



**Australian Government**



# **Groundwater Sustainable Diversion Limit Resource Unit Summary Report Cards**

## Introduction

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## Introduction

The Murray-Darling Basin Authority (the Authority) has a vision of a healthy working Basin that has vibrant communities, productive and resilient industries, and healthy and diverse ecosystems. One of the key actions to achieving a healthy working Basin is the need to ensure that there is balance between the water needs of communities, industries and the environment, while at the same time protecting and restoring the ecological and other values of water-dependent ecosystems so they remain healthy.

The Basin Plan aims to do this through the establishment of Long-Term Average Sustainable Diversion Limits (SDLs), which come into effect in 2019, along with a range of other measures that will improve the management of water in the Basin. The SDLs are limits on the volumes of water that can be taken for human uses (including domestic, urban, industrial and agricultural use) from both surface water and groundwater systems across the Basin. As well as the SDLs, the Authority has determined a baseline against which SDLs are compared. Known as the Baseline Diversion Limit (BDL), it represents the Authority's determination of the limits on groundwater use under existing water management arrangements. The draft Basin Plan SDLs and BDLs reflect the different aquifer characteristics, levels of management and knowledge of the groundwater resources across the Basin.

The groundwater resources in the Basin have been split into 23 groundwater Water Resource Plan (WRP) areas, which are further divided into 79 SDL resource units, including 3 separate deep SDL resource units (MDBA 2012). SDL resource unit boundaries were determined according to the types of aquifers present and the management boundaries used by the Basin states. There is an SDL volume for each SDL resource unit in the draft Basin Plan. A number of the SDL resource units have also been vertically separated, to reflect that water is or can be extracted from different aquifers within the same resource unit.

The *Water Act 2007* requires that the SDLs reflect an Environmentally Sustainable Level of Take (ESLT), which is defined as the level at which water can be taken from that water resource which, if exceeded, would compromise:

- key environmental assets (KEA) of the water resource; or
- key ecosystem functions (KEF) of the water resource; or
- the productive base (PB) of the water resource; or
- key environmental outcomes (KEO) for the water resource.

To meet the ESLT requirements for groundwater, the Authority determined that a groundwater SDL must:

- maintain key environmental assets that have any dependence on groundwater (KEA);
- maintain base flow groundwater contributions to rivers and streams (KEF);
- ensure that productive use of the aquifer is sustainable without compromising the hydrogeological integrity of the aquifer (PB); and
- protect against decreasing groundwater quality, in particular salinisation of the groundwater resource (KEO).

The requirement to set SDLs is just one element of the Basin Plan that should be considered in parallel to the other elements (e.g. water resource plan requirements, Water Quality and

Salinity Management Plan) that are required to deliver a healthy working Basin. Importantly, the SDL sets the regional upper limit for groundwater use. Within the limits set by the SDL, localised impacts will be managed through water management arrangements in water resource plans which will be developed and implemented by the Basin states and accredited by the Authority.

The proposed groundwater SDLs were informed by numerical groundwater models or an analytical risk assessment. Both the numerical groundwater modelling and the analytical risk assessment provide the potential volume of water available for consumptive use (the preliminary extraction limit (PEL)).

The PEL represents the Authority's initial assessment of the volume of water that can be extracted from a groundwater SDL resource unit. The Authority then applied a groundwater assessment framework that considers the PEL against other information to determine the proposed groundwater SDLs that reflect the ESLT (MDBA 2012).

The report provides the additional technical information and processes that were used to determine the PEL and SDL for each of the SDL resource units. It provides the information for areas where either the numerical groundwater model or analytical risk assessment methods were used.

The information is provided for those stakeholders who may wish to further understand the methodologies and process described in the proposed Groundwater Baseline and Sustainable Limits: Methods Report (available at <http://download.mdba.gov.au/proposed/Proposed-BP-GW-BDL-SDL.pdf>).

If further information is required please use the contact form on our web site at <http://www.mdba.gov.au/contact#contact-form> or email [engagement@mdba.gov.au](mailto:engagement@mdba.gov.au).

## **SDL resource unit Report Cards**

This report contains individual Report Cards for each groundwater SDL resource unit which contain a summary of the technical information used during the development of the groundwater SDLs and BDLs for the proposed Basin Plan. The report cards are provide in numeric order by state.

To understand how the proposed SDL were determined, this document should be read in conjunction with the proposed Groundwater Baseline and Sustainable Limits: Methods Report, which explains the Groundwater Assessment Framework used to derive the proposed SDLs (available at <http://download.mdba.gov.au/proposed/Proposed-BP-GW-BDL-SDL.pdf>). The Groundwater Baseline and Sustainable Limits: Methods Report should be referred to, if additional information is required.

Each Report Card provides the location of the resource unit, the volume of recharge, the current level of development (entitlement and stock and domestic water), the salinity of the groundwater, the preliminary extraction limit (PEL), the BDL and the SDL for each groundwater resource unit. Where applicable the Report Cards provide a summary table of the risk assessment for each groundwater resource unit.

Where there is additional information for an SDL resource unit, it has also been presented. The additional information relates to the spatial representation of groundwater extraction, any drawdown of groundwater levels, details on connectivity between surface and groundwater, graphs showing long term monitoring data at key groundwater monitoring sites and details on the hydrogeology and water management arrangements.

The Report Cards were initially published by the Authority on the Basin Plan Knowledge and Information directory (<http://www.mdba.gov.au/files/bp-kid/1050-SDL-summary-report-cards.pdf>) in December 2010. Since the original report was published, the Authority has conducted considerable work to refine the assessments used to determine the groundwater Baseline Diversion Limits (BDLs) and SDLs.

## **Modelled SDL resource units**

The Authority found that within the Murray-Darling Basin there were a limited number of numerical groundwater models available to inform the determination of groundwater SDLs. In contrast to surface water, where numerical models were available for the majority of surface water catchments in the Basin, there were only 11 numerical groundwater models available that cover 13 SDL resource units.

The 11 numerical groundwater models focus on the higher use alluvial groundwater systems in NSW, Victoria and Queensland. These models were developed or modified for the CSIRO Murray–Darling Basin Sustainable Yields Project (CSIRO 2008) and all of the NSW numerical models were originally developed and calibrated by the New South Wales Office of Water or its predecessors.

Further information on the application of the numerical groundwater models in the development of the proposed Basin Plan is available as separate report at:

<http://download.mdba.gov.au/proposed/Proposed-BP-GW-BDL-SDL.pdf>

## Recharge Risk Assessment Method (RRAM)

The RRAM is a risk assessment process that is used to determine a PEL for an SDL resource unit. The method establishes sustainability factors (SF), which are then applied to the recharge volume to determine the PEL. The SF was defined as the fraction of recharge that could be used for extraction without compromising the ESLT. Further information on the application of the RRAM process in the development of the proposed Basin Plan is available as separate report at: <http://download.mdba.gov.au/proposed/Proposed-BP-GW-BDL-SDL.pdf> .

In summary, there were four steps to determining the PEL.

Step 1: The first step in determining the PEL, using RRAM, was to determine recharge across the Basin using the Water Vegetation Energy and Solute (WAVES) model and upscaling techniques developed for the Murray-Darling Basin Sustainable Yields project and subsequently refined for the Basin Plan (CSIRO 2010). Additional recharge information was also used where it was made available by the states.

The next 3 steps determined the SF using a risk matrix that assessed:

- the risks to the 4 ESLT characteristics: and
- the level of uncertainty within an SDL resource unit.

### Risks to the 4 ESLT characteristics

Step 2: The higher the risk that groundwater extraction represents to compromising one of the ESLT characteristics, the lower the SF will be. The following SF factors were used:

- High risk – 10% of recharge
- Medium risk – 50% of recharge
- Low risk – 70% of recharge

Applying the SF to the modelled recharge provides an available recharge volume.

Step 3: The risk of groundwater extraction compromising groundwater quality was assessed separately. Where there is a risk of groundwater extraction compromising groundwater quality the SF is further reduced. Each SDL resource unit was separated into 4 salinity classes:

Salinity Class	Salinity (mg/L)
Class 1	0 – 1,500
Class 2	1,500 – 3,000
Class 3	3,000 – 14,000
Class 4	14,000+

If there was a risk of groundwater extraction compromising salinity class 1 or 2 groundwater, the following factors were applied to the SF determined in Step 2:

- Class 1 – 80% of the available recharge volume; and
- Class 2 – 90% of the available recharge volume

The reductions in available recharge only applied to the area of the SDL resource unit with the relevant class of groundwater.

### The level of uncertainty within an SDL resource unit

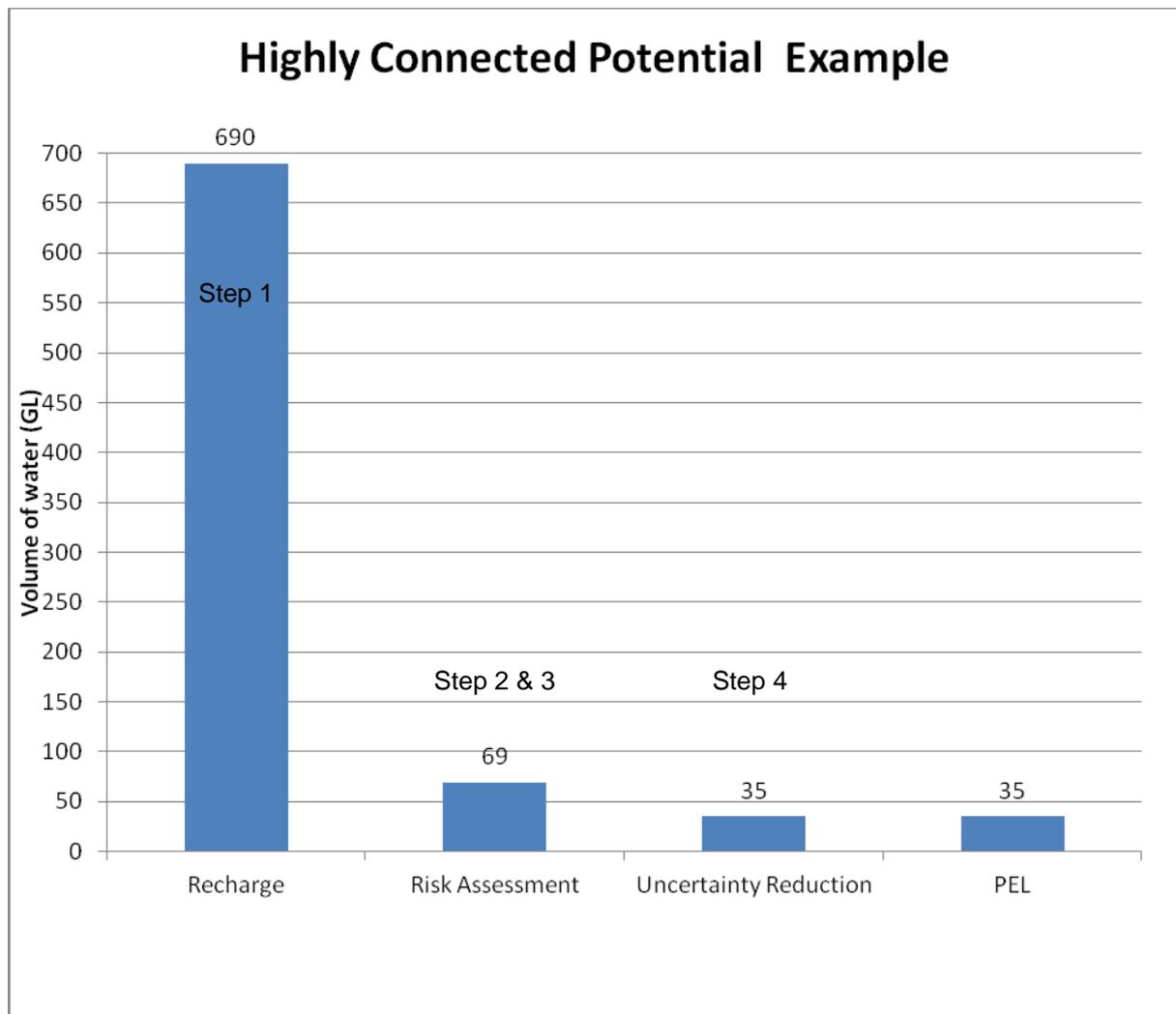
Step 4: The level of uncertainty reflects the information and data that is available and the level of understanding of the groundwater processes. Where there is a high degree of uncertainty regarding the groundwater system, the SF is further reduced. The reduction was determined by the level of risk to the ESLT characteristics determined in Step 2:

- Risk to ESLT characteristics is high or medium – SF reduced by 50%
- Risk to ESLT characteristic is low – SF reduced by 25%

The SF was then applied to the available recharge volume to determine the PEL.

The following is a graphical representation of the RRAM to derive the PEL.

**Figure 1. Graphical presentation of RRAM**



The PEL is the starting point to which the Authority then applied the Groundwater Assessment Framework to determine the proposed groundwater SDLs that reflect the ESLT.

The Groundwater Assessment Framework includes seven SDL determination categories, based on the application of the assessments used to refine the PEL to determine the proposed SDL that reflects the ESLT. The categories include:

- Deep groundwater

- Non-renewable groundwater
- Connected resources
- Existing reduction program
- SDL resource units with proposed reductions
- Existing planning arrangements / up to date science
- Unassigned groundwater

The SDL in each Report Card has been matched to one of these assessment categories.

For more details on how the methods and assessments have been applied, refer to: The proposed Groundwater Baseline and Sustainable Diversion Limits: methods report.