

**INDEPENDENT REVIEW OF NEW SOUTH WALES METHOD AND PLANNING
ASSUMPTIONS FOR LONG TERM DIVERSION LIMIT EQUIVALENCE (LTDLE) FACTORS
IN THE MURRAY-DARLING BASIN**

By

The Independent Review Panel

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31 July, 2018

Summary

An Independent Review Panel (IRP), consisting of Drew Bewsher and Greg Claydon, has undertaken an independent review of the planning assumptions and methodology for derivation of Long Term Diversion Limit Equivalence (LTDLE) factors provided to date by the State of New South Wales for its valleys subject to the Murray-Darling Basin Plan 2012.

The LTDLE (or “Cap”) factors are a means to estimate the long-term average water use associated with a class of water entitlement in a valley on a consistent basis and on equal terms, even though the entitlement classes may be quite different in their features (location, reliability, access rules, degree of utilisation etc).

Each LTDLE factor is key to understanding the volume of water required to be recovered to ‘bridge the gap’ between the baseline diversion limit (BDL) and the sustainable diversion limit (SDL) specified in the Murray-Darling Basin Plan 2012.

Planning assumptions are a fundamental component of a Basin State’s demonstration in its water resource plans (WRPs) that their water management arrangements will comply with the SDLs.

The IRP agrees that it is important that LTDLE factors are calculated as accurately as possible, using the best available data, modelling and information and defensible planning assumptions where required.

The IRP also agrees that it is also important to ‘get the factors right’ now rather than later (for example, after an accredited WRP commences later in 2019).

Due to a number of weaknesses identified with earlier work, the IRP agrees that the 2011 LTDLE factors need to be updated.

The IRP has reviewed the data and information, assumptions and approach pertaining to the variables used to date in the method to derive the updated NSW LTDLE factors. The IRP has noted that stakeholder consultation is also being undertaken about these matters and the results and outcomes of that consultation process are not known by the IRP at the time of this report.

From the information provided and discussions held with officials, the IRP is satisfied that the entitlement volumes (or shares) for each entitlement class have been based on official registers and publicly available records.

The IRP endorses that each valley BDL, determined through the accepted BDL model run, is the appropriate figure to use and ensures consistency with the Basin Plan. The IRP notes that, in any case, there are specified processes required under the legislation and policy to change a previously accepted BDL figure.

It also follows that the average reliability figure for each entitlement class, as an output of the accepted BDL model, is legitimate and appropriate to adopt.

The IRP has concluded that, while recognising there are relatively small volumes of unmetered (though estimated) water use and there may be compliance actions in play from time to time, the figures for historical water use in NSW can be verified by the publicly available General Purpose Water Accounting Reports.

The IRP agrees that, on the bases of principle and equity, and correct water accounting, net trades are included in the historical utilisation calculations for the purposes of deriving the LTDLE factors.

Given the arrangements for prioritisation and the requirements in the NSW water sharing plans for entitlement classes A (Domestic and stock), B (Local water utility) and C (High water security), the IRP agrees that it is appropriate to use the historical utilisation factor (generally calculated for 2004 to 2017) for these classes in the derivation of LTDLE factors.

Based on the available information, the IRP agrees with the rationale that water entitlement class E (Supplementary) is and will be usually taken, rather than water access entitlement class D (General security), when a Supplementary entitlement access event is declared, and that the best available information on the long term average diversions of water access entitlement class E (Supplementary) is the corresponding output from the accepted BDL model runs for the 1895 to 2009 climate. Consequently, the IRP supports the approach adopted in the derivation of the LTDLE factors for these water entitlement classes.

Conclusions

Based on the information provided to the IRP, and the IRP's assessments, the IRP concludes that the method used in NSW to derive updated LTDLE factors:

- appropriately incorporates results from the approved and accepted BDL model runs that are consistent with the Basin Plan level of baseline data, conditions and assumptions that informed the Basin Plan;
- is based on the best available data and information, and, where, assumptions have had to be made about that data or information, those assumptions are reasonable, robust and defensible based on the available evidence;
- considers and treats entitlement classes appropriately and consistently;
- has been applied in a repeatable and consistent way across the NSW valleys in the Murray-Darling Basin;
- can be used to further update the LTDLE factors should new data or information from the current stakeholder consultation process provide justifiable evidence.

The IRP agrees that the methodology is appropriate to use in NSW for determining and accounting the volumes to “bridge the gap” between the SDLs and the BDLs.

Suggestions for Further Work

The IRP notes that water entitlement holder behaviour in the Gwydir may not always preference Supplementary access over General security access when Supplementary access is available. The IRP suggests that any stakeholder feedback and further evidence about this matter be considered and, if necessary, additional information could be collected and considered about General security and Supplementary water entitlement class holders' behaviour in the Gwydir.

The IRP also suggests that any stakeholder feedback and evidence be considered and, if necessary, additional information could be collected and considered about High security, General security and Supplementary water entitlement class holders' behaviour in the Lower Namoi.

The IRP suggests that additional information could be provided to more transparently explain how the LTDLE factor results come about in the Lachlan, and to explain how water entitlement Class F- Conveyance is handled in the method.

The IRP suggests that the Entitlement Class figures for the Murrumbidgee, and the way that the LTDLE factors have been derived for water entitlement classes F – Conveyance, and G, H, and I for the Lowbidgee, could be supported with some additional information and explanation to assist transparency.

The IRP notes there are some small discrepancies in water entitlement volumes for the Lower Darling listed in the documentation provided and suggests that these be clarified for transparency and trust in the figures.

Recommendations

The IRP recommends that, if stakeholder evidence is provided to warrant a change in the historical water usage figures, the changed figures be used in the method rather than the currently reported figures.

The IRP recommends that, if stakeholder feedback and evidence are provided to warrant a change in the approach to accounting for the behaviour by Supplementary and General security entitlement classes, the changed approach be used in the method rather than the currently adopted approach.

1.0 Introduction

The Murray-Darling Basin Plan 2012 established new sustainable diversion limits (SDLs) for water take from across the Basin, which will come into effect from 2019 once water resource plans (WRPs) have been accredited.

Planning assumptions are a fundamental component of a Basin State's demonstration in its WRPs that their water management arrangements will comply with the SDLs.

In developing a model (or other method) to demonstrate how the SDL will be met for a particular valley, State water planners include the planning assumptions as the inputs to the model, along with the 'givens' and agreed rules for a particular valley, where:

- a) planning assumptions might include user behaviour (such as in relation to carry over and trade, the amount and type of cropping), the level of utilisation of entitlements, and starting conditions;
- b) 'givens' include things like the physical characteristics of the system, the agreed baseline diversion limit (BDL) and the historical climate sequence (1895 – 2009) (the latter of which might be different to previous model runs); and
- c) agreed rules might include the prioritisation of allocation of available water.

As well as the planning assumptions used in developing models (or methods) for the WRPs, other planning assumptions need to be developed as part of the determination of 'Cap' factors - or Long Term Diversion Limit Equivalence (LTDLE) factors. It is the planning assumptions used for determining these LTDLE factors (together with their associated calculation methodologies) that are the subject of this review

Each LTDLE factor is a means to estimate the long-term average water use associated with a class of water entitlement in a valley on a consistent basis and on equal terms, even though the entitlement classes may be quite different in their features (location, reliability, access rules, degree of utilisation etc).

The LTDLE factors are key to understanding the volume of water required to be recovered to 'bridge the gap' between the BDL and the SDL i.e. will the entitlements being recovered actually bridge the gap between the BDL and the SDL for each respective valley over the long term?

The Australian Government has made a commitment to 'bridge the gap' to reduce diversions to the SDL by 2019. To allow for the finalisation of the remaining water recovery task under the 'bridging the gap' commitment, each Basin State must settle their planning assumptions for each SDL resource unit, ahead of the commencement of the SDLs.

If the LTDLE factors change, the current estimates of water recovery may increase or decrease in the affected valleys, requiring more (or less) entitlements to be recovered than may have been previously understood to be the case.

The Murray-Darling Basin Authority (MDBA) and each Basin State are working together so that the planning assumptions and the LTDLE factors are able to be settled within this timeframe.

With this in mind, the MDBA appointed an Independent Review Panel (IRP) on 19 June, 2018 to undertake an independent review of the planning assumptions and methodology for derivation of the LTDLE factors provided to date by the Basin State of New South Wales.

Specifically, the MDBA required an independent review of the work undertaken to date by New South Wales to assess if the planning assumptions and the calculation methodology used to determine the LTDLE factors will provide a suitable basis for determining the extent to which the entitlements being recovered will 'bridge the gap' from the BDL to the SDL.

It is important to clarify that the IRP's review in this case concerns the planning assumptions and methodology inherent in the derivation of the new LTDLE factors prepared for NSW to date. The planning assumptions in future WRPs and their models / methods (including determination of permitted take), may change for legitimate reasons and any such future changes cannot be the subject of the IRP's current review.

This is the report of the review by the IRP based on the data and information provided to it to date.

2.0 Review Process

The IRP was provided with electronic copies of the following written documents:

Consultation paper: NSW updated factors for water recovery (NSW Department of Industry, May, 2018);

Water reform technical report: Derivation of LTDLE factors in NSW (NSW Department of Industry, May, 2018); and

Basin Plan Water Resource Plan Requirements Position Statement 3H – Planning Assumptions (MDBA Position Statement Issued 1 March, 2016).

The IRP was also provided with access to Excel spreadsheets used by the NSW Department of Industry and the MDBA to summarise the planning assumptions data and to derive the LTDLE factors presented in the above documents. The IRP also reviewed the data in these spreadsheets to evaluate the planning assumptions and the method used to derive the LTDLE factors as well as other potential methods and their implications.

To build its understanding and inform its views, the IRP held a teleconference with representatives of the MDBA and the NSW Department of Industry on 21 June, 2018 and met face to face with them in Canberra on 28 June, 2018. Further data and information were provided to the IRP as requested following those discussions.

A draft report was made available to the MDBA and the NSW Department of Industry for comment prior to the finalisation of this report.

3.0 The Importance of LTDLE Factors

Since there are many different entitlement classes, with different locations, purposes, reliabilities, access rules, water usage and trade patterns, among other things, across the Murray-Darling Basin, the IRP understands that the LTDLE factors were established to assess, as accurately as possible, how much water has been recovered for the environment and to guide future water recovery decisions.

LTDLE factors are a numerical value assigned to each entitlement, so that entitlements can be considered on equal terms how they contribute to progress towards the recovery target. LTDLE factors are an essential element of water accounting so that the amount of water recovered for the environment can be determined.

Consequently, the IRP agrees that it is important that LTDLE factors are calculated as accurately as possible, using the best available data, modelling and information and defensible planning assumptions where required.

The IRP also agrees that it is also important to ‘get the factors right’ now rather than later (for example, after an accredited WRP commences later in 2019).

On the one hand, if the factors used result in an under-estimate of the water recovery required, or an over-estimate of the water recovery achieved to date, there could be residual risk that further interventions by the Basin State are required to achieve compliance with the SDL. This could result in water allocations being reduced for some or all entitlement classes in an SDL resource unit (through provisions which respond to and limit any “growth in use” - a “growth in use” provision is a short-hand term that describes a rule in a WRP which is activated when cumulative actual take exceeds the cumulative permitted take by 20% of the SDL. The aim of the rule is to reduce future actual take.). To avoid this future risk, deriving the factors as accurately as possible with the best available data, modelling and information can be seen as providing greater certainty to water entitlement holders and consumptive water users when the WRP is introduced. In that way, water allocations will not need to be reduced to achieve SDL compliance to address any errors in factors.

An alternate outcome, where factors used result in over-estimating the recovery required, is that too much water is recovered now, leaving consumptive users in the future with less water than is necessary under the Basin Plan.

It is also necessary to understand that, despite their importance, the actual LTDLE factors do not alter the entitlements themselves nor do they affect water resource assessments to determine water allocations (e.g. Available Water Determinations or AWDs). The LTDLE factors are not an indication of reliability. While they do reflect average historical use of water allocations, they are not a measure of the actual amount of water that entitlement holder can access. An LTDLE factor does not determine the value of a water entitlement as an asset.

4.0 The Context for Updating LTDLE Factors

The IRP's review of the available information and discussions with officials indicate that LTDLE or "Cap" factors have been relatively poorly understood by some water managers, entitlement holders and users to date. The factors have had a somewhat complicated and confused history, some of the concepts and definitions have been complex and difficult to grasp, and a number of alternative approaches involving inconsistencies in logic and application have been used.

Furthermore, the factors adopted by the Murray-Darling Basin Ministerial Council in 2011 have been shown to have weaknesses in addition to those resulting from different approaches having been used in the past. Calculations using the 2011 factors do not add up to the BDL accepted for each valley. In addition, better historical water use data and information about water user behaviour are now available to input to hydrological models and to the derivation of the factors.

Consequently, and recognising the importance of the LTDLE factors as outlined above, all Basin governments are committed to reviewing, and, where possible, updating the methodology and the assumptions used to develop the 2011 factors.

There is also significant stakeholder interest in the outcomes of the planning assumptions and the LTDLE factors work, so it is appropriate for an independent review to be undertaken to verify the methodology, its appropriateness, and the transparency, consistency and robustness of its application. In that way, it may be expected that trust and confidence in the results may increase.

Based on the above, the IRP agrees that the 2011 LTDLE factors need to be updated.

5.0 Method Used to Calculate Updated LTDLE Factors

It is the view of the IRP that the method used to calculate the updated LTDLE factors is reasonably well described in the document *Water reform technical report: Derivation of LTDLE factors in NSW* (NSW Department of Industry, May, 2018). The essence of the method is outlined below:

The calculation for the LTDLE factors for each entitlement class can be expressed as:

$$\text{LTDLE factor for an entitlement class} = \frac{\text{Long-term water usage by the entitlement class}}{\text{Volumetric share of the entitlement class}}$$

The 2018 factors have been determined from a combination of historical water usage data, and the BDL models (MDBA Model Run 871) used to develop the 2012 Basin Plan legislative instrument.

Historical recorded usage and trade data (generally 2004 to 2017) for different entitlement classes were used in most cases, as was modelled information describing the BDL and reliability of entitlement classes. Modelled uses against supplementary entitlement types over the 1895–2009 climate sequence were adopted.

All entitlement data was extracted from NSW's water allocation system for June 2009 conditions. In the case of the Lower Darling, Murray and Murrumbidgee river systems, it was corrected to account for water recovery under The Living Murray (TLM) and Water for Rivers initiatives.

The following sets out a hypothetical example of the procedure used to calculate the 2018 factors:

Hypothetical valley:

BDL = 250,000 ML/y (excluding floodplain harvesting and unregulated entitlements water use).

Entitlement classes and prioritisation:

- A. Domestic and stock
- B. Local water utility
- C. High security
- D. General security
- E. Supplementary.

Step 1:

The utilisation factor (column 4 in the Table below) is calculated for entitlement classes A to D from historical data generally between 2004 and 2017. The utilisation factor is calculated as:

$$\text{Utilisation factor for an entitlement class} = \frac{\text{Average annual account usage}}{\text{Average (AWD + net trade)}}$$

A positive net trade represents an increase in available water for an entitlement class.

Step 2:

The initial share of the BDL (column 5 in the Table) over the 1895–2009 climate period used in the modelling is calculated by multiplying the utilisation factor (column 4 in the Table), average reliability (column 3 in the Table) and entitlement share volume (column 2 in the Table).

Step 3:

The initial share of BDL for the Supplementary entitlement class is adopted from the BDL model run.

Step 4:

A check is undertaken to ensure that diversions estimated using the derived 2018 factors equal the BDL defined under the Basin Plan. The example in the Table indicates that the initially calculated LTDLE factors resulted in diversions of 235,930 ML/y, which does not meet the valley BDL of 250,000ML/y.

Step 5:

The full value of Supplementary use from the long-term model is assumed for each valley due to the opportunistic nature of this entitlement class being adequately represented in models.

Step 6:

The final share of the BDL for the General security entitlement class is adjusted so that total diversions based on the LTDLE factors of the other entitlement classes is equal to the BDL model run (column 6 in the Table).

Step 7:

The final 2018 LTDLE factor (column 7 in the Table) is calculated by dividing the share of the BDL (column 6 in the Table) by the entitlement volume (column 2 in the Table).

Table - A hypothetical example of LTDLE factors calculations:

Entitlement Class	Entitlement Volume (Share) ^a	Average Reliability ^b	Utilisation Factor of Entitlement	Initial Share of BDL ^d	Final Share of BDL	2018 LTDLE Factor ^j
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A (D&S)	2,000	1.00	0.85 ^c	1,700	1,700 ^h	0.850
B (Utility)	3,000	1.00	0.85 ^c	2,550	2,550 ^h	0.850
C (High)	50,000	0.97	0.88 ^c	42,680	42,680 ^h	0.854
D (Gen)	350,000	0.60	0.90 ^c	189,000	153,070 ⁱ	0.437
E (Supp)	150,000	-	-	-	50,000 ^g	0.333
	555,000			235,930 ^e	250,000 ^f	

NOTES

- a. Based on entitlement data from NSW's water allocation system to describe entitlements on issue under BDL conditions.
- b. Based on the BDL model run for the 1895 to 2009 climate, recognising priorities given to entitlement classes.
- c. Calculated using the formula above for the historical water use, carryover and trade data, generally from 2004 to 2017.
- d. The product of columns (2), (3) and (4) for each entitlement class.
- e. The sum of the initial shares calculated as in (d) – invariably this does not equal the BDL determined from the BDL model run.
- f. The valley BDL determined from the BDL model run.
- g. The water use from the Supplementary entitlement class determined from the BDL model run for the 1895 to 2009 climate.
- h. Taken as the same as the initial shares calculated as in (d), recognising the priority of these three entitlement classes.
- i. Calculated as the difference between the valley BDL (f) and the sum of the final shares of the other entitlement classes (g+h).
- j. Calculated by dividing column 6 by column 2.

6.0 General Comments on the Method Used to Calculate LTDLE Factors

The method used for calculating LTDLE factors requires knowledge of several variables, including:

- the volume of each class of entitlement in a specified resource unit;
- the total long-term diversion limit volume; and
- the degree of utilisation of entitlements.

The IRP has reviewed the available data and information, assumptions and approach pertaining to these variables.

From the information provided and discussions held with officials, the IRP is satisfied that the entitlement volumes (or shares) for each entitlement class have been based on official registers and publicly available records.

In addition, the BDL models to date have been peer and independently reviewed and found to be “fit for purpose”. The assumptions used in the BDL models to determine the BDLs have been accepted as being reasonable and based on the best available data and information for consistency with the Basin Plan.

While the IRP notes that NSW has prepared updated BDL model scenarios, currently being reviewed by the MDBA, the IRP endorses that each valley BDL, determined through the accepted BDL model run, is the appropriate figure to use and ensures consistency with the Basin Plan. The IRP notes that, in any case, there are specified processes required under the legislation and policy to change a previously accepted BDL figure.

It also follows that the average reliability figure for each entitlement class, as an output of the accepted BDL model, is legitimate and appropriate to adopt.

The IRP notes that the method used for determining final BDL shares to calculate LTDLE factors involves outputs from both the BDL model runs under the 1895 to 2009 climate and calculations based on historical water use, carryovers and trades, generally from 2004 to 2017, rather than using only model run outputs or only relevant historical records as a basis.

The IRP appreciates that sustainable water management is most likely to be achieved if it is based on long run data and behaviours with evidence covering a range of climate and water use conditions.

The IRP understands the challenges in estimating the long term water uses by different entitlement classes, given that official records in some instances have lumped use volumes together and so assumptions have to be made to apportion the use. It is acknowledged that the 2004 to 2017 period of historical records is relatively short and contains the “millennium drought” during which water availability was generally less than for the average of the 1895 to 2009 climate period used for modelling the BDL.

The Murray-Darling Basin Plan and new (and in some cases suspended) water sharing plans for some parts of New South Wales were also introduced during the period used to determine historical water utilisation, as was the commencement of water recovery for the environment by the Australian Government and the operations of the Commonwealth Environmental Water Holder. All of these may have had some influence on water user behaviour and actual water use.

The IRP further explored the evidence and the rationale for determining long term water usage by entitlement class under the method used to calculate LTDLE factors.

Advice from MDBA and NSW officials is that there is a high degree of confidence in using historical water use data (from the period ~2004 to 2017). This is considered to be the best estimate of actual water use available.

NSW has confidence in this data as it has been extracted from the NSW Water Accounting System, and reflects volumes that have been reported individually to water users (via their accounts, providing opportunities for discrepancies to be detected early and addressed) and also publicly (via the NSW Department of Industry web site in the annual NSW General Purpose Water Accounting Reports since 2009-10). The MDBA also reviews the data annually and the figures may be subject to review by the Independent Audit Group for Cap Compliance under specific circumstances.

While longer rather than shorter historical water use figures are highly desirable, the IRP was informed that water use data prior to 2004 does not necessarily reflect the same classes of entitlement as that reflected in NSW water sharing plans. Generally, from 2004, water sharing plans introduced new classes of entitlement, and, in some instances, new rules or conditions. Therefore, water use data from prior to 2004, whilst it may be reliable, is less reflective of the water access and sharing rules relevant to the Basin Plan.

Regarding compliance matters, if it is proven that there has been illegal water take, this would not be included within historical water use data as it is illegal take and does not reflect legal take.

The IRP has concluded that, while recognising there are relatively small volumes of unmetered (though estimated) water use and there may be compliance actions in play from time to time, the figures for historical water use can be verified by the publicly available General Purpose Water Accounting Reports.

The IRP also notes that through the Consultation Paper and process seeking submissions by 17 July, 2018, the NSW Government and the MDBA are seeking any stakeholder evidence that could be considered regarding historical usage. The IRP notes that the results and outcomes of that consultation process are not known to the IRP at the time of this report.

The IRP recommends that, if stakeholder evidence is provided to warrant a change in the historical water usage figures, the changed figures be used in the method rather than the currently reported figures.

The arrangements for prioritisation of water entitlements in NSW result in the following order of allocations (highest to lowest) across each valley:

- A. Domestic and stock
- B. Local water utility
- C. High security
- D. General security
- E. Supplementary.

The method for calculating LTDLE factors adopts the historical period (generally 2004 to 2017) utilisation factors for water entitlement classes A, B and C above, but not for D and E.

The arrangements for prioritisation for water entitlement classes A, B and C result in the average reliability for the BDL model runs over the 1895 to 2009 climate being either 1.000 for A and B and some C classes or very close to 1.000 for other C classes. All NSW water sharing plans require that entitlement classes A and B are fully available each year and most NSW water sharing plans require that entitlement class C is fully available each year. While these entitlement classes may be fully available each year, it does not necessarily follow that they are fully utilised each year, irrespective of the climate conditions prevailing in any year. Indeed, the general 2004 to 2017 historical data shows this to be the case, even after accounting for net trades.

The IRP agrees that, on the bases of principle and equity, and correct water accounting, net trades are included in the historical utilisation calculations.

For the general 2004 to 2017 historical water usage period considered, the IRP sought advice as to whether there is any evidence of changes or trends in water entitlement holder and/or user behaviour with respect to, for example, total water use from changing businesses or agronomy, approaches to carryovers, and/or approaches to trade. This may be important as the method used for calculating factors uses the averages for a period and this may mask a trend that may continue into the future with consequent implications for future sustainable water resources management.

Advice provided is that the operational evidence indicates that there have not been any significant trends in historical utilisation of entitlement classes A, B and C. The IRP again notes that through the Consultation Paper and process seeking submissions by 17 July, 2018, the NSW Government and the MDBA are seeking any stakeholder evidence that could be considered regarding historical usage.

Given the arrangements for prioritisation and the requirements in the NSW water sharing plans for entitlement classes A, B and C, the IRP agrees that it is appropriate

to use the historical utilisation factor for these classes in the derivation of LTDLE factors.

The IRP sought further advice on why the approach applied to entitlement classes A, B and C was not extended to entitlement class D – General security, recognising that respective entitlement volumes (shares), modelled reliability results and historical water usage and trade data and information were available. It was understood that, for entitlement class D, entitlement volumes and historical water usage are generally much higher than the sums for entitlement classes A, B and C, while the modelled reliability is generally much lower.

Officials informed the IRP that using the historical utilisation data for class D - General security was considered and trial calculations were undertaken. With the need to balance the BDL shares to the modelled and accepted BDL, it was found that this approach led to small, and sometimes ‘negative’, amounts of water being calculated as the BDL share for entitlement class E – Supplementary. This outcome did not reflect lived experience and the available evidence. This was considered to emanate from utilisation of General security class entitlements in the general 2004 to 2017 historical period, which includes the effects of the “millennium drought”, being unrepresentative of the long term average.

The IRP agrees that using this approach would not be appropriate.

With this in mind, officials informed the IRP that using an alternative approach of adopting average diversions from the BDL model run over the climate period from 1895 to 2009 for all classes of water entitlement was also considered. However, this was not pursued as it could not be applied consistently across NSW given that not all models break down diversions to the entitlement class level. In addition, such an approach did not accommodate redistribution through water trade to some products (e.g. Lachlan high security) which resulted in factors for such products being outside the range of lived experience.

The IRP agrees that using this approach would not be appropriate either.

Since doing nothing was also unacceptable as the ‘2011 factors’ do not match the BDL, officials informed the IRP that another approach was adopted to overcome the shortcomings in the approaches outlined above. This approach adopts the estimate of the BDL share for water entitlement class E – Supplementary as the volume of Supplementary entitlement diversions that are the output from the accepted BDL model run for the 1895 to 2009 climate. The BDL model estimate for Supplementary diversions was thought to be the best available representation of how Supplementary access is actually used and would be used over the long term average. In most cases, the available evidence and advice from water users is that, when a Supplementary entitlement access event is declared, the Supplementary access water is taken, rather than General security. Therefore, to ensure that the total estimate of the BDL is used for calculations, the ‘balancing item’ for the total BDL is the BDL share for General security rather than Supplementary access.

Based on the available information, the IRP agrees with the rationale that water entitlement class E – Supplementary is and will be usually taken, rather than water access entitlement D – General security, when a Supplementary entitlement access event is declared, and that the best available information on the long term average diversions of water access entitlement E – Supplementary is the corresponding output from the accepted BDL model runs for the 1895 to 2009 climate. Consequently, the IRP supports the approach adopted in the derivation of the LTDLE factors for these water entitlement classes.

The IRP also notes that through the Consultation Paper and process seeking submissions by 17 July, 2018, the NSW Government and the MDBA are seeking specific stakeholder feedback on this aspect of the method used to derive the final shares of the accepted BDL and hence the updated LTDLE factors.

The IRP recommends that, if stakeholder feedback and evidence are provided to warrant a change in the approach to accounting for the behaviour by Supplementary and General security entitlement classes, the changed approach be used in the method rather than the currently adopted approach.

Another feature of the method used is the adoption of average water use across a water entitlement class, whether it is an average across the historical utilisation period or a longer term average as an output from the BDL model runs. The IRP acknowledges that the adoption of longer term averages is consistent with the Basin Plan. In addition, this is consistent with the NSW legislative framework requiring equal treatment of individual water entitlement holders within a class of entitlements. All entitlements within a class can be activated up to their water sharing plan limit. Under the arrangements for that water sharing plan limit, any provisions which respond to and limit any “growth-in-use’ for actual take apply when potential SDL exceedance is activated, regardless of which individual water users may trigger it. Therefore, it is appropriate to use average water use when determining factors for water recovery.

Finally, the IRP notes that NSW has adopted a consistent approach for all SDL resource units across NSW. If different approaches were adopted in different SDL resource units, this could be inconsistent with the NSW legislative framework. Under the NSW framework all entitlements within a single class in an SDL resource unit are treated equally. Despite levels of extraction varying across entitlements within a class and extraction physically occurring in different locations, the losses in delivering this water is shared equally within that SDL resource unit and not attributed to individual entitlements.

Based on the above comments, the IRP concludes that the method used to calculate the updated LTDLE factors is reasonable, robust, defensible and consistent with the Basin Plan. It enables incorporation of the best available data, modelling, information and planning assumptions.

7.0 Specific Comments for Specific Valleys

In addition to an evaluation of the overall method to derive the updated LTDLE factors as discussed above, the IRP has also reviewed the results of applying the method as made available by the MDBA and the NSW Department of Industry in the written documents and the Excel spreadsheets referred to in section 2.0 of this report.

Specific results of interest for specific valleys are summarised in the tables below.

The IRP makes no specific comments for the Intersecting Streams as it notes that work is still progressing on finalising the BDL factors for that valley. The IRP also makes no specific comment about the Barwon-Darling because the updated LTDLE factors have not changed as the values are defined rather than calculated.

Border Rivers

Entit't Class	Entit't Volume (Share)	% of Vol Total	BDL Model D'vers	% of D'vers Total	Hist Acct Usage	% of Use Total	LTDLE BDL Share	% of BDL Total	LTDLE
A	1275	0.3	405	0.2	657	0.5	787	0.4	0.617
B	620	0.2	617	0.3	511	0.4	504	0.3	0.812
C	1500	0.4	315	0.2	315	0.2	905	0.5	0.603
D - A	22114	5.7	16181	8.6	13835	9.9	21578	11.4	0.976
D - B	242123	62.4	87866	46.5	75019	53.6	81610	43.2	0.337
E	120000	31.0	83642	44.2	49560	35.4	83642	44.2	0.697
Total	387632	100	189026	100	139897	100	189026	100	

The IRP notes that the average relatively shorter term total historical account usage in the Border Rivers (139, 897 ML/y) is considerably less than the average longer term total modelled diversions under the BDL (189,026 ML/y) and that, for the relatively dry historical period, the proportion of the total of the General security used (63.5%) is relatively higher than for the BDL modelled diversions proportion (55.1%). The corresponding proportion of the total of the Supplementary historically used (35.4%) is relatively lower than modelled (44.2%). In addition, the historical utilisation of the water entitlement class D – B (General security B) was 0.779 while the historical utilisation for class E – Supplementary was 0.553 (after accounting for an estimate of the Supplementary water actually on offer as being 0.775 of the AWD on average). All of these observations support the rationale used in the method for the LTDLE factor calculations. The IRP notes that the LTDLE factor for the water entitlement class D – A (General security A) was calculated in the same way as for water entitlement classes A, B and C, while water entitlement class D – B was adopted for “balancing” to the accepted BDL. The IRP notes that, as a result of the method used for the calculations, the LTDLE factor for water entitlement class E – Supplementary (0.697) is somewhat higher than for water entitlement class A – Domestic and stock (0.617) and class C –High security (0.603) and substantially

higher than for General security class D – B (0.337). Subject to any stakeholder feedback, overall, the IRP does not detect any anomalies of concern in the figures.

Gwydir

Entit't Class	Entit't Volume (Share)	% of Vol Total	BDL Model D'vers	% of D'vers Total	Hist Acct Usage	% of Use Total	LTDLE BDL Share	% of BDL Total	LTDLE
A	2788	0.4	1126	0.4	1126	0.6	1205	0.4	0.432
B	3836	0.6	3818	1.3	2045	1.0	2217	0.7	0.578
C	14405	2.0	10193	3.4	8944	4.4	12759	4.3	0.886
D	509403	71.9	194702	65.7	121475	60.2	193659	65.4	0.380
E	178000	25.1	86317	29.2	68317	33.8	86317	29.2	0.485
Total	708432	100	296156	100	201907	100	296156	100	

The IRP notes that the average relatively shorter term total historical account usage in the Gwydir (201,907 ML/y) is considerably less than the average longer term total modelled diversion under the BDL (296,156 ML/y), but for the relatively dry historical period, the proportion of the total of the General security used (60.2%) is somewhat lower than for the BDL modelled diversions proportion (65.7%), though the percentage difference is not as high as in the Border Rivers. The corresponding proportion of the total of the Supplementary historically used (33.8%) is somewhat higher than modelled (29.2%). However, the historical utilisation factor of 0.882 for General security was much higher than the figure of 0.671 for Supplementary (calculated after accounting for an estimate of the Supplementary water actually on offer as being 0.560 of the AWD on average). The IRP notes that, as a result of the method used for the calculations, the LTDLE factor for water entitlement class E – Supplementary (0.485) is somewhat higher than for water entitlement class A – Domestic and stock (0.432) and class D – General security (0.380). Subject to any stakeholder feedback, overall, the IRP notes that water entitlement holder behaviour in the Gwydir may not always preference Supplementary access over General security access when Supplementary access is available. The IRP suggests that any stakeholder feedback and further evidence about this matter be considered and, if necessary, additional information could be collected and considered about General security and Supplementary water entitlement class holders' behaviour in the Gwydir.

Peel

Entit't Class	Entit't Volume (Share)	% of Vol Total	BDL Model D'vers	% of D'vers Total	Hist Acct Usage	% of Use Total	LTDLE BDL Share	% of BDL Total	LTDLE
A	471	1.0	144	0.9	46	0.3	133	0.9	0.282
B	16400	34.4	8816	57.8	8248	59.0	8617	56.5	0.525
C	601	1.3	108	0.7	274	2.0	236	1.5	0.393
D	30091	63.3	6199	40.6	5416	38.7	6280	41.1	0.209
Total	47563	100	15267	100	13984	100	15267		

The IRP notes the relatively low LTDLE factors across the board for the Peel, with relatively low historical utilisation factors from 0.282 to 0.525. Subject to any

stakeholder feedback, overall, the IRP does not detect any anomalies of concern in the figures.

Lower Namoi

Entit't Class	Entit't Volume (Share)	% of Vol Total	BDL Model D'vers	% of D'vers Total	Hist Acct Usage	% of Use Total	LTDLE BDL Share	% of BDL Total	LTDLE
A	2636	0.7	1414	0.6	880	0.7	1148	0.5	0.435
B	2421	0.6	149	0.1	793	0.6	845	0.4	0.349
C	6298	1.7	728	0.3	701	0.6	4551	2.0	0.723
D	254502	66.7	195826	85.0	85538	68.4	191573	83.1	0.753
E	115503	30.3	32246	14.0	37225	29.7	32246	14.0	0.279
Total	381360	100	230363	100	125137	100	230363	100	

The IRP notes that the average relatively shorter term total historical account usage in the Lower Namoi (125,137 ML/y) is considerably less than the average longer term total modelled diversions under the BDL (230,363 ML/y), but for the relatively dry historical period, the proportion of the total of the General security used (68.4%) is considerably lower than for the BDL modelled diversions proportion (85.0%), and the percentage difference is higher than for the Gwydir. The corresponding proportion of the total of the Supplementary historically used (29.7%) is considerably higher than modelled (14.0%). However, the historical utilisation factor of 0.918 for General security was much higher than the figure of 0.508 for Supplementary (calculated after accounting for an estimate of the Supplementary water actually on offer as being 0.640 of the AWD on average). The IRP notes the very high proportion of historical net trade out for water entitlement class C – High security in the Lower Namoi and the impact that has on historical account usage (relatively low in volume) and historical utilisation factor (relatively high) with the latter also driving up the LTDLE factor and the final BDL share. Subject to consideration of any stakeholder feedback and further evidence, overall, the IRP suggests that, if necessary, additional information could be collected and considered about High security, General security and Supplementary water entitlement class holders' behaviour in the Lower Namoi.

Macquarie-Castlereagh

Entit't Class	Entit't Volume (Share)	% of Vol Total	BDL Model D'vers	% of D'vers Total	Hist Acct Usage	% of Use Total	LTDLE BDL Share	% of BDL Total	LTDLE
A	6000	0.8	1664	0.5	1430	0.8	1741	0.5	0.290
B	18805	2.6	27875	7.3	10889	6.1	12799	3.3	0.681
C	17900	2.5	5111	1.3	8483	4.8	11957	3.1	0.668
D	632400	87.2	317917	83.2	146878	82.8	326070	85.4	0.516
E	50000	6.9	29398	7.7	9820	5.5	29398	7.7	0.588
Total	725105	100	381965	100	177500	100	381965	100	

The IRP notes that the average relatively shorter term total historical account usage in the Macquarie-Castlereagh (177,500 ML/y) is considerably less than the average longer term total modelled diversion under the BDL (381,965 ML/y), but for the relatively dry historical period, the proportion of the total of the General security

used (82.8%) is very similar to the BDL modelled diversions proportion (83.2%). The corresponding proportion of the total of the Supplementary historically used (5.5%) is also similar to that modelled (5.5%). However, the historical utilisation factor of 0.656 for General security was much higher than the figure of 0.252 for Supplementary (calculated after accounting for an estimate of the Supplementary water actually on offer as being 0.800 of the AWD on average). The IRP notes that, as a result of the method used for the calculations, the LTDLE factor for water entitlement class E – Supplementary (0.588) is much higher than for water entitlement class A – Domestic and stock (0.290) and slightly higher than for class D – General security (0.516). Subject to any stakeholder feedback, overall, the IRP does not detect any anomalies of concern in the figures.

Lachlan

Entit't Class	Entit't Volume (Share)	% of Vol Total	BDL Model D'vers	% of D'vers Total	Hist Acct Usage	% of Use Total	LTDLE BDL Share	% of BDL Total	LTDLE
A	12970	2.0	8711	3.0	4353	3.2	5220	1.8	0.402
B	15545	2.3	9948	3.5	7080	5.3	8237	2.9	0.530
C	24557	3.7	9061	3.2	41432	30.9	22772	8.0	0.927
D	591137	89.3	249109	87.3	72667	54.2	234187	82.0	0.396
F - Cve	17950	2.7	8559	3.0	8559	6.4	14972	5.3	0.834
Total	662159	100	285388	100	134091	100	285388	100	

The IRP notes that the average relatively shorter term total historical account usage in the Lachlan (134,091 ML/y) is considerably less than the average longer term total modelled diversion under the BDL (285,388 ML/y). Over the historical usage period, there was a relatively high net trade into water entitlement class C – High security (24,256 ML/y on average), mostly from class D – General security (23,425 ML/y on average). There was also a high utilisation of this trade in (the overall historical utilisation factor for water entitlement class C was 0.927). This flows through to the calculated LTDLE factor resulting in the final BDL share for class C (22,772 ML/y) from the LTDLE method being quite different to the figure from the BDL model run (9,061 ML/y). The IRP suggest that additional information could be provided to more transparently explain how this result comes about in the Lachlan, in addition to explain how water entitlement Class F- Conveyance is handled in the method.

Murrumbidgee

Entit't Class	Entit't Volume (Share)	% of Vol Total	BDL Model D'vers	% of D'vers Total	Hist Acct Usage	% of Use Total	LTDLE BDL Share	% of BDL Total	LTDLE
A	35922	1.0	27654	1.3	28654	1.9	28923	1.4	0.805
B	21586	0.6	13000	0.6	11383	0.8	10531	0.5	0.488
C	377420	10.8	260528	12.3	278192	18.8	368916	17.4	0.977
D	1744030	49.9	1249992	59.1	791852	53.5	1031429	48.7	0.591
E	198780	5.7	75000	3.5	81652	5.5	75000	3.5	0.377
F - Cve	371468	10.6	211900	10.0	236665	16.0	323276	15.3	0.870
G - NC	381000	10.9	173901	8.2	51143	3.5	173901	8.2	0.456
H - RN	213499	6.1	36758	1.8			36758	1.8	0.172
I - RS	152501	4.4	68264	3.2			68264	3.2	0.448
Total	3496206	100	2116997	100	1479541	100	2116997	100	

The IRP notes that the average relatively shorter term total historical account usage in the Murrumbidgee (1,479,541 ML/y) is considerably less than the average longer term total modelled diversion under the BDL (2,116,997 ML/y). However, the IRP notes that the total of the entitlement shares listed individually is 3,496,206 ML/y not 3,130,206 ML/y as listed in the documents. The IRP suggests that this figure and the way that the LTDLE factors have been derived for water entitlement classes F – Conveyance, and G, H, and I for the Lowbidgee, could be supported with some additional information and explanation to assist transparency. The IRP notes there have been substantial volumes of net trade out of the Murrumbidgee and the historical utilisation of the remaining water has been relatively high (e.g. class C – 0.998, class D – 0.861 and class F – 0.894) while the Supplementary volume is relatively small as has its historical utilisation of 0.470 (calculated after accounting for an estimate of the Supplementary water actually on offer as being 0.882 of the AWD on average).

Murray (NSW)

Entit't Class	Entit't Volume (Share)	% of Vol Total	BDL Model D'vers	% of D'vers Total	Hist Acct Usage	% of Use Total	LTDLE BDL Share	% of BDL Total	LTDLE
A	14998	0.7	14518	0.9	10286	1.0	9349	0.6	0.623
B	35202	1.6	28483	1.7	17412	1.6	20461	1.2	0.581
C	204955	9.0	155281	9.2	96500	9.0	178899	10.6	0.873
D	1557808	68.8	1141230	67.9	648032	60.7	1088920	64.8	0.699
E	152362	6.7	107140	6.4	53531	5.0	107140	6.4	0.703
F - Cve	300000	13.2	233638	13.9	241704	22.7	275522	16.4	0.918
Total	2265325	100	1680290	100	1067465	100	1680290	100	

The IRP notes that the average relatively shorter term total historical account usage in the Murray (1,067,465ML/y) is considerably less than the average longer term total modelled diversion under the BDL (1,680,290 ML/y). but for the relatively dry historical period, the proportion of the total of the General security used (60.7%) is lower than for the BDL modelled diversions proportion (67.9%). The corresponding proportion of the total of the Supplementary historically used (5.0%) is only very

slightly lower than modelled (6.4%). On the other hand, the proportion of water entitlement class F - Conveyance used (22.7%) in the relatively dry historical period is much higher than for the longer period modelled (13.9%) and this seems reasonable. There have been relatively high volumes of net trades out of the Murray for High security and to some extent General security while the historical utilisation of the remaining water in those entitlement classes has been relatively high with factors of 0.881 and 0.929 respectively. The Supplementary volume is relatively small as has its historical utilisation of 0.243 (calculated after accounting for an estimate of the Supplementary water actually on offer as being 0.872 of the AWD on average). The IRP notes that, as a result of the method used for the calculations, the LTDLE factor for water entitlement class E – Supplementary (0.703) is somewhat higher than for water entitlement class A – Domestic and stock (0.623) and class B –Water utility (0.581) and very similar to that for General security class D – B (0.699). Subject to any stakeholder feedback, overall, the IRP does not detect any anomalies of concern in the figures.

Lower Darling

Entit't Class	Entit't Volume (Share)	% of Total	BDL Model Div's	% of Total	Hist Acct Usage	% of Total	LTDLE BDL Share	% of Total	LTDLE
A	1415	2.8	1006	1.8	415	0.8	489	0.9	0.345
B	10135	20.0	5910	10.8	3642	6.7	3700	6.8	0.365
C	7560	15.0	4914	9.0	3654	6.7	5547	10.1	0.734
D	31355	62.2	42889	78.4	46573	85.8	44984	82.2	0.931
Total	50465	100	54719	100	54284	100	54720	100	

The IRP notes there are some small discrepancies in water entitlement volumes for the Lower Darling listed in the documentation provided and suggests that these be clarified for transparency and trust in the figures. The Lower Darling is the only NSW valley where the average relatively shorter term total historical account usage (54,284 ML/y) is not considerably less than the average longer term total modelled diversion under the BDL (54, 719 ML/y). The IRP recognises that there have been proportionately high volumes of General security traded into the Lower Darling and the historical utilisation has been relatively high (0.820 overall for General security). Subject to the clarifications noted above and any stakeholder feedback, overall, the IRP does not detect any anomalies of concern in the figures.

Subject to the above comments, overall, the IRP is of the view that the method to derive the LTDLE factors has been applied in a consistent way across the NSW valleys, while some additional information and clarifications of approaches in a few instances would assist transparency and understanding.

8.0 Concluding Remarks

Based on the information available to the IRP, and the IRP's assessments, the IRP concludes that the method used in NSW to derive updated LTDLE factors:

- appropriately incorporates results from the approved and accepted BDL model runs that are consistent with the Basin Plan level of baseline data, conditions and assumptions that informed the Basin Plan;
- is based on the best available data and information, and, where, assumptions have had to be made about that data or information, those assumptions are reasonable and defensible based on the available evidence;
- considers and treats entitlement classes appropriately and consistently;
- has been applied in a repeatable and consistent way across the NSW valleys in the Murray-Darling Basin;
- can be used to further update the LTDLE factors should new data or information from the current stakeholder consultation process provide justifiable evidence.

The IRP agrees that the methodology is appropriate to use in NSW for determining and accounting the volumes to “bridge the gap” between the SDLs and the BDLs.