



Department of  
Primary Industries  
Office of Water

# Water Sharing Plan for the Lower Murray Shallow Groundwater Source

Background document



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The NSW Office of Water manages the policy and regulatory frameworks for the state's surface water and groundwater resources, to provide a secure and sustainable water supply for all users. It also supports water utilities in the provision of water and sewerage services throughout New South Wales.

Water Sharing Plan for the Lower Murray Shallow Groundwater Source

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## Introduction

Water sharing plans are being progressively developed for rivers and groundwater systems across New South Wales following the introduction of the *Water Management Act 2000*. These plans protect the health of our rivers and groundwater while also providing water users with perpetual access licences, equitable conditions, and increased opportunities to trade water through separation of land and water. In July 2004, 31 water sharing plans commenced in NSW, bringing these water sources and about 80 per cent of water extracted in NSW under the management and licensing provisions of the *Water Management Act 2000*.

In recent years, water sharing plans for the unregulated rivers and groundwater systems have been completed using a 'macro' or broader-scale river catchment or aquifer system approach<sup>1</sup>. More than 90 per cent of the water extracted in NSW is now covered by the *Water Management Act 2000*. The macro planning process is designed to develop water sharing plans covering most of the remaining water sources across NSW. Each macro plan covers a large river basin rather than a single subcatchment, or in the case of groundwater systems, cover a particular type of aquifer, such as fractured rock.

The *Water Sharing Plan for the Lower Murray Shallow Groundwater Source* covers one alluvial groundwater source. Water sharing rules that the plan focuses on are:

- environmental water rules – the share of the water reserved for the environment
- access rules – which determine when extraction is allowed
- dealing rules – which control the trade of water, both the transfer of share components of an access license and assignment of water allocation between access licenses, as well as changing the location for water extraction.

The following additional water sharing rules have been prepared:

- long-term average annual extraction limits – a growth-in-use assessment and management tool
- rules for granting access licenses – what types of licenses may be granted
- rules for granting works approvals – what types of set back conditions are required

This document provides background to the development of the rules in the plan and includes:

- the purpose of the plan
- a physical description of the area including land and water use
- the process of plan development including scope, history and basis for decisions
- the relationship between the plan and the Basin Plan
- the use of adaptive management
- the activities associated with implementation, monitoring and review of the plan.

The objectives of the plan are to:

- protect the important water dependent environmental, Aboriginal cultural and heritage values
- protect basic landholder rights
- manage water extraction to ensure equitable sharing between users
- provide opportunities for market based trading of licences and water allocations
- provide flexibility for licensed water users in how they can use their water

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<sup>1</sup> Unlike regulated rivers, the supply of water in unregulated rivers is typically not regulated by controlled releases of water from dams but rather is dependent solely on rainfall and natural river flows.

- allow for adaptive management, that is, to allow changes to the plan to be made as a result of more information that may become available during the life of the plan.

This document is part of a range of material available specifically on the plan including:

- Water Sharing Plan for the Lower Murray Shallow Groundwater Source – a legal instrument written in its required statutory format
- Water sharing plans – Inland NSW unregulated and alluvial water sources – Overview – a plain English version of the plan explaining the key sections and rules
- rules summary sheet, which details the management rules.

In addition, general information on the macro planning process is available in the Water sharing plans section of the NSW Office of Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au), and includes:

- *Macro water sharing plans – the approach for groundwater. A report to assist community consultation* – explains the work begun in 2004 to develop macro water sharing plans to cover all remaining groundwater sources in NSW.

## Purpose of the plan

### Why are water sharing plans being prepared?

The expansion of water extraction across NSW in the 20th century has placed most valleys at or close to the limit of sustainable water extraction. This has seen increasing competition between water users (towns, farmers, industries and irrigators) for access to water. This has also placed pressure on the health and biological diversity of our rivers and aquifers.

Water sharing plans provide a legislative basis for sharing water between the environment and consumptive purposes. Under the *Water Management Act 2000* a plan for sharing water must protect the water source and its dependent ecosystems and must protect basic landholder rights. Sharing or extraction of water under any other right must not prejudice these rights. Therefore, sharing out water to licensed water users is effectively the next priority for water sharing. Among licensed water users, priority is given to water utilities and licensed stock and domestic use, ahead of commercial purposes such as irrigation and other industries.

Water sharing plans also recognise the economic benefits that commercial users such as irrigation and industry can bring to a region. Upon commencement, access licences held under the *Water Act 1912* are converted to access licences under the *Water Management Act 2000*, and land and water rights are separated. This facilitates the trade of access licences and can encourage more efficient use of water resources. It also allows new industries to develop as water can move to its highest value use.

In conjunction with other provisions of the *Water Management Act 2000*, water sharing plans also set rules so that commercial users can also continue to operate productively. In general, commercial licences under the *Water Management Act 2000* are granted in perpetuity, providing greater commercial security of water access entitlements. Plans also define the access rules for commercial users for 10 years providing all users with greater certainty regarding sharing arrangements.<sup>2</sup>

### Benefits for water users

With the introduction of the plan, a number of benefits will flow to water users including:

- greater certainty for water users – the plan sets out the water sharing arrangements for a 10 year period
- clear trading and access rules which will help foster trading
- automatic conversion of licences in the plan area to perpetual water access licences providing greater security for water users – meaning the volumetric water access licences do not have to be renewed, however, approvals for the works used to extract water under these access licences will need to be renewed.

The plan recognises the economic benefits to the region that are generated by commercial users such as irrigators and industry. It sets rules so that commercial users can continue to operate productively.

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<sup>2</sup> Security versus reliability. These terms are used differently across different jurisdictions, often interchangeably. The National Water Commission encourages the adoption of nationally consistent terminology based on the National Water Initiative. The definitions in the glossary relate to National Water Initiative-consistent use of these terms. In summary, security provides better tenure for an entitlement and does not necessarily provide greater reliability as this is determined by water availability and is influenced by seasonal and climatic conditions.

## Environmental considerations

The water sharing plan is required to reserve water for the overall health of the groundwater source and to protect specific ecosystems that depend on groundwater, such as wetlands, floodplains and connected riverine systems. This share of water reserved for the environment is also intended to sustain the aquifer system's aquatic fauna and flora.

An aquifer is an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be usefully extracted. Aquifers can store large volumes of water, often accumulated over thousands, or even tens of thousands of years; this is referred to as 'storage'. In the alluvial groundwater source covered by this plan, 100 per cent of the groundwater storage is reserved as planned environmental water.

The volume of water in storage is recharged in a number of ways depending on the type of the groundwater system. Recharge usually comes from rainfall, surface water bodies such as rivers, or via flow from adjacent aquifers.

Under this plan, 67 percent of the estimated long-term average annual recharge is available for extraction. The remainder of recharge is reserved for the environment. Limiting the volume of use to a proportion of the recharge is intended to reduce the risk of unsustainable groundwater extraction in the long term.

The plan also includes rules on the location of new works and extraction from existing works to protect high-priority groundwater dependent ecosystems (GDEs) and other sensitive environment areas such as rivers or streams.

## Scope of the plan

The plan covers one alluvial groundwater source, the Lower Murray Shallow Groundwater source. It does not cover any water contained in the Lower Murray Groundwater Source as defined in the *Water Sharing Plan for the Lower Murray Groundwater Source 2006*.

## Water management units

The plan falls within the Murray Water Management Area. Water management areas are constituted areas of land by an order under section 11 of *the Water Management Act 2000*. These are generally declared at the catchment level.

Water sharing plans generally have a hierarchy of water planning units to which the plan provisions may apply.

The highest level of management units described in this plan is the water source. The plan contains one water source. This has been established for the purpose of creating a geographic area over which the LTAAEL applies. An available water determination (AWD) can be made for each licence category within the water source, and any growth in extraction above the LTAAEL is managed across the water source. Access rules are also generally applied at the water source level. The spatial extent of the water source in the plan area is shown in Appendix 1.

A water management zone is the next level down in the planning unit hierarchy. It is part of a water source and is the level at which more refined implementation of access or trading rules are applied. In this plan the water source has been split into two management zones for more refined management. These are the Lower Murray Shallow (Eastern) Management Zone and Lower Murray Shallow (Western) Management Zone.

## Description of the plan area

The Lower Murray Shallow Groundwater Source is defined as the uppermost part of the Shepparton Formation aquifer (shallower than 12m) within the area defined by Groundwater Management Area 016. The groundwater management area is located in south western NSW and covers the eastern part of the Murray Geological Basin, covering 17,900 square kilometres. It comprises the deep and shallow alluvial aquifer systems of the Murray Geological Basin bounded by the Murray River in the south and the Billabong Creek in the north. The eastern boundary is shared with the Upper Murray Groundwater Management Area 015 along the Corowa-Urana road. The western boundary is at the confluence of the Murray River and the Wakool River, close to the village of Goodnight. Water contained in the groundwater management area deeper than 12 metres of the ground surface is included in the gazetted Water Sharing Plan for the Lower Murray Groundwater Source.

The main administrative feature of the area is the Murray Irrigation Districts (Denimein, Berriquin, Deniboota and Wakool) and associated Murray Land and Water Management Plans (LWMPs) that cover about half of the groundwater management area.

The shallow Shepparton Formation and deeper Calivil Formation and Renmark Group were deposited from the early Eocene epoch of the Tertiary period. The Renmark Group is the basal formation which sits upon a pre-Cainozoic basement. It was deposited from the early Eocene to the late Miocene and is virtually continuous over the entire basin (Evans et.al, 1989). The Calivil Formation unconformably overlies the Renmark group and was deposited in the late Miocene to Pliocene. The Shepparton formation represents the most recent (Pliocene to Recent) major phase of fluvial (river) sedimentation. The Shepparton Formation overlies the Calivil Formation and consists of clay and silty clays interbedded with sand layers. The base of the Shepparton Formation is as great as about 70m deep. The productive aquifers in the Shepparton Formation are usually in the first 20m of the profile and are often referred to as shallow aquifers. The Lower Shepparton aquifers in some cases are directly in hydraulic connection with the underlying Calivil aquifer.

Two types of abandoned stream/river channels have been identified in the Shepparton Formation. One type known as *prior* streams are remnants of older channels, abandoned at some considerable time in the past (Brown & Stephenson, 1991). The other type *ancestral* rivers are recently abandoned rivers/streams and often associated with the present river/creek systems. The prior stream sands are up to 20m deep (thickness up to 8m and width up to 100m) and a good source of groundwater (where salinity is low) for irrigation by shallow bores and spearpoints.

Shallow prior stream aquifers are widely developed for irrigation in the Murray Irrigation Districts by means of spearpoint bore systems. Most of the spearpoints are located in the Berriquin Irrigation District where reasonably good quality groundwater is found. The groundwater in these prior streams becomes more saline towards the west (higher than 3,000 uS/cm), thus restricting groundwater pumping in those areas.

The majority of works that tap the shallow Shepparton aquifer are for irrigation purposes. There are also bores for stock, domestic, industrial, recreational and town water supply purposes.

There are two management zones in the Groundwater Source. These zones divide the water source into units based on water quality (salinity) and they are the Western Management Zone and Eastern Management Zone.

The Western Management Zone is the portion of the Lower Murray Shallow Groundwater Source that extends from the Murray and Wakool River junction in the west to the Edward River and Cobb Highway in the east, but excluding the former Denimien Irrigation District.

The Eastern Management Zone is the portion of the Lower Murray Shallow Groundwater Source that includes the former Denimien Irrigation District and the area bounded by the Cobb Highway and Edward River in the west to the Corowa-Urana Road in the east.

## Land use history

Indigenous people settled in the Murray catchment over 40,000 years ago. Before European settlement, the region included 10 indigenous nations. According to Tindale (1974) the Djilamatang people were traditionally associated with the Upper Murray region west of Mount Kosciusko down to the upper headwaters of the Murray River. The Wiradjuri people were traditionally associated with lands north of the Murray River from Tumbarumba in the east down to Howlong in the west. The Jeithi people were traditionally associated with lands north of the Murray River from Howlong to west of Tocumwal. The Jotijota, Baraparapa, Wembarwemba, Narimara, Wati Wati, Muthi Muthi and Tati Tati peoples were traditionally associated with lands west of Tocumwal to the junction of the Murray and Murrumbidgee rivers.

Aboriginal peoples prior to European settlement were custodians of rivers, lakes and other water sources and today continue a spiritual and cultural relation to water. Rivers of the region were a source of sustenance for Aboriginal peoples, often serving as clan boundaries, and had an important place in the Dreaming. This relationship is articulated in the United Nations Declaration of the Rights of Indigenous Peoples (the Declaration), especially articles 3, 25, 28 and 29. Australia is a signatory to the Declaration. Article 3 states that Indigenous peoples have a right to determine their political status, and their economic, social and cultural future. Article 25 states that indigenous peoples have a right to maintain and strengthen their distinctive spiritual relationship with their lands, territories, and resources confiscated, taken, occupied, used or damaged, while Article 28 states the right to redress for lands, territories, and resources confiscated, taken, occupied, used or damaged. Article 29 states the right to the conservation and protection of the environment, and the productive capacity of lands, territories and resources.

Aboriginal peoples, traditional owners and clans are represented across the broader Murray region by 11 statutory Local Aboriginal Land Councils. The councils are constituted under the *Aboriginal Land Rights Act 1983* and have a range of functions relating to land acquisition, land use and management, Aboriginal culture and heritage, and financial stewardship. The 11 councils are Eden, Bega, Merrimans, Wagonga, Brungle/Tumut, Albury and District, Cumberangunja, Deniliquin, Moama, Wamba Wamba, and Balranald.

The first Europeans to arrive in the Murray catchment were the explorers Hume and Hovell, who travelled through the Upper Murray in 1824 and crossed the Murray River at Albury. European settlement occurred across the entire Murray catchment as a result of overland trips by Hume and Hovell, and Sir Thomas Mitchell. Both parties made mention of the suitability of the country for livestock. Mitchell and Captain Charles Sturt renamed the newly named Hume River to the name Murray, in recognition of Sir George Murray, Secretary of State for the colonies.

Agriculture, including pastoralism, irrigation and horticulture now dominate the landscape. Today over three-quarters of the Murray catchment is managed by private land owners for primary production. Almost three-quarters of the population live in the major towns of Albury, Corowa and Deniliquin.

## Climate

The climate of the Murray catchment is described as cool temperate, controlled by eastward moving low pressure cells and associated frontal systems along the southern margins of Australia (Doughty 2003). The highest rainfall occurs on the slopes of the Snowy Mountains, and upwards of 800

millimetres elevation snow commonly falls, in winter. Rainfall in the catchment is winter/spring dominant and decreases from east to west (Murray Catchment Action Plan 2006).

## Groundwater recharge

The main source of groundwater recharge is from rainfall and irrigation. Infiltration from rivers/creeks and irrigation channels have also been identified as sources of recharge. The underlying deep Calivil and Renmark aquifers receive water through the shallow aquifer and the lower Shepparton Formation.

A groundwater model was developed in 2001 which conceptualised the aquifer framework with recharge and discharge features. When the water balance for the shallow aquifers was determined, it was essential to identify the usable (less saline) groundwater component for groundwater quantity management.

The model indicated that the leakage from the Shepparton Formation is the major source of recharge to Calivil and Renmark aquifers and the level of leakage was a function of the level of pumping in those aquifers. Therefore in order to determine the recharge of the Shepparton aquifer, the model was run to simulate the water balance of all three aquifers where extraction from the Calivil and Renmark aquifers were simulated at 83.7 ML/year.

The groundwater levels in the irrigation districts are monitored by a network of about 1,400 piezometers.

Rising groundwater levels in the shallow groundwater source, water logging and subsequent soil salinisation have been a significant environmental issue in the Murray irrigation districts for over four decades. In 1980, the area of shallow water tables (shallower than 2 m) was about 45,000 ha, with most of the problems occurring in the Wakool Irrigation District. By 1998, the area of shallow watertable expanded to about 55,728 ha (MIL, 1998).

Shallow groundwater pumping has been promoted to control the shallow water tables including the issuing of 'unrestricted use' licences for shallow groundwater pumpers.

Watertable levels in the Wakool area are naturally shallow and subsequent irrigation has exacerbated the problem. To combat rising water tables levels in this area, the Wakool-Tullakool Sub Surface Drainage Scheme was established. The scheme involves pumping shallow saline groundwater to control water tables with strategically placed bores and spearpoints. The NSW Government constructed the scheme in the early 1980s. Murray Irrigation Limited owns and operates the scheme with government assistance.

Over the past decade, an extended severe drought and the implementation of Land and Water Management Plans have controlled the shallow water tables.

## Shallow groundwater pumping

The majority of private groundwater pumps within the Lower Murray Shallow groundwater source are connected to spearpoint style bores that tap the shallow aquifers within 12m of the surface. Most of the spearpoints are located in the former Berriquin and Denimein Irrigation Districts where low salinity groundwater is found in prior stream aquifers. Many of the spearpoint systems were installed during the 1982-83 droughts to supplement low surface water allocations. Many were unlicensed and unregistered and fell into neglect once the drought was over.

Later, recognising that the groundwater resource in the region was under-utilised, and the imminent threat of the rising watertable, landholders were encouraged to extract more groundwater during programs in the mid 1990's. In most cases there was no defined volumetric entitlement or pumping restrictions allowing unrestricted access to groundwater.

## Volumetric conversion

Deep and shallow aquifers are connected and receive or discharge groundwater from each other. Therefore having unrestricted access to the shallow aquifer compromised the management of both the shallow and deep aquifers. NSW water management policy also required all licensed access to be defined by a volumetric entitlement. All shallow groundwater licences issued after 2001 were issued with volumetric entitlements, and the volumetric conversion of non-volumetric licences was completed in September 2010.

## Entitlement and use

At present there are 311 licences in the area covered by the plan, totalling 60,905 megalitres of entitlement. The majority of these licences are for irrigation purposes. There are two town water supply licences, totally 87 megalitres and another 10 megalitres for salinity and groundwater table control.

Murray Irrigation Limited also operates the Wakool-Tullakool Sub-Surface Drainage Scheme that is capable of extracting up to 20,000 megalitres per year of saline groundwater for disposal into two evaporative ponds. Water is also extracted from bores within the water source through basic landholder rights (not requiring a licence).

## Developing the plan

### Project groups

#### State Interagency Panel

The State Interagency Panel has overall responsibility for the state-wide strategic direction of water sharing planning, to ensure that adequate resources are available from each agency and the varying policy and statutory requirements of the relevant NSW government agencies are met. The State Interagency Panel also has the role of making water sharing decisions in cases where the interagency regional panel cannot reach agreement or where the issue has state-wide significance.

The SIP is chaired by the NSW Office of Water and comprises representatives from the Office of Water, the NSW Office of Environment and Heritage (OEH), NSW Department of Primary Industries (DPI), and two catchment management authorities (CMAs). The Office of Water is responsible for the overall project management.

#### State Groundwater Panel

The State Groundwater Panel provides a senior level interagency forum for discussing and resolving a wide range of water planning and policy issues specific to groundwater. The panel plays a specific role in reviewing and, where appropriate, modifying the outcomes of the regional groundwater assessments and the proposed groundwater sharing rules to ensure consistency across the state for aquifer types.

The group is chaired by the NSW Office of Water and has representatives from the Office of Water, OEH, NSW DPI and the CMAs. The panel had access to staff from the agencies to provide technical and scientific information.

#### Interagency Regional Panel

The plan rules were developed by the Murray Interagency Regional Panel (IRP), which comprises representatives from the Office of Water, OEH and NSW DPI with the participation of the Murray CMA (as an observer). Appendix 4 lists the names of the IRP representatives, their areas of expertise and support staff who provided the IRP with technical and scientific information to inform their recommendations on water access and trading rules.

The key roles of the IRP were to:

- establish and review the hydrological units or water sources
- assign economic, social and environmental values and undertake risk and value assessments to classify each water source
- review the existing licence conditions as to their applicability
- make recommendations on the water access and trading rules for each water source
- assist the Office of Water with the public consultation on the proposed rules
- review submissions received during targeted consultation and public exhibition and recommend changes where necessary to the water sharing rules.

The IRP used a consensus decision-making approach and where agencies had particular issues those issues were highlighted during the public consultation period for specific attention.

The IRP worked under the guidance of the State Groundwater Panel.

## Policy context

There are a number of national and state policies that impact on and direct the development of water sharing plans.

### National Water Initiative

The NSW Government is a partner to the National Water Initiative that was signed by the Council of Australian Governments (COAG) in June 2004. The National Water Initiative recognises the continuing imperative to increase the productivity and efficiency of Australia's water use and the need to service rural and urban communities. It also recognises that there is a need to ensure the health of river and groundwater systems by establishing clear pathways to return all systems to environmentally sustainable levels of extraction.

The National Water Initiative has a number of relevant requirements for water planning in Clauses 23, 25, 35 to 40, 52, 78, 79 and Schedule E (for details refer to the National Water Commission website [www.nwc.gov.au](http://www.nwc.gov.au) in the Water Reform section). This intergovernmental agreement contains provisions on water planning including:

- settling the trade-offs between the competing uses must be based on the best available science and socio-economic analysis, as well as consultation with the community
- ensuring that environmental and other public-benefit outcomes are provided for through planned and adaptive environmental water on a statutory basis and achieved, including actions to sustain high-conservation value rivers, reaches, and groundwater areas
- providing for water trading to enhance water markets
- recognising and addressing surface and groundwater connectivity
- managing local impacts in groundwater areas as well as protecting groundwater dependent ecosystems (GDEs)
- providing for indigenous consultation and aboriginal cultural and commercial entitlements
- assessing and addressing interception
- monitoring and reporting on implementation.

The intergovernmental agreement on the National Water Initiative sets out outcomes and guidelines and timelines for water plans and planning processes. The National Water Commission is an independent statutory body responsible for providing advice to COAG on the implementation of the National Water Initiative and national water issues and undertakes a biennial assessment of each state's progress with implementing the National Water Initiative for this purpose.

### Natural Resources Commission

The macro water sharing plans must also comply with the NSW Natural Resources Commission (NRC) state-wide standards and contribute to the relevant state-wide targets such as Targets 5 and 6 (for details see [www.nrc.nsw.gov.au](http://www.nrc.nsw.gov.au)) which is a requirement of the NSW State Plan (see [www.nsw.gov.au/stateplan](http://www.nsw.gov.au/stateplan)). The NRC was established in 2003 to provide the NSW Government with independent advice on natural resource management issues. To achieve this, the NRC has developed and recommended a Standard for Quality Natural Resource Management and 13 state-wide targets for natural resource management in NSW, which have been embedded in the NSW State Plan. Table 1 lists the state targets and how these are met within the plan. As with the National Water Initiative, the components of the State Standard focus on the use of the best available knowledge, use of appropriate information management systems, delivery of integrated outcomes, engagement of the community and regular monitoring, measuring, evaluation and reporting to specify how delivery of the

targets is progressing. The NRC reviews water sharing plans against this standard and its associated targets.

**Table 1: Contribution of the plan to the relevant NRC state-wide targets**

Relevant state-wide target	Contribution by the plan
By 2015 there is an increase in the recovery of threatened species populations and ecological communities (Target 3)	– rules will be applied to protect high priority groundwater dependent ecosystems (GDEs) from groundwater extraction.
By 2015 there is an improvement in the ability of groundwater systems to support their groundwater dependent ecosystems and designated beneficial uses (Target 6)	– rules will be applied to protect high priority GDEs from groundwater extraction.
By 2015 there is an improvement in the condition of important wetlands, and the extent of those wetlands is maintained (Target 8)	– rules will be applied which protect sensitive environmental areas, including high priority GDEs, rivers and streams.
Natural resource decisions contribute to improving or maintaining economic sustainability and social well-being (Target 12)	<ul style="list-style-type: none"> <li>– the plan provides a defined share to water and defined certainty of access</li> <li>– separation of land and water enhances trading and value of licences</li> <li>– establishment of perpetual and compensable water access licences provides security for business investment</li> <li>– water markets encourage movement of water licences to high value uses</li> <li>– rules developed which consider community dependence on water extraction.</li> </ul>

## Catchment Action Plan

The plan is consistent with and contributes to the following catchment action plan:

- Murray Catchment Management Authority Catchment Action Plan (MCMACAP). The MCMACAP is located on the Murray Catchment Management Authority (MCMA) website [www.murray.cma.nsw.gov.au](http://www.murray.cma.nsw.gov.au) in the Corporate Documents section.

One of the catchment management authority's responsibilities as an observer on the Interagency Regional Panel is to provide the IRP with advice on the alignment of the proposed classification and extraction limits and rules with the priorities of the catchment action plan.

## Murray Land and Water Management Plans

Half of the surface area covered by the plan is covered by one of four Murray Land and Water Management Plans (LWMPs). The LWMPs were developed to respond to rising water tables. In the 1980s watertables in the area were rising at a rate that would cause 50% of the region to be affected by dryland salinity within 30 years. Licence holders authorised to extract 75% of the licensed volume from the shallow aquifer were involved in developing the LWMPs and had an interest in ensuring that the LWMPs remain effective. LWMPs and watertable management will become increasingly important if current wet conditions persist. The water sharing plan complements LWMPs in managing rising water tables while minimising impacts on the environment and other users.

## Basin Plan

The Commonwealth *Water Act 2007* requires the Murray-Darling Basin Authority (MDBA) to prepare and oversee a Basin Plan. The Basin Plan is a legally enforceable document that provides for the integrated management of all the basin's water resources.

Some of the main functions of the Basin Plan will be to:

- set and enforce environmentally sustainable limits on the quantities of surface water and groundwater that may be taken from basin water resources
- set basin-wide environmental objectives, and water quality and salinity objectives
- develop efficient water trading regimes across the basin
- set requirements that must be met by state water resource plans
- improve water security for all uses of the basin water resources.

The Basin Plan will provide the new foundation for managing the basin's water resources in accordance with any rules and plan accreditation criteria established by the MDBA. At the heart of the Basin Plan will be limits on the quantities of surface water and groundwater that can be taken from basin water resources. These are known as 'sustainable diversion limits'. As these limits come into effect, they will replace the current MDBMC Cap on diversions in the basin. They will set limits on the taking of both groundwater and surface water from the basin.

Further details on the Basin Plan can be found on the MDBA website [www.mdba.gov.au](http://www.mdba.gov.au) in the Basin Plan section.

## Other considerations

There are a number of policies and water related issues that required consideration during the development of the plan.

### **Murray-Darling Basin Ministerial Cap**

Water diversions from rivers in NSW progressively increased throughout the last century, but most rapidly in the 1980s. Growth in water diversions:

- takes more water away from the river and may threaten its environmental health
- reduces water available to other legitimate businesses increasing competition and the potential for inequitable access
- reduces flows from upstream river systems into downstream systems.

In 1994, the Murray-Darling Basin Ministerial Council (MDBMC) undertook an assessment of water diversions across the basin. This found that the levels of diversions at that time were placing stress on both the environmental health of our river systems and the reliability of supply to water users; and that diversions were continuing to increase. In response, the MDBMC introduced - introduced a diversion limit – the Cap – in 1995.

Schedule F (now Schedule E) of the Agreement was then introduced in 1996 and set the operating framework for the Cap. In NSW, the Cap is defined as the long-term average yearly volume of water that would have been diverted under 1993/94 levels of development and management rules.

Under the Agreement, plans are required to be developed to ensure consistency with the Cap. This means that the long-term average annual extraction limit (LTAAEL) for regulated and unregulated water sources must be equal to or less than the Cap. NSW has chosen to divide the surface water Cap into unregulated and regulated components.

There is no MDBMC Cap Agreement on groundwater diversions.

To recognise that extractions from groundwater systems have the potential to exacerbate losses from connected surface water systems, in NSW extractions from connected groundwater systems must also be controlled to ensure no impact on surface water sources. Since the signing of the MDBMC Cap Agreement new entitlements in some groundwater systems have been granted and investments

made. Extractions from groundwater aquifers have risen since 1993/94. The retrospective application of policy to redress the impact of groundwater pumping on surface water would result in unacceptable impacts on rural communities. Therefore NSW has committed to limit extractions from alluvial and connected systems in inland NSW to current levels of pumping.

### **Managing surface water and groundwater connectivity**

A key objective of the National Water Initiative (2004) is 'recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource'.

For the purposes of developing water sharing plans for NSW inland aquifer systems, a highly connected system has been defined as a system in which '70 per cent or more of the groundwater extraction volume is derived from stream flow within a single irrigation season'. This is a simplified version of, but still reasonably consistent with, the key findings and conclusions circulated for discussion among state jurisdictions by the Murray-Darling Basin Commission (MDBC) in their report *Evaluation of the connectivity between surface water and groundwater in the Murray-Darling Basin* (MDBC, 2006).

Aquifers 'highly connected' to regulated water sources can be managed annually via linked AWDs and aquifers 'highly connected' to unregulated water sources can be managed daily via cease-to-pump levels.

Using the above definitions of connectivity, the Lower Murray Shallow Groundwater Source will be treated as 'less highly connected' to streamflow and therefore management will not be linked to surface water available water determinations or cease-to-pump levels.

### **Granting new access licences**

Water sharing plans provide for the limited application for new access licences, in addition to those that may be applied for under the Water Management (General) Regulation 2004. Under the plan, applications for specific purpose access licences may be made in accordance with Clause 19 of the Water Management (General) Regulation 2004, and an access licence may be granted in accordance with a dealing. If additional licences are granted in a water source and usage is assessed to have exceeded the LTAAEL, then the plan's growth management provisions are implemented.

### **Mandatory conditions**

The plan sets out provisions that will be applied as mandatory conditions to water access licences and water supply work approvals. These mandatory conditions are designed to protect the rights of all users in the water source and the plan's environmental water rules. They cannot be removed or altered unless the plan is amended.

### **Protecting Aboriginal values**

Aboriginal cultural values may be affected by water extraction from aquifers and surface waters. Most of the information about flow-related Aboriginal values resides with indigenous communities.

Initial consultation sessions provided some insights into Aboriginal cultural values particularly associated with unregulated rivers. Aboriginal communities have indicated that water sharing rules should protect natural instream values. While Aboriginal groups acknowledge the rights of commercial water users, they believe this entitlement should not be at the expense of the environment or cultural values.

Furthermore, opportunities for granting licences for Aboriginal cultural purposes throughout the Murray catchment are included in the plan. These can be used for purposes such as manufacturing traditional artefacts, hunting, fishing, gathering, recreation and ceremonial purposes. The plan also allows for the

identification of water for significant Aboriginal cultural sites. The Office of Water is currently working with Aboriginal communities to identify these sites and their water requirements as part of an extensive consultation program being rolled out across NSW.

For more information on macro water sharing plans and Aboriginal water users, visit the Office of Water website at [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

## **Protecting environmental values**

The plan is required to reserve water for the overall health of the aquifer and to protect groundwater dependent ecosystems.

The plan reserves all of the storage volume as environmental water and a proportion of the estimated annual recharge as environmental water.

Groundwater dependent ecosystems (GDEs) are ecosystems which have their species composition and natural ecological processes determined to some extent by the availability of groundwater. GDEs can include cave systems, springs, wetlands and groundwater dependent endangered ecological communities (EECs).

The methodology used for the identification and scheduling of high-priority groundwater dependent ecosystems (GDEs) in the development of this plan is consistent with the NSW State Groundwater-Dependent Ecosystem Policy (DLWC, 2002).

### ***Stage 1 Prior to the commencement of the plan***

Stage 1 occurs during the initial development of a macro water sharing plan. It involves a desktop exercise assembling all known records of high priority GDEs. The desktop assessment in stage 1 allows the plan to protect GDEs of known high conservation value from year 1 of the plan where time and resources are not available to conduct detailed field studies and analysis. GDEs that have been identified through other processes as having important conservation significance are listed in a schedule to the plan and rules are developed to protect them. For example, GDEs listed under the Directory of Important Wetlands, Ramsar listed wetlands, communities listed under the *Threatened Species Act 1995* and karst conservation reserves listed under the *National Parks and Wildlife Act 1974* by the karst conservation unit of OEH are added to the GDE schedule for the commencement of the plan.

The IRP then has the opportunity to review and amend the GDE list as well as the rules that have been developed to protect them based on their expertise. If the rules vary substantially from the standard rules that have been developed to protect GDEs, then the proposed rules may be submitted to the State Groundwater Panel for endorsement.

The list of high priority GDEs compiled at this stage can be either be amended after year five of the plan as further GDEs are identified or during the life of the plan on submission to and approval by the Minister.

Records of other GDEs are also collated from interrogating other Government databases, GIS records and relevant studies. Note that there may be GDEs identified as having high levels of groundwater dependence and/or high conservation value, which are not currently considered to be 'high priority' and are not scheduled in the plan. These GDEs are listed as moderate priority on NSW Office of Water's GDE records and are considered in the assessment of licence applications.

### ***Stage 2 During the life of the plan***

Records of other GDEs are collated from interrogating other government databases, GIS records and other studies. Other GDEs in the plan area may also be listed if they have been identified as having high levels of groundwater dependence and/or high conservation value by a technical expert.

Stage 2 occurs during the life of the plan and is a comprehensive assessment of the individual GDEs listed through the collation process above. Stage 2 involves a significantly more detailed analysis of GDEs to build upon the desktop assessment undertaken at Stage 1 based on the *Groundwater Dependent Ecosystems: Assessment, Registration and Scheduling of High Priority: Manual to Assist Groundwater Macroplanning*, (DNR, 2006). This involves undertaking a comprehensive assessment of all records of known GDEs to determine their ecological value. High ecological value for an ecosystem is defined as an ecosystem in a natural or near-natural condition, health and integrity assessed in terms of four criteria, which are:

- ecosystem condition/level of disturbance
- rarity of the dependent biota or physical features
- diversity
- special features.

The DNR 2006 manual sets out the process for weighing the ecological values to achieve an overall ranking of high, medium and low-priority for each GDE. Those determined to be of high-priority are then listed in the NSW GDE records and included in schedules to the plans. Changes to the rules that protect the GDEs will also be made, where appropriate.

### **Protecting basic landholder rights**

Under the *Water Management Act 2000*, extraction of water for **basic landholder rights** does not require a licence, although in the case of accessing groundwater under basic landholder rights, the bore must still be approved by the Office of Water. Basic landholder rights includes water for domestic and stock purposes extracted from a water source fronting a landholder's property or from any aquifer underlying the land, harvestable rights and for native title rights.

The principles of the *Water Management Act 2000* also require that water sharing must protect basic landholder rights. The plan does this by including an estimate of the water requirements for basic landholder rights at the start of the plan. There are currently no extractions for native title rights. However, these rights may be activated during the plan's 10 year term.

Furthermore, the access rules apply to licensed water users but not to extractions for basic landholder rights. This in effect, affords those exercising their basic landholder rights, some additional protection.

Domestic and stock rights can be restricted by the Minister to protect the environment or public health, or to preserve existing basic landholder rights. These restrictions are outside the framework of the plan. The Office of Water is developing a regulation which will limit extractions under domestic and stock rights to a reasonable volume where they are metered and more clearly define what is considered to be reasonable purposes, which is important where they are not metered.

### **Protecting town water supply access**

Towns have a higher priority of access to water than commercial licences. Water sharing plans recognise this priority by ensuring that a full share of water is allocated for annual town water supplies except where exceptional drought conditions prevent this. The annual share for every town water supply will be specified on the operator's licence. Towns may be able to sell part of their annual account water to other towns but, unlike commercial users, will not be able to sell the licence outright.

In unregulated surface water and groundwater sources, towns will not need to change their existing water access arrangements unless their current infrastructure is unable to meet their water needs and requires upgrading. In this case, when a major augmentation of the works occurs, town water utilities will need to meet conditions specified in the plan to ensure that there is enough water flowing to protect the environment and consider any potential impacts on other consumptive users.

## **Other water sharing considerations**

There are a number of policies and water related issues that required consideration with the development of the plan and the associated water sharing rules. A large range of reference material was also used in addition to the knowledge of panel members and technical support staff. Reference material is listed in Appendix 3.

## Rules for groundwater sources

### Background

The plan was developed based on the 'macro planning' approach for groundwater. For further information refer to: *Macro water sharing plans – the approach for groundwater. A report to assist community consultation*) available on the Office of Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

### Hydrogeological modelling

The main source of groundwater recharge is from rainfall and irrigation. Infiltration from rivers/creeks and irrigation channels have also been identified as sources of recharge. The deep Calivil and Renmark aquifers receive water through the shallow aquifer and the lower Shepparton Formation. A groundwater model was developed in 2001 which conceptualised the aquifer framework with recharge and discharge features. In order to determine the recharge of the shallow aquifer, the model was run to simulate the water balance of all three aquifers where extraction from the deep aquifers was simulated at 83.7 megalitres per year (the extraction limit for the gazetted Lower Murray Groundwater Source). The resulting recharge for the shallow aquifer is 121,300 megalitres per year from all sources. This annual estimate of recharge is based on the calibrated model using 15 years of data (from 1985 – 2000), and include many wet years. The modelled recharge estimate includes both saline (56,260 ML/year) and freshwater (65,040 ML/year) inputs. The volume of entitlement licensed for irrigation purposes provides access to 95% of the annual freshwater recharge.

### Water sharing rules

Upon commencement of the plan, licences in the Lower Murray Shallow Groundwater Source become subject to a number of management rules. These are described below and summarised within the individual rule summary sheet for the Lower Murray Shallow Groundwater Source which is available on the Office of Water website at [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

### Defining the long-term average annual extraction limit

The volume of water potentially available for extraction is termed the long-term average annual extraction limit (LTAAEL) and is expressed in megalitres per year (ML/year).

NSW has resolved that the long-term average annual extraction limit for highly connected groundwater sources and alluvial water sources within NSW's portion of the Murray-darling basin shall be set equal to current average usage. Any extraction beyond this level will result in additional impact on groundwater dependent ecosystems and other users in connected water resources.

In connected river – aquifer systems, extraction in one water resource area can reduce water availability in the other. The surface waters of these connected river – aquifer systems tend to be groundwater dependent and are most vulnerable during dry periods.

Surface waters within the NSW's portion of the Murray-Darling Basin have been capped at 1993-94 levels of development, following the Murray-Darling Basin Ministerial Council Agreement, in 1995. While the Murray-Darling Basin Ministerial Council Cap does not apply to groundwater, NSW has resolved that the long-term average annual extraction limit for highly connected and alluvial groundwater sources within NSW's portion of the Murray- Darling Basin shall be set equal to current average levels of pumping. Any extraction beyond this level will result in additional impact on groundwater dependent ecosystems and other users in connected water sources and may lead to a breach of the Murray Darling Basin cap on extractions.

The approach taken recognises the retrospective application of policy to redress the impact of groundwater pumping on surface water since 1993/94 would result in unacceptable impacts on inland rural communities. Current levels of groundwater pumping from alluvial and other highly connected aquifers in the Murray-Darling Basin are considered to have an acceptable impact on surface water sources.

The best estimate of usage in the shallow aquifer is equal to current licensed entitlement. As such, the LTAAEL, or the total volume of water available for extraction from this water source, is equal to current licensed entitlement (60,905 ML/yr), plus requirements for salinity and groundwater table control (20,000 ML/yr), plus an estimate for basic landholder rights (988 ML/yr).

Current licensed entitlement was issued based on the average of each licence holders' wet- and dry-year usage. The volume for salinity and groundwater table control was based on the design capacity of the Wakool-Tullakool Sub-Surface Drainage Scheme. Basic landholder rights usage was estimated using a consistent statewide approach and the portion attributable to the shallow alluvium estimated based on local assessment.

### **Managing extraction to the long-term average annual extraction limit**

Total extraction in the groundwater source is managed to the LTAAEL. The plan allows for the 'peaks' and 'troughs' of usage above and below the average, over the period from which the LTAAEL has been defined, to be replicated.

In the Lower Murray Shallow Groundwater Source, if the average annual usage over a period of five years exceeds the LTAAEL by more than 10 per cent, a growth-in-use is triggered. If a growth in use is triggered available water determinations will be reduced by an amount necessary to return total water extractions to the LTAAEL.

### **Managing connectivity**

Consistent with the state-wide approach, aquifers have been classified as either 'highly connected' or 'less highly connected' for the purposes of applying management rules. Aquifers 'highly connected' to regulated water sources will be managed annually via linked AWDs and aquifers 'highly connected' to unregulated water sources will be managed daily via cease-to-pump levels.

It is estimated that less than 70 percent of the groundwater pumped from the Lower Murray Shallow Groundwater Source is derived from stream flow. As such the water source is classified as less highly connected and available water determinations will not be linked to surface water rules.

### **Protecting environmental values**

The plan protects environmental values in the Lower Murray Shallow Groundwater Source by reserving a proportion of recharge to the aquifer and the water within the groundwater storage of the aquifer as planned environmental water.

The estimated annual average recharge to the Lower Murray Shallow Groundwater Source from all sources is 121,300 megalitres. With an LTAAEL of 81,893 megalitres, 33 per cent of this recharge is reserved as planned environmental water. Five per cent of the recharge set aside for the environment is from freshwater inputs. The rest is from saline inputs.

This approach of reserving a proportion of the recharge as planned environmental water ensures that the aquifer storage cannot be drawn down over the long term while ensuring that as much freshwater recharge is available for extraction when it is closer to the surface to assist with managing rising or high water tables.

Although no high priority groundwater dependent ecosystems have been identified within the Upper Murray Groundwater Source, there are many River Red Gum communities identified on the floodplain of the Murray River that may at times, be dependent on groundwater. Many of these plant communities occur on buried prior river channels that still have some longitudinal connectivity with the river. Many of these are also dependent on the regular availability of regulated Murray River surface flows. More research will better quantify their relative degree of dependence on the groundwater resource. The plan may be amended to add high priority groundwater dependent ecosystems in the future.

## **Water supply works approvals**

In accordance with the principles of the *Water Management Act 2000*, the plan sets rules to minimise the cumulative impacts resulting from groundwater extraction. To do this, the plan specifies rules which prohibit new/amended works from extracting water within certain distances of other water users, contaminated sites, groundwater dependent ecosystems and groundwater dependent culturally significant sites. This is to prevent significant levels of water table drawdown occurring in the local vicinity of these users and sites.

Standard distance rules were developed for the macro plans through internal meetings of regional and state panels consisting of regional groundwater experts and representation from NSW DPI and the Office of Environment and Heritage, to incorporate a socio-economic and environmental perspective. These panels compiled sets of distance criteria based on previous studies, substantial local knowledge and experience. This experience included knowledge of analytical and numerical models and their results, such as those used in dryland salinity studies until the late 1990s. A consistent set of rules for common groundwater aquifer types (for example fractured rock, alluvium, coastal sands and porous rock) was then produced by comparing the various rules proposed by the regional panels based on what has worked in the past in similar geological provinces.

Groundwater flow modelling with representative aquifer parameters was used to calculate water balances and also provided water table drawdowns at different distances under a 24 hour/day pumping regime for one year. The modelling was undertaken to test the distance criteria produced by the IRPs to protect regulated stream flow and base flow in the unregulated systems. The modelling indicated that the water table fluctuation due to pumping was not above natural variations if the access rules in the plan are implemented. For high priority GDEs the distances were set so that overall ecosystem health would remain the same and resulting impacts on drawdown would be within seasonal water level movements. For other GDEs, water users and significant sites, only a minimal level of impact was permitted.

The standard set of distance criteria then went to the State Groundwater Panel for approval. This panel, when negotiating the final rules, weighed the social, environmental and economic impacts of extraction on groundwater sources to set an acceptable level of drawdown near critical sites and other water users. Since then, the standard rules have been further tailored as a result of further development of macro plans.

As the distances are based on a combination of experience and modelled estimates of drawdown, the macro plans allow for these distances to be altered in some cases. For example, the distances to minimise interference with other works may be reduced if a proponent can demonstrate in a hydrogeological study that no more than minimal impact will occur on existing extraction at a lesser distance.

In the plan, regional hydrogeologists made draft recommendations on rules for the plan which were then compared against the standard rules. The Murray IRP then made a final decision as to the rules to be recommended in the plan, striving to remain consistent with the standard rules where possible while being sensitive to any unique attributes of the groundwater sources in the Upper Murray.

The plan details rules applying to water supply work approvals including:

- rules for amending water supply work approvals for replacement groundwater works
- rules to minimise interference between neighbouring water supply works
- rules for water supply works located near contaminated sources
- rules for water supply works located near sensitive environmental areas, including rules to protect water levels near groundwater dependent ecosystems
- rules for water supply works located near groundwater dependent culturally significant sites
- rules for the use of water supply works located within restricted distances.

The Minister has discretion to grant or amend a water supply work approval at a lesser distance if satisfied that the location of a water supply work at this distance will not compromise the intent of the rules. This clause caters for local circumstances where it may be desirable for an approval to be granted at a lesser distance in recognition of existing property rights and small lot sizes. These exemption clauses are included in the plan, including the agreed position of the State Groundwater Panel that replacement bores be exempt from all distance criteria. By exempting replacement bores from all distance criteria, existing property rights are acknowledged and the issues associated with the distance criteria resulting in difficulties for replacement of existing water supply works are addressed. This is consistent with the policy principles for setting the LTAAEL in alluvial aquifers i.e. that no worse than current impacts should occur.

Refer to the plan for the distance rules applying to the Lower Murray Shallow Groundwater Source.

### **Available water determinations**

Available water determinations (AWDs) are used to credit water into a licences water allocation account. The commencing AWD for all access licences is 1 ML/unit share, or 100 per cent of entitlement, unless a growth in use response is required.

The commencing AWD for a water source is used to manage growth in extractions above the LTAAEL, i.e. if growth is assessed to have occurred then the commencing AWD will be reduced to the extent necessary to return the average annual extractions in the groundwater source to the LTAAEL.

Assessments of extraction will commence in the sixth year of the plan, using extraction records from the first year of the plan.

During a water year, if in the Minister's opinion, the water table in this groundwater source rises significantly and insufficient allocations are available to lower the water table, then the Minister may announce additional water determinations of up to 150 ML/unit share or 150% of entitlement for licences other than a salinity and water table management access licence or access licence (sub-category 'town water supply').

### **Carryover and water accounts**

Account management rules may provide for the carryover of unused water allocations from one water year to the next where the aquifer has the capacity to absorb a higher level of annual extraction on a short-term basis.

In the Lower Murray Shallow Groundwater Source the aquifer storage is significant. As such the Murray IRP agreed to permit general aquifer access licences in the Lower Murray Groundwater Source to carryover, from one water year to the next, up to 1 ML/unit share with an annual take limit of 1.5 ML/unit share. They agreed that this would provide users with flexibility while the Minister's legislative powers under the Act could be relied upon to manage undesirable impacts of overpumping in particular localities if required.

## Trading of access entitlement

The water market is an effective and equitable way to reallocate water between users. The National Water Initiative sets out guidelines for water trading and these will be largely superseded in the Murray-Darling Basin once the Basin Plan commences. Trading can currently occur either on a permanent or temporary basis. Trading of water entitlement needs to be addressed in the plan within a framework that maximises the flexibility for users to be able to use water to its highest value but does not adversely impact on water sources or other users.

The Minister's *Access Licence Dealing Principles Order 2002* currently prohibits the trade of entitlement from a groundwater source to a surface water source. Trades are only permitted between sources where there is a hydrologic connection.

Within the water source, trades are not permitted into the Eastern management zone. Trade is permitted into the Western management zone, subject to local assessment. Trades are permitted within management zones, subject to local assessment. Conversion of access licence from one category to another in the groundwater source is not permitted.

## Impact of water sharing rules

The water sharing rules have been designed so that they are expected to have minimal socio-economic impact. While this is expected to be the case, it is impossible to foreshadow all scenarios and impacts.

Under the plan rules, socio-economic impacts are expected to be minimal as licence holders are able to continue pumping at licensed entitlement levels.

Impacts may be felt locally if pumping becomes concentrated through trade. Licensing procedures allow for assessment of potential impacts and local impact rules can be applied if these circumstances arise.

Licence holders have expressed concern about potential rising water tables under a wet scenario which potentially could have environmental and socio-economic consequences. The plan allows for issuing of available water determinations up to 150% if, in the Minister's opinion, the watertable in this groundwater source rises significantly and insufficient allocations are available to lower the watertable. It is likely that in a wet scenario licence holders will be using less water and alternative mitigation options will need to be considered.

## Consultation

The interagency regional panel's recommended access and trading rules underwent targeted consultation with water users and specific interest groups<sup>3</sup> before the plan was drafted. Formal public exhibition<sup>4</sup> of the plan ensured wider public consultation.

While developing the plan, the participating agencies (NSW Office of Water, the Office of Environment and Heritage, NSW DPI and the Murray CMA) identified areas where better data is needed for making future water planning decisions. Similarly, the community were able to suggest areas where further analysis or data gathering were required. This local input was essential in finalising the plan.

The Office of Water managed the public consultation process, and ensured that all stakeholders and interested parties had an opportunity to examine and comment on the proposed water sharing rules. In particular, the Office of Water was looking for stakeholders to provide:

- local knowledge and expertise – for example, there may be other natural or socio-economic values that were not yet been considered by the Interagency Regional Panel
- feedback on the practical elements of the proposed water sharing rules – to make certain they are understood and able to be implemented by the licence holders
- confirmation that there are no unintended perverse outcomes from the plan – it is essential that this be given due consideration before the plan was finalised
- specific comments on the Minister's notes included in the draft plan.

## Targeted consultation on the draft rules

Targeted consultation on the proposed rules for the plan began in 2010 (see Table 2). The objectives of this consultation were:

- to provide background as to why the water sharing plans were being developed, how they were developed, what rules were proposed in the various areas, and how stakeholders could provide feedback
- to provide a 'first opportunity' to consult informally with key stakeholders to test the suitability of the proposed water sources and management zones, flow reference points and access and trading rules.

Discussions with water users also continued though to the public exhibition period.

**Table 2: Key groups consulted in the plan area as part of the targeted consultation**

Date	Group	Location
21 October 2010	016 Shallow Groundwater Users	Deniliquin
25 January 2011	016 Shallow Groundwater Users	Deniliquin

## Refining water sharing rules as a result of targeted consultation and updated data

The IRP reviewed all submissions and recommended some changes to the initial water sharing rules. Appendix 4 outlines the changes made to the proposed rules as a result of this consultative process and inclusion of new data.

<sup>3</sup> Targeted consultation refers to informal consultation held with key stakeholders to test the suitability of the proposed water sharing rules and provide feedback on the potential impacts of the rules.

<sup>4</sup> Public exhibition is the formal exhibition of a draft plan where the Minister invites submissions on the draft plan and in particular will seek comment on a range of key issues.

## Public exhibition of the draft water sharing plan

Public exhibition of the proposed plan was held in the plan area in late 2011. The objectives of this consultation were:

- to provide background to stakeholders as to why the plan was being developed, how it had been developed to date, what rules are proposed in the various areas and how stakeholders can make a submission
- to formally consult with a broad range of stakeholders to explain the proposed water sharing rules and how they will be implemented
- to seek feedback from stakeholders and the general community about the proposed water sharing rules.

Table 3 shows the locations of meetings that were held across the plan area as part of the public exhibition process.

**Table 3 Public exhibition meetings held throughout the plan area**

<b>Date</b>	<b>Plan area</b>	<b>Location</b>
8 September 2011	016 Shallow Groundwater Users	Deniliquin

## Refining water sharing rules as a result of public exhibition and updated data

The Murray IRP reviewed all submissions as well as matters raised at the public meeting and any updated data.

Stakeholders were encouraged to submit their comments in writing to the Office of Water. No changes were made to the plan after the panel reviewed it in response to submissions made during public exhibition.

## Adaptive management

Adaptive management is an important part of a water sharing plan. Adaptive management refers to the process of ongoing data collection, monitoring, evaluation and review during the term of the plan that either enables plan amendments or remaking of an improved plan after 10 years. Adaptive management is a requirement of both the *Water Management Act 2000* and the National Water Initiative, and has been allowed for during the term of the plan through amending provisions and the establishment of 'limits of change' to the plan.

Where adaptive management is identified, further studies may be undertaken within agencies or by external organisations which may assist in informing the review of plan provisions.

## Monitoring plan performance

The Office of Water is also developing a Monitoring, Evaluation and Reporting (MER) Framework. This framework will be developed in collaboration with key stakeholders and will be consistent with the MER needs of the Natural Resources Commission and the National Water Commission. The intention is that the framework can be applied to existing water sharing plans and macro water sharing plans to enable the development of a specific MER plan.

## Performance indicators

The plan includes a number of performance indicators that will be monitored over the 10-year life of the plan.

It is not practicable to monitor all issues in all water sources. The performance indicators identify that monitoring will be undertaken for specific issues in key water sources. The actual procedure for monitoring each indicator may change over the period of the plan as improved methods are developed.

## Plan review

Under the *Water Management Act 2000*, the Natural Resources Commission is required to undertake a review of the plan prior to any decision to extend its term or to make a new plan.

The MER framework developed will consider the statutory requirements for the different types of evaluation:

- An audit of the plan, at intervals of no more than five years, for the purpose of ascertaining whether its provisions have been given effect to. This audit is to be carried out by an Audit Panel, which has been appointed by the Minister for Primary Industries, as having this role.
- An audit of the plan by the Natural Resources Commission to assess to what extent the water sharing provisions have contributed to the relevant state wide targets, and natural resource standards and targets in the relevant catchment management area. The Natural Resources Commission will call for public submissions when undertaking its review.
- An annual review of implementation programs.
- The application of information from the relevant monitoring and evaluation programs to inform progress against the relevant state-wide targets and requirements of the National Water Commission under the National Water Initiative.

## Implementation

### Implementation programs

An implementation program may be established to set out the means by which the objectives of the plan are to be achieved. The process for monitoring of the performance indicators will be outlined in the program.

An annual review of the implementation program will be conducted to determine whether the program is effective in implementing the water sharing provisions. The results of this review will be included in the NSW Office of Water's annual report.

### Monitoring water extractions

Each water sharing plan establishes the relevant mandatory conditions for extraction, including that all licenses undertake measurement of extraction as required by the Minister. The Office of Water will develop a measurement of extractions strategy to meet the objectives of the NSW Water Extraction Monitoring Policy.

Measurement of extractions will be via meters fitted to approved water supply works. Different types of devices will be required depending on the nature of the water supply work installation, the size of the work, and the affect that the operation of the work may have on the water source and other water users. Telemetry systems will be placed onto all meters, subject to availability.

### Compliance

The NSW Office of Water will undertake compliance activities as necessary to enforce each individual's licence conditions, which are developed based on the provisions of the plan once it is implemented. Some reliance is placed on local water users to identify inappropriate or unlawful behaviour and report this to the Office of Water. Reports may be made by calling 1800 633 362, emailing [watercompliance@water.nsw.gov.au](mailto:watercompliance@water.nsw.gov.au), or through the NSW Office of Water website at [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

## Glossary

Many of the terms in this document are defined in the *Water Management Act 2000* and are therefore not redefined here. However, there are some terms that are not and have therefore been defined here to assist with understanding the water sharing plan.

**Account water:** The balance in an access licence water allocation account at a particular time. An access licence water allocation account records water allocations accrued under the licence as well as water allocations taken, assigned or re-credited. The operation of the account is also governed by rules for the carrying over of credits from one accounting period to the next and rules for the maximum credit that may be allowed to accumulate in the account as established in a water sharing plan.

**Alluvial, alluvium:** Sediment deposited by a stream of running water, in particular along river beds or flood plains.

**Aquifer:** An underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be usefully extracted. The volume of water stored in an aquifer, the rate at which water can recharge, the volume of water extracted from it, and the rate at which water can move through the aquifer are all controlled by the geologic nature of the aquifer.

**Connectivity:** A connected system is defined as any system with significant connectivity occurring between an aquifer and a surface water system. Connected systems are those where there is a zone of continuous saturation between the river and the aquifer.

**Endangered ecological communities:** Ecological communities listed in Schedule 1 of the *Threatened Species Conservation Act 1995* or Schedule 4 of the *Fisheries Management Act 1994*.

**Extraction of water:** Taking of water from a water source.

**Groundwater:** The water beneath the earth's surface that has filtered down to the zone where the earth or rocks are fully saturated.

**Groundwater dependent ecosystems (GDEs):** Ecosystems that rely on groundwater for their species composition and their natural ecological processes.

**Long-term average annual extraction limit (LTAAEL):** The target for total extractions (under all water access licences plus an estimate of basic landholder rights within an EMU) which is used to assess whether growth in use has occurred. The actual annual extractions (metered plus estimated) are averaged over a fixed period of time defined by the water sharing plan when comparing with the LTAAEL. If the fixed period of time is greater than one water year, then in any one water year, extractions can exceed the LTAAEL without triggering a growth in use response.

**Macro water sharing plans:** Water sharing plans which apply to a number of water sources across catchments or different types of aquifers. The macro planning process is designed to develop broader-scale water sharing plans covering most of the remaining water sources in NSW.

**Management zone:** An area within a water source used for defining the location of applicability of water sharing rules, but secondary to the water source. A management zone is more likely to be designated where local dealing restrictions are in place or where cease-to-pump (EFPR) rules for works approvals apply.

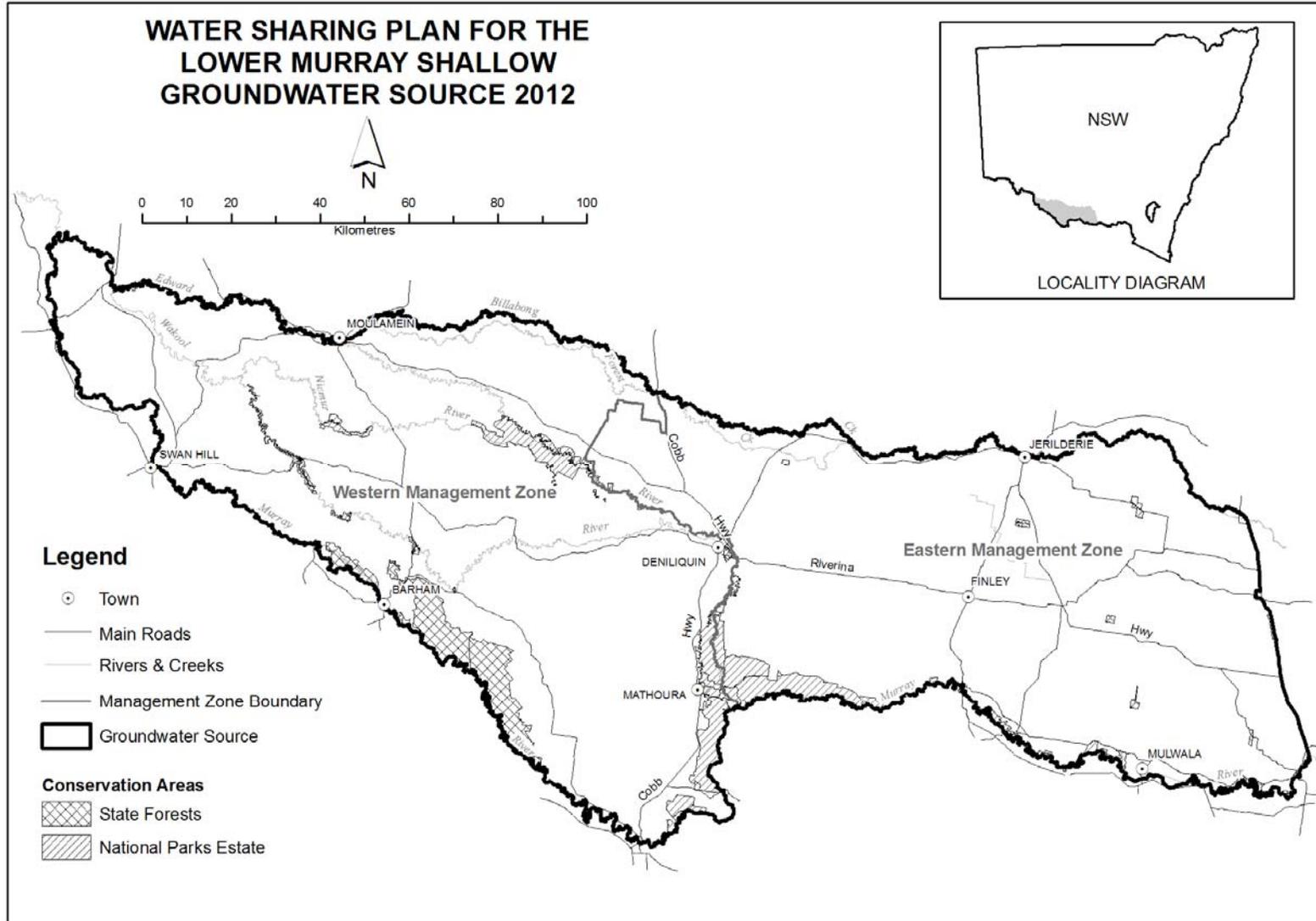
**Security:** The legal status and tenure of a right to access water. This includes the level and assurance that a water access entitlement will provide that which it specifies. Security thus includes the reliability of supply. The range of water access entitlement characteristics detailed in the National Water Initiative contributes to the security of a water access entitlement.

**Water sharing plan:** A plan made under the *Water Management Act 2000*, which sets out the rules for sharing water between the environment and water users within whole or part of a water management area or water source.

**Water year:** The 12 months running from 1 July to 30 June.

## Appendix 1: Water sharing plan area

Figure 1 Map of water sharing plan area



## Appendix 2: Interagency regional panel and support staff – current membership and expertise

Name	Agency	Role	Expertise
<b>Interagency regional panel</b>			
Tracey Brownbill	Office of Water	Agency representative/Chair	Grad. Dip. Water Science (Monash University), Bachelor of Science (University of Melbourne). 16 years experience in natural resource management, the last 6 years in water management.
Justen Simpson	Office of Environment and Heritage	Agency representative	Bachelor of Applied Science with Honours, University of Canberra. 25 years experience in natural resource policy and management. 12 years of Water Sharing Planning experience and last 5 years as the NSW Manager for Environmental Flow Delivery.
Giles Butler	Department of Primary Industries	Agency representative	Bachelor of Rural Science (University of New England). 18 years experience in agricultural and natural resource research development, extension and management. The last 6 years as Regional Director for the South West region, having a strong focus on water policy and natural resource management.
Patricia Bowen	Murray CMA	CMA observer	15 years experience in natural resource management through management roles with catchment management authorities and NSW natural resource and environmental departments.
<b>Support staff</b>			
Michelle Roe	Office of Water	Plan coordinator	Bachelor of Laws and Bachelor of Science (Griffith University). Ten years experience in natural resource management, the last five years in water management.
Kathryn Pender	Office of Water	Planning support	Bachelor of Science (University of Newcastle). 5 years experience in science education. 2 years in water management.
Frances Guest	Office of Water	Technical support (policy)	Bachelor of Science (University of Sydney), Bachelor of Arts (University of Sydney), Masters in Environmental Science and Law (University of Sydney), over 5 years experience in water resource management in NSW and Western Australia.
Nimal Kulatunga	Office of Water	Technical support (hydrogeology)	M.Sc. Hydrogeology (University of London), B.Sc. Geology (University of Peradeniya, Sri Lanka). 30 years experience in groundwater exploration and management.
Lindsay Holden	Office of Water	Technical support (licensing)	Licensing officer with local knowledge of water users, water use agreements, local access arrangements, reference points and implementation.
Greg Delmenico	Office of Water	Technical support (compliance)	Diploma Conservation Land Management, Diploma Government Investigations. 17 years working in the water industry last 10 years working in the Water Compliance area.
Adrian Smith	Department of Primary Industries	Technical support (irrigation)	B. Sc.Agr (Uni. Syd). Currently Irrigation Officer, NSW Dept. Primary Industries. More than 20 years involvement in NRM, environmental management, (irrigated) agricultural production and extension in southern NSW.

## Appendix 3: Reference materials

- Alamgir, M. 2011. Lower Murray Alluvium: Groundwater Management Area 016– Groundwater Status Report 2010, NSW Office of Water, Sydney.
- Bogoda, K.R., and Kulatunga, N. 1995. *Hydrogeology Study – Denimein LWMP*, Resource Assessment and Planning Unit, Department of Land and Water Conservation, Deniliquin.
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- Ecoseal. 2001. *Groundwater Management Model for GWMA 016*. Lower Murray Region.
- Murray CMA. 2007. *Catchment Action Plan*. Murray Catchment Management Authority. NSW.
- Murray CMA. 2010. *Wetlands of the Murray Catchment: An inventory of wetlands of the NSW Murray Catchment*. Murray Catchment Management Authority. NSW.
- MIL. 2008. *Total Farm Water Balance Policy – 1 December 2008*, Murray Irrigation Limited, Deniliquin.
- NOW. 2011. *Macro water sharing plans – the approach for groundwater. A report to assist community consultation*, NSW Office of Water, Sydney
- NOW. *Regional Groundwater Monitoring Network* (in development). A regional groundwater monitoring network used to monitor alluvial groundwater levels and assess stream / surface water connectivity. NSW Office of Water.
- NOW. *TRITON Water Quality database* (ongoing). State wide database holding all corporate water quality data. Data is available for most basic parameters (i.e. EC, pH, temp, TP, TN) for the majority of water sources. NSW Office of Water.
- PPK. 2000. *Identification of Groundwater Dependent Ecosystems within Groundwater Management Area (GWMA) 016*. PPK Environment & Infrastructure Pty Ltd. NSW.

## Appendix 4: Changes to water sharing rules as a result of targeted consultation and updated data

Change to water sharing rules	Justification
Provide the ability for the Minister to announce available water determinations of more than 100% to manage rising groundwater tables if required.	<p>Water level management in this water source is critical. Current policy is to manage growth in use by limiting available water determinations (AWDs) to the extent necessary to control growth in use if the LTAAEL is exceeded.</p> <p>In this case the best estimate of current average use (the LTAAEL) is equal to licensed entitlement, so growth in use with AWDs of 100% is highly unlikely. A bigger risk is that usage would be less than the LTAAEL on average and that there would be insufficient allocation in users accounts to help lower high water tables through pumping shallow groundwater.</p>
Include an additional restriction distance restriction for new or replacement bores located within 100m of an irrigation channel and for consistency increase the distance restriction from the top of the high bank or a river or stream.	The revised distance restrictions were consistent with existing distance restrictions.