (average 2004–05 to 2023–24)

Entitlement type	Share	AWD	Account usage	USE/AWD
Domestic and stock	5,928	5,928	1,687	0.285
Local water utility	20,045	20,045	12,570	0.627

Macq_LTDLE_Working.xlsx (Sheet "ObservedData")

Floodplain harvesting utilisation rates

For floodplain harvesting, entitlements that can trade should be treated as part of a pool of shares for the purpose of calculating historical usage (BN23/5480). In the Macquarie River Valley the Macquarie floodplain harvesting rules summary sheet describes permanent trade as being possible between management zones, which is visualised in Figure 1. This shows that there are 3 disconnected zones for trade of floodplain harvesting licenses and as such 3 factors will be derived for the zones described in Table 4.

Figure 1. Visualisation of trading relationships for floodplain harvesting licences in the Macquarie River Valley

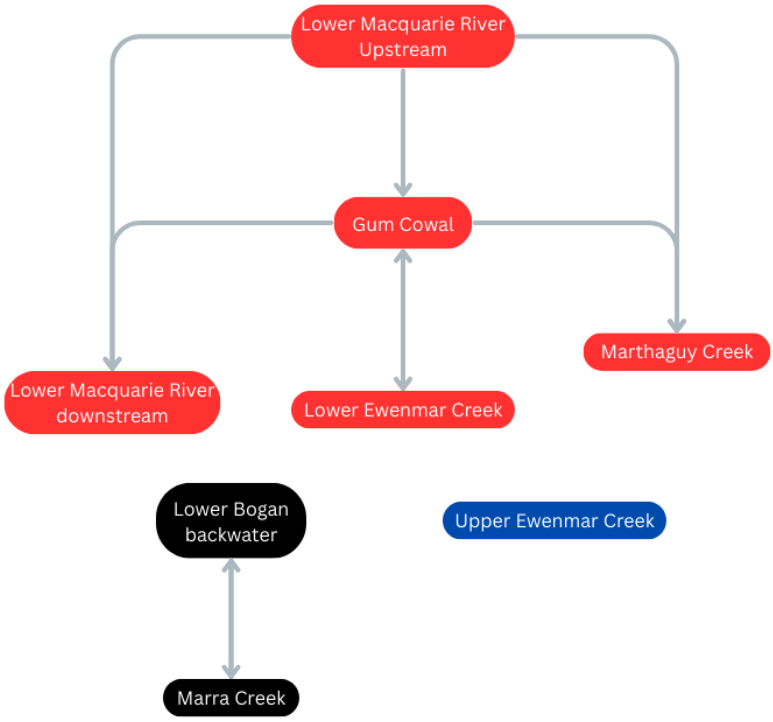

Table 4. Macquarie River floodplain harvesting trade zones for the purposes of LTDLE factors

Zone	Floodplain Harvesting Management Zone
Zone 1	Lower Macquarie River Upstream
Zone 1	Gum Cowal
Zone 1	Marthaguy Creek
Zone 1	Lower Macquarie River Downstream
Zone 1	Lower Ewenmar Creek
Zone 2	Lower Bogan Backwater

Zone	Floodplain Harvesting Management Zone
Zone 2	Marra Creek
Zone 3	Upper Ewenmar Creek

Allocation reliability

The MDBA has agreed that the allocation reliability indicated by the BDL model in the WRP represents the best available information to describe the reliability of allocations made to entitlements under the BDL conditions, as shown in Table 5.

Table 5. Macquarie Rivers average allocation reliability

Entitlement type	Average reliability from BDL model run	Method description
Domestic and stock	1.000	All NSW water sharing plans require that these entitlements are fully available each year. Defined as 100%.
Local water utility	1.000	All NSW water sharing plans require that these entitlements are fully available each year. Defined as 100%.
High Security	1.000	The modelled long-term average allocation at the end of the water year is used.
General Security	0.546	The modelled long-term average allocation at the end of the water year is used.
Supplementary	1.000	These are fully available by definition and would only be cut by a growth in use compliance action.
Floodplain harvesting all zones (including non-exempt rainfall runoff harvesting)	1.000	These are fully available by definition and would only be cut by a growth in use compliance action.

Macq_LTDLE_Working.xlsx (Sheet "Modelled_HS_AWD")

Results

2018 factors

The Basin Plan BDL regulated component of the Macquarie River was 381,965 ML in 2018 factors calculation. This is 30.165 GL (or 11%) higher than the revised Basin Plan BDL estimate (342.8 GL) in the Macquarie River WRP.

2024 factors

Table 7 sets out the basis for how the updated factors were determined in 2024.

The revised Basin Plan BDL for the regulated component of the Macquarie River is 342.8 GL.

Key between 2018 and 2024 factors

- The Macquarie River BDL model used, has been rebuilt and recalibrated for the purposes of accurately representing floodplain harvesting.
- Floodplain harvesting (including non-exempt rainfall runoff harvesting) entitlement and diversions are now more accurately modelled in the BDL WRP runs.
- All factors have decreased (Table 6), the main reasons for this include:
  - New model calibration lead to significantly lower general security and supplementary usage in comparison to the previous model. The latest model version more closely matches observed diversions.
  - Less use in the water years following the 2018 factors (For example 2018–19 and 2019–20 were very dry water years leading water restrictions for towns and more conservative stock and domestic use).

Table 6. Summary of 2018 and 2024 LTDLE Factors

Entitlement type	2018 LTDLE Factors	2024 LTDLE Factors
Domestic and stock	0.290	0.285
Local water utility	0.681	0.627
High security	0.668	0.537
General security	0.516	0.439
Supplementary	0.588	0.274
Floodplain harvesting Zone 1	-	0.637

Entitlement type	2018 LTDLE Factors	2024 LTDLE Factors
Floodplain harvesting Zone 2	–	0.434
Floodplain harvesting Zone 3	–	0.588

Updated water recovery estimates

For a relative comparison, the environmental entitlements were from *Water reform technical report: Derivation of LTDLE factors in NSW (May 2018)*. As shown in Table 8 the new factors decrease the LTDLE volume of high security, general security and supplementary entitlements. This represents a net decrease of 17,678 ML (17%) in the LTDLE volume of recovery in the Macquarie River.

Table 7. Macquarie River entitlements, 2018 factors, 2024 factors derivation and BDL shares by entitlement class

Entitlement type	2018			2024				
	Entitlement shares	Factors	BDL share (ML/y)	Entitlement shares	Average reliability	Utilisation factor	Factors	BDL share (ML/y)
Domestic and stock	6,000	0.290	1,741	5,928	1	0.285	0.285	1,700
Local water utility	18,805	0.681	12,799	20,045	1	0.627	0.627	12,600
High security	17,900	0.668	11,957	17,873	1	0.537	0.537	9,600
General Security	632,400	0.516	326,070	632,466	0.546	–	0.439	277,700
Supplementary	50,000	0.588	29,398	49,998	1	0.274	0.274	13,700
Floodplain harvesting Zone 1	–	–	–	23,219.4	1	0.637	0.637	14,800
Floodplain harvesting Zone 2	–	–	–	15,662	1	0.434	0.434	6,800

Entitlement type	2018			2024				
Floodplain harvesting Zone 3	–	–	–	10,030	1	0.588	0.588	5.900
Total	**725,105**	–	**381,965**	**824,133**	–	–	–	**342,800**

Macq_LTDLE_Working.xlsx (Sheet "Corrected")

Table 8. Summary of Macquarie River environmental entitlements, the LTDLE volumes under the 2024 and 2018 factors, and the difference between the 2024 and 2018 factor volumes by entitlement class

Entitlement type	NSW environmental entitlements register–May 2018 (ML)	Other entitlements nominated by MDBA & DAWR (ML)	Total environmental entitlements (ML)	2018 factor	Recovery under 2018 factors (ML/y)	2024 factor	Recovery under 2024 factors (ML/y)[d]	Change in recovery amount (ML/y)
Domestic and stock	–	–	0	0.290	0	0.285	0	0
Local water utility	–	–	0	0.681	0	0.627	0	0
High security	–	5,475	5,475	0.668	3,657	0.537	2,940	-717
General Security	174,643	5,893	180,536	0.516	93,086	0.439	79,255	-13,901
Supplementary	9,744	–	9,744	0.588	5,729	0.274	2,670	-3,060
Floodplain harvesting Zone 1	–	–	0	0	0	0.637	0	0
Floodplain harvesting Zone 2	–	–	0	0	0	0.434	0	0
Floodplain harvesting Zone 3	–	–	0	0	0	0.588	0	0
Total	184,387	11,368	195,755	–	102,543	–	84,865	-17,678

Macq_LTDLE_Working.xlsx (Sheet "Factor_Savings")