Upper Lachlan Alluvium (GS44)

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 *groundwater dependent ecosystems (GDEs)*.

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: Upper Lachlan Alluvium SDL Resource Unit

The Authority is assessing whether the Sustainable Diversion Limit (SDL) for the Upper Lachlan Alluvium 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 the process for making a submission are available on the MDBA website.

About this Unit (as at June 2024)

Aquifer Storage/size (GL)	138,833
SDL as at June 2025	94.2
Entitlement volume (GL/y)	176
Recharge estimate range (GL/y)[1]	62-195
Average annual take (2012/13–2022/23, GL/y)	55
Significant surface connections	None

[1] Recharge estimate range is derived from three estimates of recharge: Modelled 187 GL/y, SY2 (diffuse) 195 GL/y and Chloride Mass Balance (CMB) 62 GL/y.

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The Water Resource Plan (WRP) that supports this Unit was accredited on 22 August 2023. The WRP includes the rules and arrangements that New South Wales are using to manage this Unit and maintain sustainability.

Utilisation at the time of the review

The Upper Lachlan Alluvium is a multi-layered groundwater system comprising alluvial sands and gravels which are divided into two main aquifer systems: a shallow unconfined aquifer (up to 60 m depth) and an underlying confined aquifer (up to 150 m depth). The assessment reflects that there are no signification connections to surface water resources in this Unit.

The SDL for the Unit was based on capping at the Long Term Average Annual Extraction Limit (LTAAEL) set in the 2012 Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Source, which was set at the estimate of use occurring at the time.

NSW management of this SDL Resource Unit is at a zonal scale. The SDL Resource Unit is divided into eight jurisdictional management zones, allowing management arrangements to address localised issues. NSW have noted that management of take, along with climatic conditions, have led to historical declines in water levels being stabilised, except for those south of Lake Cowal, near Forbes, and west of Cowra in the short term.

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.

Annual take has varied from year-to-year, related to climate, with a cluster of years of high take during the dry years from 2017 to 2020. Take averaged 59% of the SDL over the period 2012-13 to 2022-23 (Figure 2). Since 2019, water take has been substantially less in response to high rainfall.

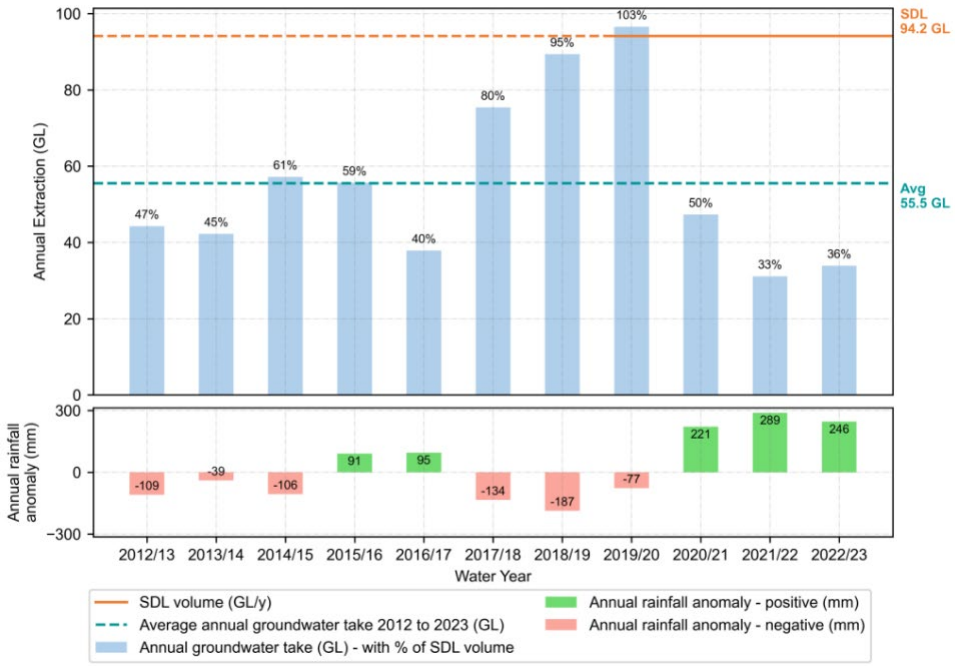

Figure 2: Average annual take (2012/13 – 2022/23)

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 trends 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)	43%	10%	●●○	7%	45%	●●○
Surface water – groundwater connectivity	42%	8%	●●○	4%	47%	●●○
Productive base	43%	11%	●●○	8%	46%	●●○
Water quality	0%	0%	●○○	0%	0%	●○○

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

The long-term monitoring data indicates a potential risk for the following characteristics. This risk is not expressed in the short-term data, which shows fewer bores (less than 30%) with a **declining trend**, however the long-term trend warrants a consequence assessment for these characteristics:

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

Long-term trends show medium to high rates of decline (between 0.5 and 2 metres per year) observed in multiple localised areas of the Unit, including areas west of Cowra, east of Gooloogong between Lachlan and Belubula rivers, upstream of Forbes (area close to Forbes and Parkes town water supply bore-fields), north of Fairholme and south of Lake Cowal.

There has been stabilisation of most water levels in the short term. Given that this is a predominantly shallow system which responds quickly to wet conditions, stabilisation could be partly due to recent wet conditions.

Moderate to high rates of decline (up to 1 metre per year) have continued to be observed over the short-term in specific areas: south of Lake Cowal, near Forbes, and west of Cowra. It is possible that these continuing declines can be attributed to legacy declines, i.e. groundwater levels that declined during periods of limited rainfall and increased take (including the impact of the millennium drought and the tinderbox drought) and have not recovered to earlier groundwater levels even with a few years with above average rainfall and reduced take.

There is no data available to assess *water quality* trends in this Unit.

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 (modelled)			Proportion of average annual take to recharge (modelled)
		Modelled	Buffering	Sensitivity	
Best available	0.51 No additional risk indicated	744	High	Low	0.30

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	
		●				59

Table 3: Likelihood of take increasing to the SDL

Annual groundwater take is 59% 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 in the long-term dataset corresponding to the *GDEs, surface water - groundwater connectivity* and the *productive base* characteristics. 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.

Understanding the consequence assessment (Table 4)

Potential nature of impact describes the potential impact of groundwater level or water quality decline on connected GDE (including whether the GDE supports 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.

Characteristic	Potential 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** Multiple localised areas	**High** • There are potential GDEs mapped in the area. • Uncertainty around magnitude of impacts to GDEs.	**MEDIUM**
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** Multiple localised areas	**Low** • Upper Lachlan Alluvium display relatively low levels of connectivity to surface water.	**LOW**
Productive base	Potential impacts on provisioning services. Structural integrity of aquifer potentially compromised.	**Low** Multiple localised areas	**Low** • Some medium-to-high rates of decline in current groundwater level observed, but these have mostly stabilised in the short-term data. • Ratio of recharge to take does not indicate significant risk.	**LOW**

Table 4: outcome of consequence assessment

There are potential *GDEs* mapped within the Upper Lachlan including threatened flora species and riparian vegetation. The assessment for the Lachlan surface water SDL Resource Unit notes that adult trees are likely accessing groundwater to sustain themselves through prolonged dry periods.

Drivers of impact

In this Unit, *GDEs* have 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 **Low Risk**	Recharge less than SDL **High Risk**		Recharge greater than SDL **Low Risk**	Recharge less than SDL **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

An examination of the results in Table 5 demonstrates that under a range of plausible climate futures there is no additional risk to the assessment characteristics.

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 localised risk to *GDEs* in multiple local areas (specifically Lake Cowal, near Forbes, and west of Cowra).

Consideration of Response

The Authority will work with New South Wales to understand whether management rules and arrangements are in place and suitable and to identify appropriate responses address this risk. High-level response options currently under consideration for this Unit include:

- Targeted changes to rules or management settings.
- Improved knowledge and information: MDBA has funded a new conceptual model through Sustainable Yields which is currently being developed. Management of this system could be improved by developing a numerical model based on this conceptual model once completed.

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 Climate Change, Energy, the Environment and Water (2024) Upper Lachlan Groundwater Source Groundwater annual report 2024, Upper Lachlan Alluvial Groundwater Source PUB25/92
- NSW Department of Planning and Environment (2021) Review of groundwater levels in alluvial groundwater sources of inland NSW. PUB22/15
- NSW Department of Planning and Environment (2021). Upper Lachlan Alluvial Groundwater Source: 2021 Groundwater Level Review PUB22/27
- NSW Department of Planning and Environment (2019) Lachlan Alluvium Groundwater Resource Description INT22/31961

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.