

Lower Macquarie Alluvium (GS26)

INITIAL SDL ASSESSMENT RESULT

The Authority is **confident** that the SDL continues to reflect an environmentally sustainable level of take and **proposes the SDL is maintained**.

However, additional investigation is warranted as groundwater decline poses a localised risk to the *productive base*.

The Authority will continue to work with **New South Wales** to ensure that the appropriate rules and management arrangements are in place to manage localised and Unit-scale issues.



Figure 1: Lower Macquarie Alluvium SDL Resource Unit

The Authority is assessing whether the Sustainable Diversion Limit (SDL) for the Lower Macquarie Alluvium (GS26) SDL Resource Unit (the **Unit**) continues to support environmental outcomes and reflect an environmentally sustainable level of take (ESLT).

This Assessment Summary provides an overview of the factors which are relevant to that work and the Authority's initial view. The summary draws on three 'Lines of Enquiry', engaging with the likelihood that trends in groundwater levels and salinity support environmental outcomes, the Authority's confidence in that assessment, and the consequence of an 'at risk' finding.

Information on the Lines of Enquiry and methodology used in this assessment is available in the *Summary of Assessment Approach* and the *SDL Assessment and Response Framework*. Information on the *Basin Plan Review Discussion Paper* and process for making a submission are available on the MDBA website.

About this Unit (as at June 2024)

Aquifer Storage/size (GL)	66,643
SDL as at June 2025 (GL/y)	52.7
Entitlement volume (GL/y)	51
Recharge estimate range (GL/y)¹	14-47
Average annual take (2012/13–2022/23, GL/y)	33
Significant surface connections	None

The Water Resource Plan (WRP) that supports this Unit commenced on [30 August 2022](#). The WRP includes the rules and arrangements that NSW are using to manage this Unit and maintain sustainability.

¹ Recharge estimate range is derived from three estimates of recharge: Modelled 63, SY2 (diffuse) 47 GL/y and Chloride Mass Balance (CMB) 14 GL/y.

Utilisation at the time of the review

The Lower Macquarie Alluvium consists of unconsolidated sediments comprising a shallow unconfined aquifer, and a deeper high-yielding confined aquifer restricted to a buried paleo-channel.

The SDL for the Unit was originally based on the Achieving Sustainable Groundwater Entitlements (ASGE) program limit (69.3 GL/y) plus an estimate of stock and domestic take (1.4 GL/y). When the SDL was set, the ASGE program was still being implemented. The program had a staged reduction in entitlements (by 49% in this Unit) to reduce groundwater use to the long-term average annual extraction limit (LTAAEL) set in the NSW Lower Macquarie Groundwater Sources Water Sharing Plan (2006) by 30 June 2017.

The MDBA noted that the aquifers for this Unit were large and had low risk of depleting in the timeframe of the initial Basin Plan. The MDBA decided to allow the ASGE to complete before considering the need for further reductions. This would also allow time for further monitoring and data to be collected and the response to the ongoing ASGE program to be assessed.

Management settings specific to this Unit are set out in the relevant Water Resource Plan. The NSW Groundwater Strategy 2022 has a 20-year timeframe and a long-term vision that groundwater supports cultural and social values, dependent ecosystems and resilient towns and industries. Implementation will be staged and follow a risk-based approach.

Since 2012, annual take has varied depending on climate, with high annual take from 2017-2020 because of dry conditions. There has been some stabilisation in the short-term likely due to recent wet years since 2020, and an associated decrease in groundwater take. Figure 2 displays the average annual extraction of 63% of the SDL over the period 2012-2013 to 2022-2023.

Annual groundwater take and rainfall anomaly for GS26

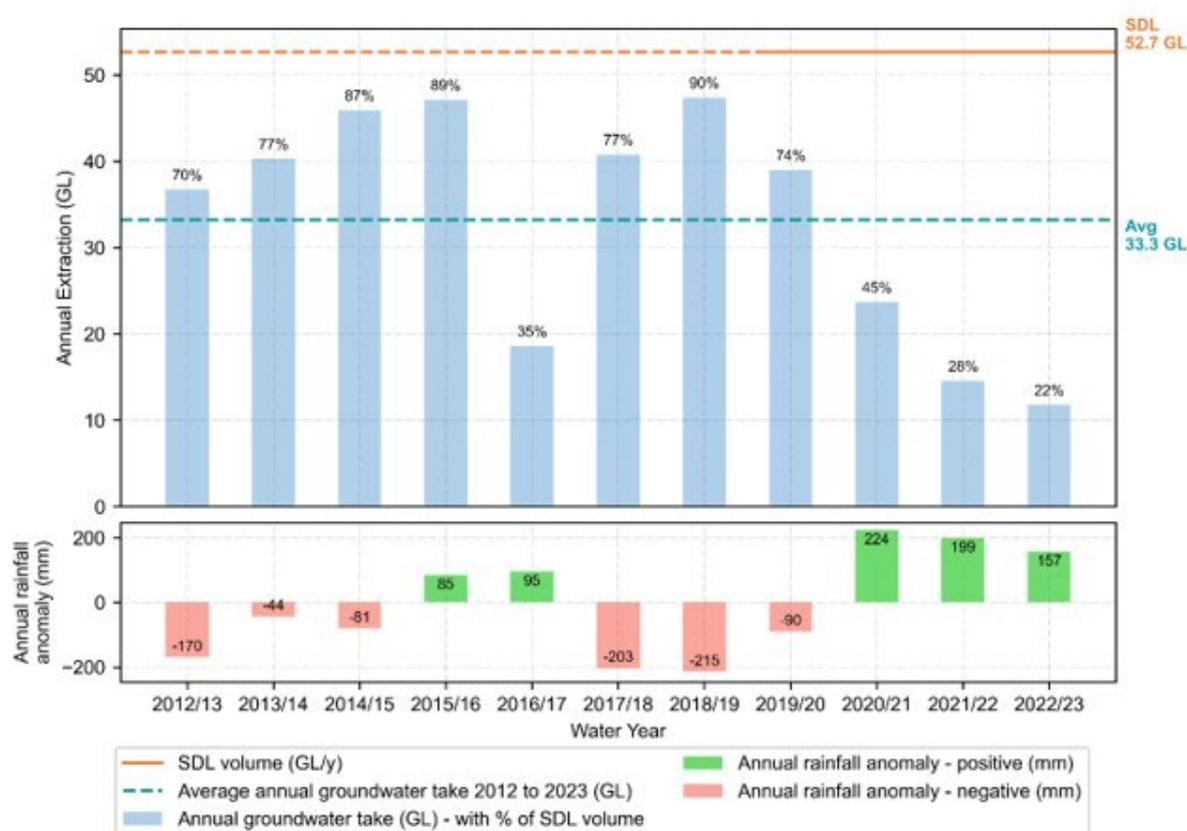


Figure 2: Utilisation for the period 2012/13 to 2022/23

Environmental outcomes at time of the Review

Likelihood and confidence

Groundwater level and water quality (salinity) trends

Table 1 presents a compilation of the groundwater level and salinity trend for this Unit, and the Authority’s *confidence* in that assessment (i.e. low (L), medium (M) or high (H) surety of the finding).

Understanding the groundwater level and salinity trend assessment (Table 1)

For those characteristics informed by groundwater level: The table lists the *percentage of monitoring bores* that are exhibiting either a rising or declining trend in water levels (the remainder refer to bores for which a statistically significant trend could not be detected). A percentage of 30% or greater in the *declining* category indicates a risk to groundwater levels supporting the relevant assessment characteristic.

For those characteristics assessed by reference to water quality: The table lists the *percentage of monitoring bores* that are exhibiting either a rising or declining trend in water quality (the remainder refer to bores for which a statistically significant trend could not be detected). A rising/stable trend means that water quality (salinity) is improving.

Regarding confidence: a single dot indicates low confidence in the trend data, two dots indicate moderate confidence, and three dots indicate high confidence.

The percentages are based on number of monitoring bores providing data over the short and long-term periods. In some Units the number of monitoring bores has decreased over time, and this is accounted for in the percentages. Also, when necessary, a Unit assessment will further explore the detailed data under the assessments to determine if localised declining trends persist.

Productive base is defined as the capacity of an aquifer to provide a sustainable supply of water for environmental and consumptive uses (domestic, agricultural, and industrial) without compromising the long-term health and function of the resource and dependent ecosystems.

Assessment characteristic	Short term trend (Past 12 years)			Long term trend (Past 40 years)		
	Rising/stable	Declining	Confidence	Rising/stable	Declining	Confidence
Groundwater Dependent Ecosystems (GDEs)	34%	25%	● ● ○	10%	49%	● ● ○
Surface water – groundwater connectivity	35%	23%	● ● ○	5%	53%	● ● ○
Productive base	28%	44%	● ● ●	23%	54%	● ● ●
Water quality	0%	0%	● ○ ○	14%	0%	● ○ ○

Table 1: Groundwater level and salinity trend assessment over the past 12 and 40 years.

The long-term and short-term monitoring data shown in Table 1 indicates potential immediate risks in localised areas to the assessment characteristics of:

- *GDEs* (moderate confidence)
- *Surface water – groundwater connectivity* (moderate confidence)
- *Productive base* (high confidence)

The long-term data shows low to medium rates of decline (up to 0.5 m/y) dispersed across the Unit but concentrated near Narromine.

The limited available long-term data does not indicate any risks to *water quality*.

Other lines of evidence

NSW have indicated that they have identified minor declines in only one localised area in the Lower Macquarie Alluvium. This will be further explored with NSW through the Basin Plan Review consultation process.

Recharge and utilisation information

Tables 2 and 3 below provide a summary of recharge information, and an assessment of the likelihood of full utilisation of the SDL. This information is relevant because it enables a comparison of recharge

relative to take (current and by reference to the SDL) and how sensitive the Unit is to change in recharge (i.e. variability in conditions year to year) and increases in actual take.

Understanding modelled recharge information (Table 2)

The ‘proportions’ presented below can also be interpreted as a percentage. For example, a proportion of 1.29 indicates that the SDL is 129% of (or 29% above) the recharge rate.

If the SDL as a proportion of recharge is 1:1 they are equal, and if it is **more than 0.9**, risk is indicated because take is approaching the level of recharge.

‘Buffering’ relates to how big total aquifer storage is compared to recharge. An aquifer with a very large total storage will offer high buffering because it will take a long time for changes in recharge to affect overall groundwater levels. In that scenario, the aquifer is described as having ‘low’ sensitivity to changes in recharge. The reverse applies where total aquifer storage is relatively small. In that case it would have ‘high’ sensitivity to changes in recharge. Buffering has been categorised using the *proportion of aquifer storage to recharge estimate* as follows: Low buffering = 29 to 111, moderate buffering = >111 to 333, and high buffering = >333.

Recharge information					
Status of recharge knowledge base (modelled)	Proportion of SDL to recharge (modelled)	Proportion of aquifer storage to recharge estimate			Proportion of average annual take to recharge (modelled)
		Modelled	Buffering	Sensitivity	
Best available	0.84 No risk indicated	1061	High	Low	0.53

Table 2: Modelled recharge estimates as a proportion of the SDL, total aquifer storage and average annual actual take.

Potential likelihood of full utilisation of the SDL						Current % Average annual take
Very unlikely	Unlikely	About as likely as not	More likely than not	Likely	Very likely	
		●				63

Table 3: Likelihood of take increasing to the SDL

Annual groundwater take is 63% of the SDL, and it is assessed that use of the full SDL is **about as likely as not**. Under both scenarios (i.e. a continuation of existing take, or an increase of take to the SDL), the proportion of take to recharge is less than 0.9, and hence there is no additional risk to assessment characteristics if use were to increase to the SDL.

The aquifer storage indicates that there is **high buffering** and that the total resource will have a relatively **low sensitivity** to an increase in use or changes in recharge.

Consequence assessment

The risk assessment has detected declining trends in water levels at more than 30% of monitoring bores and noted that average annual water take is greater than recharge rates, hence a consequence assessment has been undertaken which describes the nature of potential impact, the likely spatial scale of impact and the potential impact on key values. Table 4 presents the outcome of the consequence assessment.

Long term monitoring data indicates potential risks to the assessment characteristics of *GDEs* and the *productive base*.

Understanding the consequence assessment (Table 4)

Potential nature of impact describes the potential impact of groundwater level or water quality decline on connected GDEs (including whether the GDEs support significant sites or communities), connectivity and/ or impacts on the productive base.

Spatial scale is assigned as either: Low, site specific/local; Moderate, sub-unit; or High, SDL unit to Basin scale impacts.

Key values include: impact on connected GDEs and connected surface water, and, if known, the significant sites or communities they support (Ramsar, TLM Icon sites, EPBC-listed values). Impact on the productive base which may include impacts to provisioning and other ecological services.

Final rating: a low rating requires no further action. Medium or High ratings will require a response.

Characteristics	Nature of impact	Spatial scale of impact	Impact on key values	Final rating
GDEs	Potential to reduce discharge to surface water systems, which could lead to compromised condition of vegetation.	Low Localised (mostly near Narromine)	Low Where the water table is shallow, groundwater may support riparian red gum vegetation. Note, confidence in GDE data is low.	LOW
Surface water – groundwater connectivity	Potential increase in losing streams (therefore increase in loss of surface water to groundwater). Potential reduction in base flows and low flows in surface water systems, which are important for supporting ecological values such as native fish.	Low Localised (mostly near Narromine)	Low The Macquarie River is classified as largely losing. Depth to groundwater means it is hydraulically disconnected from groundwater along most of its length. The assessment for the Macquarie-Castlereagh SDL Resource Unit (SS20) is low risk.	LOW
Productive Base	Potential impacts on provisioning services. Structural integrity of aquifer potentially compromised.	Low Localised (mostly near Narromine)	High The NSW WRP risk assessment has identified a range of low and high risks for aquifer structural integrity. Note, confidence in data is low and will be updated with NSW.	MEDIUM

Table 4: outcome of consequence assessment

Drivers of impact

In this Unit, the *productive base* has been identified to be at risk. The initial assessment has identified declining groundwater levels due to groundwater take as a driver, with the rate of recharge (which encapsulates climate change impacts to date) an exacerbating factor. The Authority will test this assessment and the relative contribution of different drivers to this result.

Environmental outcomes under a fully utilised SDL and climate impacted future

Full use of the SDL

Many groundwater units across the Basin experience water take which is substantially less than the SDL, but it is important that the work of the Basin Plan Review is conducted with awareness of the effects of a fully utilised SDL — it is the SDL that must reflect an ESLT.

As summarised in Tables 3 and 4, the initial assessment has considered a scenario where take increased and use reached up to the SDL. This analysis considered new information about diffuse recharge as a proportion of the SDL, our knowledge of total aquifer storage, and average annual actual take. The analysis used an SDL to recharge proportion of 0.9 or more as an indicator of potential risk to maintaining groundwater levels within resource condition limits that support assessment characteristics.

Climate change through to the 2036 Basin Plan Review and 2050

Table 5 presents a summary of the anticipated environmental impacts of climate change for the Unit by reference to the future recharge estimates.

SY2 climate scenario	Trend towards 2036		SY2 climate scenario	Trend towards 2050	
	Recharge greater than SDL	Recharge less than SDL		Recharge greater than SDL	Recharge less than SDL
	Low Risk	High Risk		Low Risk	High Risk
Warmer and slightly wetter	●		Hotter and slightly wetter	●	
Warmer and drier		●	Hotter and drier		●
Warmer and much drier		●	Hotter and much drier		●

Table 5: Risk to Assessment characteristics at full use of SDL using estimates of future recharge under future climate

The assessment indicates a very high sensitivity under a range of plausible future climate scenarios. The comparison of SDL to recharge under a range of plausible climate futures indicates additional risk to assessment characteristics under the 'warmer and drier', 'warmer and much drier', 'hotter and drier' and 'hotter and much drier' scenarios. At the level of the SDL, the existing risks to the *productive base* would further increase.

Initial Assessment

On the balance of all 3 Lines of Enquiry, the initial assessment has found that the Authority is **confident that the SDL reflects an environmentally sustainable level of take**, but there is a risk that the *productive base* is being impacted in localised areas (mostly near Narromine).

Consideration of Response

Given this initial assessment identifies that groundwater level decline in the Unit poses a risk to the *productive base*, the Authority will work with New South Wales to identify appropriate responses, and to understand whether management rules and arrangements are in place and suitable to address this risk.

High-level response options currently under consideration for this Unit include:

- Targeted changes to rules or management settings

The risk of a changing climate continues to be actively considered in the Basin.

Evidence summary

In addition to the standard evidence sources presented in the *Summary of Assessment Approach* on the MDBA website, the following specific evidence sources were used for this Unit:

- NSW Department of Planning and Environment (2021) [2021 review of groundwater levels in alluvial groundwater sources of inland NSW](#). PUB22/15
- [Water Sharing Plan for the Lower Macquarie Groundwater Sources 2019, NSW Government](#)

The Authority utilised the best available evidence. Through the Basin Plan Review 12-week public consultation process, and the subsequent consideration of submissions and engagements over the course of the 2026 Basin Plan Review, the Authority will continue to build on the evidence used through the initial SDL Assessments to address uncertainties and knowledge gaps.