



Upper Macquarie Alluvium: 2019-20 SDL compliance

Supporting document to NSW reasonable excuse claim

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Acknowledgment of Country

The Department of Planning, Industry and Environment acknowledges the Traditional Owners and Custodians of the land on which we live and work and pays respect to Elders past, present and future.

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Executive Summary

The 2019-20 annual actual take in the Upper Macquarie Alluvium SDL resource unit exceeded the 2019-20 annual permitted take by 4.2GL. This is equivalent to 23.5% of the Sustainable Diversion Limit (SDL) and exceeds the compliance trigger of the Basin Plan by 0.62GL.

NSW is claiming a reasonable excuse for this excess under the Basin Plan s. 6.12C(4)(a). That is, this excess occurred as the result of the operation of the water resource plan. This is a reasonable excuse classification RE1.1 (year 1). Whilst the proposed Macquarie-Castlereagh Alluvium Water Resource Plan (WRP) is not yet accredited, the reasonable excuse claim is based on the June 2020 Agreement between NSW and the Murray Darling Basin Authority (MDBA) that provides for the reporting of actual take, permitted take and compliance to the SDL to be based on the operation of the proposed WRP.

The Macquarie regulated river source was in a critical Stage 4 drought event under the NSW Extreme Events Policy from May 2019 to April 2020. With low levels of general security surface water availability in 2017-18, very restricted access in 2018-19 and none in 2019-20, there was a corresponding increase in groundwater demand from 2017-18.

Groundwater extraction data indicates this increase in groundwater trade and extraction was from existing irrigation developments responding to dry seasonal conditions and no surface water availability, and not from new developments activating licences.

The annual permitted take method for the Upper Macquarie Alluvium is based on the annual rainfall recorded at Dubbo. In years of below average rainfall, such as in 2019-20, the permitted take is higher than the SDL. In years of higher than average rainfall the permitted take volume is less than the SDL.

Even with the known limitations of the permitted take method in years of extreme wet or dry conditions, the exceedance of the compliance limit in 2019-20 was by just 0.62GL. Based on data from the seven-year transitional reporting period where the cumulative permitted take was consistently above the cumulative actual take, it is expected that there would be no excess in the accounting period within the next two water years assuming less extreme weather conditions prevail.

NSW intends to do a five-year review of the variable permitted take method and will evaluate the need to reschedule an earlier review if future seasonal data indicates this is warranted. NSW will also continue to monitor whether there is any 'growth-in-use' response from new groundwater reliant development in the Upper Macquarie Alluvium.

In February 2021 the Department of Planning Industry and Environment have scheduled a meeting with Upper Macquarie Alluvium licence holders to inform them on how their extraction is tracking against the water sharing plan and Basin Plan limits and to discuss the methods used to assess available water determinations when managing extraction to these limits.

Introduction

The Upper Macquarie Alluvium SDL resource unit includes the floodplain alluvium that extends along an 80km reach of the Macquarie River in central NSW from upstream of Wellington to about 10km upstream of Narromine. The regional city of Dubbo is located approximately mid-way along this reach. The total area of the resource unit is around 285 square kilometres.

The Upper Macquarie Alluvium is within the area of the Water Resource Plan (WRP) for the Macquarie-Castlereagh Alluvium. The proposed WRP was submitted for accreditation to the MDBA in April 2020.

The proposed WRP establishes the methods for setting the annual permitted take and the reporting of the annual actual take. Based on these methods the groundwater extraction in 2019 - 20 from the Upper Macquarie Alluvium exceeded the SDL compliance trigger by 0.62GL.

NSW is claiming a reasonable excuse for this excess under the Basin Plan s. 6.12C(4)(a). That is, this excess occurred as the result of the operation of the water resource plan. This is a reasonable excuse classification RE1.1 (year 1) as described in the Sustainable Diversion Limit Reporting and Compliance Framework (MDBA, 2018).

The SDL Reporting and Compliance Framework sets out the steps required from the Basin States to be compliant with a reasonable excuse under RE1. These are

Step 1 - investigate the issue and review permitted take method

Step 2 - review other forms of take

Step 3 - test growth-in-use response.

This document provides current available information to accompany the NSW reasonable excuse claim. It outlines the reasons for the excess take and the steps NSW will take to reach the point where there is no excess in future accounting periods. Steps 1 and 2 of the SDL Reporting and Compliance Framework are required within seven months of a reasonable excuse (RE1.1) being granted (ie by 31 October 2021 for this claim).

Compliance under the Basin Plan

Sustainable diversion limit, permitted take and actual take

The Basin Plan sets an SDL of 17.90GL per year for the Upper Macquarie Alluvium. The SDL represents the maximum long-term average annual volume that can be taken.

Section 10.10 of the Basin Plan requires the water resource plan to set out the method for determining the maximum volume permitted to be taken over one year after taking into account the seasonal conditions. The method must ensure that if applied to the historical period of climatic conditions it would result in the long-term average permitted take volume not to exceed the SDL.

The annual actual take is how much is extracted or intercepted from the groundwater SDL resource unit.

The annual permitted take and the annual actual take volumes are determined at the end of the water year and are used to assess compliance with the SDL.

Groundwater SDL Compliance

Under the Basin Plan (s. 6.12C(1)) there is non-compliance with the groundwater SDL in a water accounting period ending on or before 30 June 2028 if:

- (a) *“the sum of annual actual take in the water accounting periods since 1 July 2019 is greater than the sum of annual permitted take for those water accounting periods plus 20% of the long-term annual diversion limit for the SDL resource unit, after adjusting, for any previous water accounting period in which the circumstances mentioned in the example in paragraph (4)(b) applied, by the amount attributable to those circumstances; and*
- (b) *the Basin State does not have a reasonable excuse for the excess.” (Basin Plan, 2012)*

This compliance test is to determine if there has been ‘growth-in-use’. That is, whether the volume of groundwater being taken is increasing so that the long-term average will exceed the SDL or whether the variance around the SDL is expected due to the seasonal conditions.

Operation of the proposed Water Resource Plan

NSW submitted the proposed WRP to the MDBA for accreditation in April 2020. Whilst it is not yet accredited, the reasonable excuse claim is based on the June 2020 Agreement between NSW and the Murray Darling Basin Authority (MDBA) that provides for the reporting of actual take, permitted take and compliance to the SDL to be based on the operation of the proposed WRP.

The 2019-20 annual actual take in the Upper Macquarie Alluvium exceeded the 2019-20 annual permitted take by 4.2GL. This is equivalent to 23.5% of the Sustainable Diversion Limit (SDL) and exceeds the compliance trigger of the Basin Plan by 3.5%, or 0.62GL.

NSW is claiming a reasonable excuse for this excess under the Basin Plan s. 6.12C(4)(a). That is, this excess occurred as the result of the operation of the water resource plan. This is a reasonable excuse classification RE1.1 (year 1) as described in the Sustainable Diversion Limit Reporting and Compliance Framework (MDBA, 2018).

The proposed WRP sets out the methods for establishing the annual permitted take and the annual actual take to be compliant with the long-term average SDL under the Basin Plan as outlined below. The Water Sharing Plan for the Macquarie-Castlereagh Groundwater Sources 2020 forms Schedule A of the proposed WRP.

Annual actual take

Groundwater extraction is reported under two forms or take,

- take under basic rights and
- take from groundwater.

Under the proposed WRP the annual actual take under basic rights is assumed to be the full utilisation of the volume defined in the Water Sharing Plan for the Macquarie-Castlereagh Groundwater Sources 2020 for basic landholder rights. This is 0.30 GL each year.

Take from groundwater corresponds to extraction under access licences which in the Upper Macquarie Alluvium is metered.

Annual Permitted Take

The annual permitted take under basic rights remains unchanged each year. It is set at the volume defined in the Water Sharing Plan for the Macquarie-Castlereagh Groundwater Sources 2020 for basic landholder rights; 0.30 GL per year.

The method for determining the annual permitted 'take from groundwater' in the proposed plan is based on the rainfall recorded at Dubbo during the accounting period. This method has nine potential permitted take volumes that range from 80% to 120% of the SDL (**Table 1**).

In years of below average rainfall, such as in 2019-20, the permitted take is higher than the SDL. In years of higher than average rainfall the permitted take volume is less than the SDL.

Schedule I of the proposed WRP verifies that the application of this variable permitted take method when applied over the nominated 114-year historical climate period results in an average permitted take of no more than the SDL.

Table 1: Annual permitted take volumes for the Upper Macquarie Alluvium.

Rainfall at Dubbo (July to June)	Annual permitted take from groundwater (GL)	Annual permitted take from basic rights (GL)	Total permitted take (GL)	Total permitted take as % of SDL
Greater than 812 mm	14.07	0.30	14.37	80%
Greater than 754 mm to equal to 812 mm	14.95	0.30	15.25	85%
Greater than 696 mm to equal to 754 mm	15.83	0.30	16.13	90%
Greater than 638 mm to equal to 696 mm	16.71	0.30	17.01	95%
Greater than 522 mm to equal to 638 mm	17.59	0.30	17.89	100%
Greater than 464 mm to equal to 522 mm	18.47	0.30	18.77	105%
Greater than 406 mm to equal to 464 mm	19.53	0.30	19.83	110%
Greater than 349 mm to equal to 406 mm	20.23	0.30	20.53	115%
Less than or equal to 349 mm	21.11	0.30	21.41	120%

Compliance provisions

The proposed WRP (s 5.5.2) relies on Parts 6 and 8 of the water sharing plan to manage compliance to the SDL.

Part 6 of the water sharing plan identifies the limits on how much can be extracted on a long-term average basis. Clause 28 sets out the requirement for an assessment of compliance with the SDL to be in accordance with the Basin Plan. Part 6 also provides for the Minister to make an available water determination to restrict access to water to address non-compliance with the SDL.

Part 8 of the water sharing plan includes rules for managing individual water allocation account holder's access to water.

Section 4 of the proposed WRP refers to a number of the water sharing plan provisions that relate to the protection of environmental values within the groundwater resource. These provisions include actions to protect the aquifer and its dependent ecosystems from local groundwater extraction impacts. These actions may be taken independent of the resource scale SDL compliance actions. For example, under section 324 (2) of the *Water Management Act 2000* the Minister can make a temporary water restriction order to restrict or limit take to maintain or protect groundwater levels in the aquifer.

Investigation and review of permitted take method

Basis of the permitted take method

Variations in the annual permitted take for groundwater reflects the expected demand rather than a change in the availability to the resource. Factors that can influence the level of groundwater extraction includes seasonal rainfall, soil moisture conditions, surface water availability, commodity prices, farm cropping rotation schedules, sale price of allocation water and water account management rules.

Data is not available to establish a mathematical predictor on all factors that would influence decisions by groundwater licence holders on how much groundwater they are likely to pump or trade. This would require historic datasets on each factor at the scale of the water source, and for some, at the scale of the farming enterprises associated with the water accounts.

To develop a variable permitted take method, NSW trialled rainfall and surface water availability data as predictors of take as this data is readily available. Across NSW the annual rainfall was found to have a more consistent correlation with past groundwater extraction data. In the Upper Macquarie Alluvium, based on data from 2006-07 to 2017-18, this correlation was -0.84.

The method in the proposed WRP has set the permitted take volumes based on 5% increments of the SDL. To limit the potential for very large variations from the SDL, the method constrains the annual permitted take volumes to be no more than 20% of the SDL. Therefore, the method does not full accommodate variations associated with very wet or very dry years.

Applying the permitted take method to the transitional reporting period

The 2019-20 accounting period is the first year that the water accounting and compliance arrangements under the Basin Plan are enforceable.

To review the permitted take method's ability to predict groundwater demand in the Upper Macquarie Alluvium the annual permitted take is plotted with the annual actual take since the start of the transitional reporting period in 2012-13 in **Figure 1**. It also shows the annual rainfall at Dubbo and its comparison to the long-term average annual rainfall for this period.

The cumulative sum of the annual actual take compared to the annual permitted take since the start of the transitional reporting period is shown in **Figure 2**. The cumulative annual actual take has remained below the cumulative annual permitted take for this period.

Over the transitional reporting period the difference between the cumulative annual permitted take and the cumulative annual actual take was 12.18GL (ie cumulative actual take was 68% of the SDL below the cumulative permitted take). The data detailing the take in the Upper Macquarie Alluvium is provided in Appendix A.

Figure 1: Rainfall at Dubbo, annual permitted take and annual actual take for each year from 2012-13 to 2019-20 in the Upper Macquarie Alluvium.

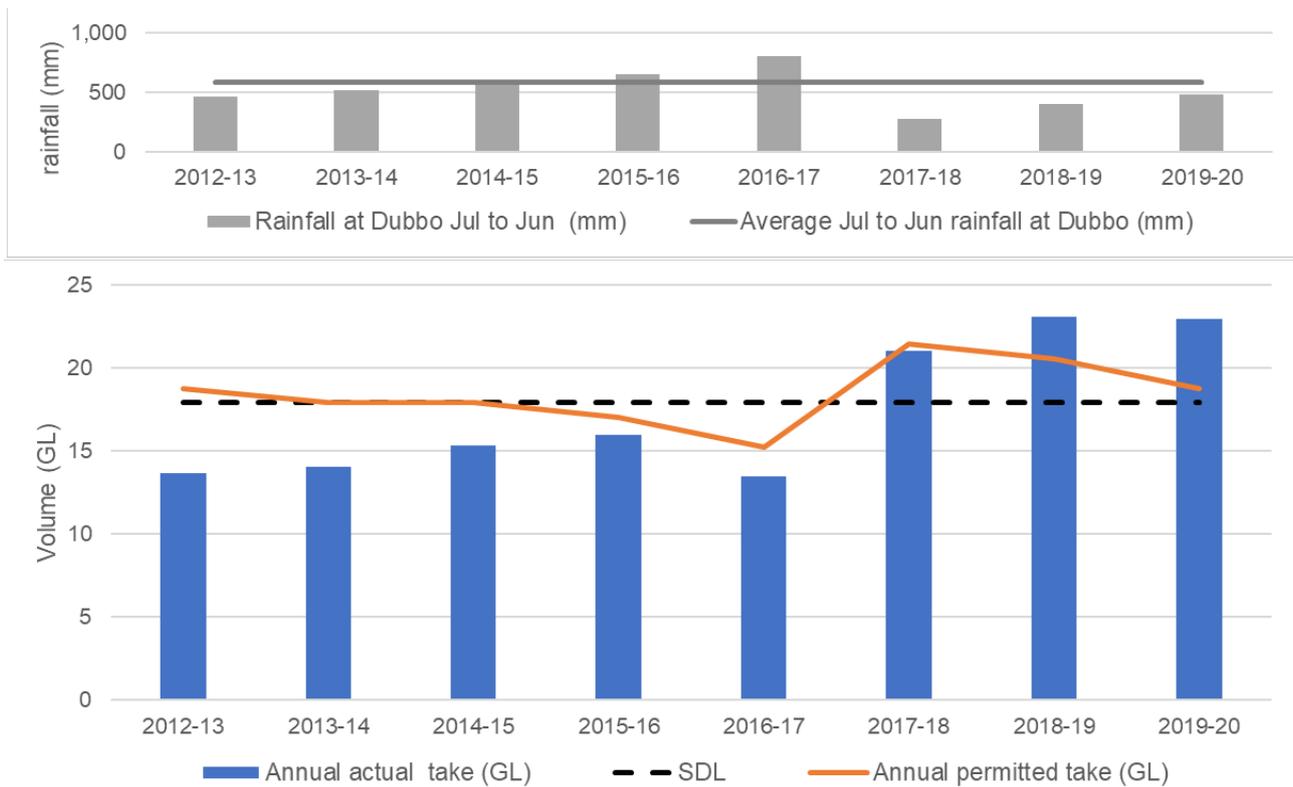
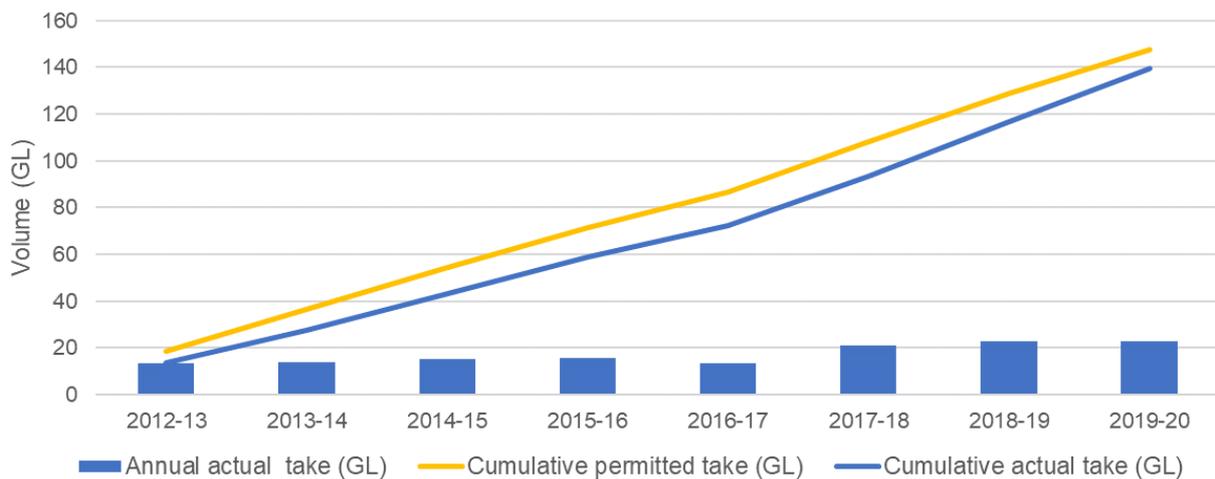


Figure 2: Cumulative annual actual take and cumulative annual permitted take since the start of the transitional reporting period from 2012-2013 for the Upper Macquarie Alluvium.



2019-20 SDL compliance

The reported annual rainfall in Dubbo from July 2019 to June 2020 was 478.6mm at the Dubbo Airport AWS (BOM, station number 65070). The April 2020 rainfall data was sourced from the Scientific Information for Land-Owners (SILO) database as this data was not available in the Bureau of Meteorology record. (<https://www.longpaddock.qld.gov.au/silo/>)

Table 2 lists the 2019-20 annual permitted take and annual actual take for the Upper Macquarie Alluvium. As 2019-20 was the first year of the Register of Take, the compliance trigger is 20% of the SDL (3.58GL) above the 2019-20 permitted take; this is 22.35GL.

The 2019-20 extraction exceeded the 2019-20 compliance trigger by 0.62GL. The annual actual take was 4.2GL above the annual permitted take, which is 23.5% of the SDL.

Table 2: Upper Macquarie Alluvium groundwater extraction compliance in 2019-20

	Take under basic rights (GL)	Take from groundwater (GL)	Total (GL)
Annual Permitted take	0.3	18.47	18.77
Annual Actual take	0.3	22.67	22.97
		Difference	4.2 GL
		Difference as percentage SDL	23.5%

Review of permitted take method for 2019-20

2019-20 seasonal conditions

The Upper Macquarie Alluvium is a relatively narrow mid valley alluvial floodplain that varies from 500m to 5km in width. Consequently, many of the irrigation farms that hold groundwater licences also have licences on the regulated Macquarie River. Therefore, demand on groundwater is closely linked to the availability of surface water in conjunction with the seasonal conditions.

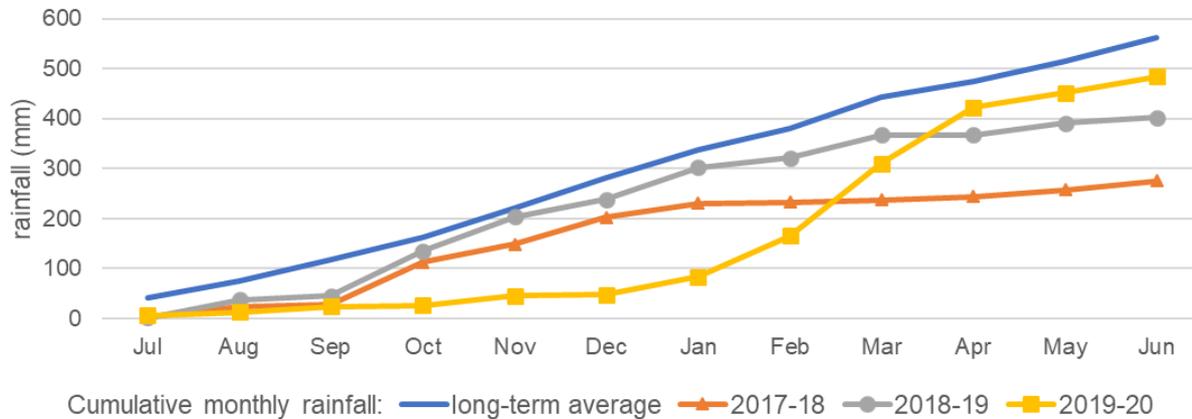
2019-20 was the third consecutive year of below average rainfall and the third year of limited or no access to surface water. The Macquarie regulated river source was in Stage 4 critical drought/water shortage under the NSW Extreme Events Policy from May 2019 to April 2020.

Figure 3 shows the monthly cumulative rainfall for the last three water years compared to the long-term average monthly cumulative rainfall. In terms of total annual rainfall, the driest of these three years was 2017-18 however the start of the 2019-20 water year was significantly drier than the preceding years until the end of February 2020.

In 2017-18 general security allocations in the Macquarie were only 38% and then zero for more than the next two years. A general security allocation was not made again until September 2020. Temporary water restrictions applied in the Macquarie regulated river below Burrendong Dam in 2018-19 and 2019-20 and until August 2020 limiting access to water held in accounts to protect critical surface water supplies. The temporary water restriction in 2019-20 fully restricted access to all remaining general security water in accounts for the whole year.

With low levels of general security surface water availability in 2017-18, very restricted access in 2018-19 and none in 2019-20, there was a corresponding increase in groundwater demand from 2017-18 as shown in **Figure 1**.

Figure 3: Cumulative monthly rainfall for the three water years of 2017-18, 2018-19 and 2019-20 compared to the long-term average cumulative monthly rainfall at Dubbo.



Limitations of the permitted take method

The variable permitted take is based on the total rainfall during the water year and is not sensitive to changes in seasonal conditions within the year.

As shown in Figure 3 the rainfall until February 2020 was much lower than average. The rainfall from July 2019 to January 2020 was 25% of the long-term average for this seven-month period. The following three months (February to April 2020) had higher than average rainfall resulting in the permitted take being based on an annual total 83% of the average annual rainfall (ie the 1895 to 2009 historical period). This does not reflect that the majority of the 2019-20 irrigation season had a much lower than average rainfall.

Even with the limitations of the permitted take method as discussed above, the exceedance of the compliance limit is just 0.62GL. When considered over the longer term this exceedance is not significant and could reasonably be expected to be resolved in future years given the cumulative permitted take over the seven-year transitional period of reporting was 68% of the SDL above the cumulative actual take for the same period.

Other forms of take

There are only two forms of take that relate to groundwater. The proposed water resource plan establishes the permitted take method for both the 'take under basic rights' and 'take from groundwater'. Only the permitted 'take from groundwater' has a variable method and impacts on the SDL compliance outcomes.

Take under basic rights is a fixed volume and this is not proposed to be reviewed.

Growth in use

To allow operational flexibility around seasonal conditions such as droughts, the water sharing plan rules allow groundwater extraction to temporarily exceed the extraction limit which is equivalent in volume to the SDL.

The compliance rules in the water sharing plan (ie Part 6) limits how long this higher level of extraction can continue. Part 6 includes provisions to reduce available water determinations if the five-year average extraction exceeds the water sharing plan long-term average annual extraction

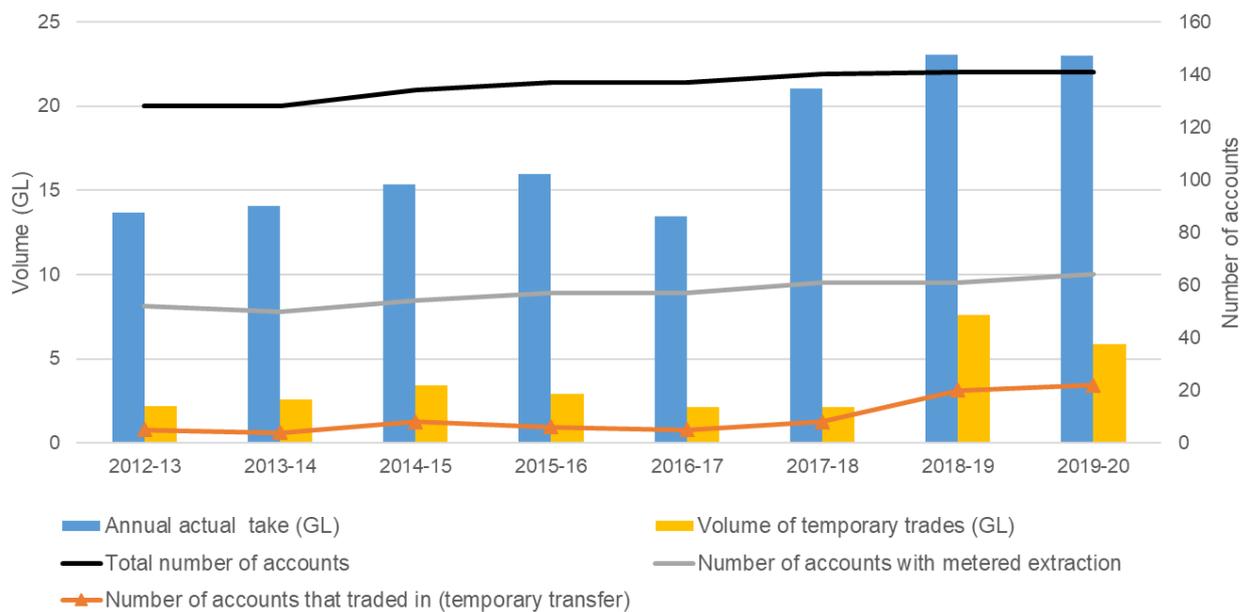
limit by more than 10%. Whilst these rules allow for seasonal flexibility they also provide an assessment of growth in use on a five year rolling average basis.

Extraction in the Upper Macquarie Alluvium has not triggered a compliance response under the water sharing plan rules to date.

Figure 4 shows the volume of annual actual take and groundwater allocations traded since 2012-13. The number of accounts (entitlements), the number of active accounts and the number of accounts that traded in allocations are plotted against the right vertical axis.

There was an increase in temporary groundwater trading in 2018-19 and 2019-20. This coincided with just a small increase in the number of groundwater accounts that were active (61 accounts in 2017-18 to 64 accounts in 2019-20) but a much larger increase in the number of accounts that traded in groundwater allocations (from 8 to 22 accounts in the same period). This indicates the increased demand in groundwater trade is primarily from existing active groundwater accounts and not new developments activating licences. That is, groundwater was being bought by existing irrigation enterprises and the increase in demand is not a growth in development response but reflects the dry seasonal conditions and no surface water availability.

Figure 4: The volume of take and temporary transfers from 2012-13 to 2019-20. Also shown against the right vertical axis is the total number of accounts (ie entitlements) and those that were actively pumping and the number of accounts that traded in groundwater allocations for each year since 2012-13. The increase in total accounts since 2012-13 reflects the selling and subdivision of licences, the total entitlement has not changed.



Action being taken by NSW

Monitoring of take

Given the small volume of exceedance, just 0.62 GL, NSW expects the cumulative extraction over the next two to three accounting periods will return extraction back within annual permitted take. This expectation is based on the groundwater take data from the transitional reporting period.

NSW will continue to monitor the groundwater take to assess whether there is any 'growth-in-use' associated with new groundwater reliant development.

Rainfall over the first six months of the 2020-21 water year was higher than average. Bureau of Meteorology's seasonal outlook for February to April indicates that rainfall is likely to be slightly above average. From this, the demand on groundwater is expected to be less than the SDL. A higher annual rainfall will also reduce the annual permitted take.

The NSW Department of Planning, Industry and Environment (DPIE) will review compliance to the SDL at the end of 2020-21 and provide an updated report on the Upper Macquarie Alluvium SDL compliance as part of the 2020-21 section 71 reporting to MDBA. This will identify whether extraction is within permitted take or whether a further reasonable excuse (RE1.2) will be made.

The permitted take method is a first step in establishing a variable permitted take in groundwater systems. NSW intends to do a five-year review and evaluation of the variable permitted take method for groundwater. NSW will monitor the effectiveness of the method and will consider rescheduling this review if an earlier review is warranted based on additional seasonal data.

Informing licence holders

DPIE presented updates to licence holders on how their extraction levels are tracking against the plan limits at Upper Macquarie Groundwater Group meetings held in Dubbo in February 2019 and September 2019.

The NSW Groundwater Allocation Statement (19 May 2020) listed the Upper Macquarie Alluvium as having potential to exceed the water sharing plan compliance trigger. This identified the potential for future allocation reductions to licence holders if groundwater extraction levels increased. (https://www.industry.nsw.gov.au/_data/assets/pdf_file/0005/301838/WAS-groundwater-20200519.pdf).

Licence holders can also track the current extraction levels against the likelihood of triggering reduced allocations via an online dashboard at <https://www.industry.nsw.gov.au/water/allocations-availability/tracking-groundwater>

In February 2021 the DPIE have scheduled a meeting with Upper Macquarie Alluvium licence holders to inform them on how their extraction is tracking against the water sharing plan and Basin Plan limits and to discuss the methods used to assess available water determinations when managing extraction to these limits. This material has already been published online at <https://www.industry.nsw.gov.au/water/allocations-availability/managing-access-to-groundwater/information>

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Appendix A

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
SDL	17.90	17.90	17.90	17.90	17.90	17.90	17.90	17.90
<i>Annual Permitted take</i>								
permitted take under basic rights (GL)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
permitted take from groundwater (GL)	18.47	17.59	17.59	16.71	14.95	21.11	20.23	18.47
Total annual permitted take (GL)	18.77	17.89	17.89	17.01	15.25	21.41	20.53	18.77
<i>Annual Actual Take</i>								
actual take under basic rights (GL)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
actual take from groundwater (GL)	13.39	13.75	15.05	15.65	13.15	20.74	22.75	22.67
Total annual actual take (GL)	13.69	14.05	15.35	15.95	13.45	21.04	23.05	22.97
Annual difference between APT and AAT (GL)	5.08	3.84	2.54	1.06	1.80	0.37	-2.52	-4.20
Annual difference between APT and AAT (%SDL)	28%	21%	14%	6%	10%	2%	-14%	-23%
Exceedance volume above SDL compliance (GL)								0.62
Cumulative annual permitted take (GL)	18.77	36.66	54.55	71.56	86.81	108.22	128.75	147.52
Cumulative annual actual take (GL)	13.69	27.74	43.09	59.03	72.49	93.53	116.57	139.54
Cumulative APT minus cumulative AAT (GL)	5.08	8.92	11.46	12.53	14.32	14.69	12.18	7.98
Cumulative APT minus cumulative AAT (% SDL)	28%	50%	64%	70%	80%	82%	68%	45%