



Office  
of Water

# Water Sharing Plan

## NSW Great Artesian Basin Shallow Groundwater Sources

### Background document



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The Office of Water is part of the NSW Department of Primary Industries. It 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.

The Office of Water also supports water utilities in the provision of water and sewerage services throughout New South Wales.

***Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources –  
Background document***

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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 the separation of land and water. In July 2004, 31 water sharing plans commenced in NSW, bringing these water sources and some 80 per cent of water extracted in the state under the management and licensing provisions of the *Water Management Act 2000*.

In recent years, water sharing plans for the unregulated<sup>1</sup> rivers and groundwater systems have been completed using a 'macro' or broader-scale river catchment or aquifer system approach.

Approximately 95 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, covers a particular type of aquifer, such as fractured rock, within that basin. These macro plans will generally apply to catchments or aquifers where there is less intensive water use compared with the areas that were covered by plans in 2004.

The Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources covers three groundwater sources.

The water sharing provisions that the plan focuses on are:

- environmental water provisions – the share of the water reserved for the environment
- the long-term annual average extraction limit for each water source
- access, dealing (trade) and work<sup>2</sup> approvals rules.

In developing the plan other water management tools were applied, including:

- available water determinations – for allocating water to access licence water accounts
- water allocation account management rules
- rules for granting access licences – the types of licences that may be granted
- rules for granting new and amending existing works, such as the types of set back conditions that are required
- mandatory conditions on access licences and water supply works approvals.

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

- the purpose of the statutory plan
- a physical description of the NSW Great Artesian Basin (GAB) Shallow groundwater sources
- the process of plan development including scope, history and basis for decisions
- the use of adaptive management
- the activities associated with implementation, monitoring and review of the plan.

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

<sup>2</sup> For groundwater, these work approvals are usually for bores.

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

- the *Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources* – a legal instrument written in its required statutory format
- *Water sharing plans – Inland NSW groundwater sources overview* – a plain English version of the plan explaining the key sections and rules
- rules summary sheets for each groundwater source detailing 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). Information available for download or viewing includes:

- *Macro water sharing plans - the approach for groundwater. A report to assist community consultation* – explains the macro approach to groundwater methodology, including assessment of risk and determination of sustainability indexes for aquifers,

## Purpose of the plan

### Why are water sharing plans being prepared?

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 the sharing of water must protect each water source and its dependent ecosystems and must protect basic landholder rights. For groundwater, basic landholder rights referred to in the plan are domestic and stock rights as defined in Section 52 of the *Water Management Act 2000*<sup>3</sup>. Sharing or extraction of water under any other right must not prejudice these. Therefore, licensed water users are 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* with land and water rights 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.

Together 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. Water sharing plans also define the access rules for commercial users for 10 years providing all users with greater certainty regarding sharing arrangements<sup>4</sup>.

### Benefits for water users

With the introduction of a water sharing 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 (dealing) and access rules which will help foster trading and
- 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.

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<sup>3</sup> Section 55 of the *Water Management Act 2000* also allows for native title holders to take and use water in the exercise of native title rights. At the time the plan was completed there were no native title rights to water held in the plan area.

<sup>4</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 seasonal and climatic conditions.

## Environmental considerations

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

Much of the groundwater within the area covered by the plan is protected from extraction. The total volume of water licensed for extraction in each water source is generally much less than the average annual recharge.

The plan also imposes new restrictions on access that may be applied to specific areas that need protection. Distance criteria are also used for any new water supply works such as bores and spear points that result in exclusion zones around any groundwater dependent ecosystems (GDEs) that require protection from extraction.



## Description of the plan area

The New South Wales GAB Shallow Groundwater Sources are located in the north west of the state and extend from the NSW borders with Queensland to the north, South Australia to the west and coincides with the underlying deeper NSW GAB Warrego, Central and Surat groundwater sources to the south and east. The plan area includes all water in all alluvials regardless of depth and all other geological formations to a maximum depth of 60 metres below the surface of the ground within the boundaries of the groundwater sources shown in the map contained in Appendix 1. Groundwater sources that are already included in other plans are explicitly excluded from these groundwater sources, namely those groundwater sources covered by the following plans:

- Castlereagh Unregulated and Alluvial Groundwater Sources
- Intersecting Streams Unregulated and Alluvial Water Sources
- Lower Gwydir Groundwater Source
- NSW Murray-Darling Basin Fractured Rock Groundwater Sources
- NSW Murray-Darling Basin Porous Rock Groundwater Sources
- North Western Unregulated and Fractured Rock Water Sources
- Upper and Lower Namoi Groundwater Sources

The plan also excludes mapped alluvials indicated on the registered map which will be covered by plans currently under development.

Appendix 1 includes a map of the area covered by the plan, showing each of the three groundwater sources. They are described below.

## New South Wales GAB Shallow groundwater sources

The three groundwater sources within the NSW GAB Shallow plan area are described below.

- The **GAB Central Shallow** groundwater source covers an area of 64,299 km<sup>2</sup>. It overlies the deeper NSW GAB Central groundwater source defined in the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008*. This groundwater source underlies north western NSW, where it extends southward from the Queensland border and east from the South Australian border to the Paroo River. It includes the towns of Tibooburra, Milparinka and Wanaaring and White Cliffs.
- The **GAB Surat Shallow** groundwater source covers an area of 64,301 km<sup>2</sup>. It overlies the deeper NSW GAB Surat groundwater source defined in the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008*. This groundwater source underlies much of north-eastern NSW, where it extends southward from Queensland to just north of Nyngan in the south west and to Goondoowindi in the north east. It includes the towns of Brewarrina, Lightning Ridge, Collarenebri, Walgett, Coonamble, Canoba, Garah, Moree, Bellata and Pilliga.
- The **GAB Warrego Shallow** groundwater source, covers an area of 33,843 km<sup>2</sup>. It overlies the deeper NSW GAB Warrego groundwater source defined in the *Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008*. This groundwater source lies between the two other NSW GAB Shallow groundwater sources and extends south of the Queensland border for approximately 300 kilometres. At its maximum width it is 360 kilometres from east to west. It includes the towns of Enngonia and Yantabulla.

Boundaries between the groundwater sources are based on those of the underlying GAB groundwater sources which are in turn based on hydrogeological considerations. The Paroo River forms the boundary between the GAB Central and GAB Warrego Shallow groundwater sources, while the Culgoa River forms the boundary between the GAB Surat and GAB Warrego Shallow groundwater sources.

The GAB shallow groundwater sources are part of a larger groundwater source which extends across state borders into Queensland, Northern Territory and South Australia. The plan area covers approximately 22 per cent of the area of NSW, 85 per cent of the deeper NSW GAB and 10 per cent of the total area of the GAB.

All of these groundwater sources exhibit similar geology and, hence, similar yields, water quality and potential uses. The NSW Surat Shallow groundwater source, however, contains more alluvial sediments. This is reflected in the rules in the plan.

The NSW GAB Shallow groundwater sources have two components – alluvium regardless of depth, and all other geological formations to a maximum depth of 60 metres below the ground surface.

The **alluvium** (or unconsolidated sediments) included in these groundwater sources consists of mainly floodplain and marshy environment deposits with occasional inter-layers of low to medium energy fluvial deposits with minor Aeolian and residual deposits of Tertiary to Quaternary period. These unconsolidated sediments are deposited on the eroded and weathered surface of Rolling Downs Group of formations of Albian age. The thickness of the unconsolidated sediments varies from a few meters to about 60 metres. They form sub-artesian aquifers which often produce brackish to saline groundwater, occasionally yielding potable water when bores are drilled near watercourses like creeks and rivers. The low yield and poor water quality make the groundwater suitable mainly for stock watering purposes.

The **other geological formations** included in this groundwater source are consolidated low permeable sediments (or confining rock) of the Rolling Down Group of Albian age. They consist of claystone, mudstone, calcrete and shale with minor inter-layers of conglomerate and sandstone. For administrative purposes, this element of the groundwater sources is defined as lying up to a depth of 60 metres below the surface of the ground. This confining rock forms subartesian aquifers which are sporadic and often produce low yielding brackish to saline groundwater. Fresh quality aquifers rarely occur in these sediments. The poor yield and water quality limit the potential uses of groundwater from these formations.

The major source of recharge to these groundwater sources is diffuse rainfall recharge. Some recharge also takes place as downward leakage from overlying rivers and also as upward leakage from the deeper NSW GAB Central, Surat and Warrego groundwater sources.

## Land use history

The land over the NSW GAB is mostly arid or semi-arid plains with few natural sources of permanent water. Vegetation types vary according to climatic and soil characteristics. Tussock grasslands and woodlands predominate in the eastern half of the Basin, with some patches of forest in the south east. The western half of the Basin is characterised by low woodland and shrubland.

The predominant land use is low intensity grazing on pastoral leases. Additional activities which occur in the NSW Surat Shallow groundwater source include irrigated agriculture, forestry and mining. The natural vegetation across the plan area has been significantly affected by the introduction of domestic animals and rabbits.

The springs and associated wetlands of the region were a source of sustenance for the numerous Aboriginal tribal groups with these lands, often serving as clan meeting places, and have an important

place in the Dreaming. Whilst these springs travel through the GAB Shallow groundwater sources, they originate in the deeper GAB groundwater sources.

In the late 1860s with the arrival of the pioneering pastoralists, Aboriginal people were displaced as the landscapes were transformed for grazing and agricultural purposes.

From this time, the sinking of artesian bores into the high yielding deeper GAB groundwater sources and associated availability of water triggered western settlement of NSW and the development of pastoral enterprises. Large stations became established in the area, and the introduction of riverboats increased the number of people moving to the area. Indigenous people were employed as stockmen, farmhands, or domestic help on stations and also as timber cutters for pastoral progress and to fuel fires on the steamboats which were beginning to ply their trade up and down the Darling River.

Today the area is made up of large pastoral stations, which occupy all the leasehold land in the western part of the plan area and irrigation development concentrated to the east and southern sections of the plan area.

There are areas within the plan area that remain under native vegetation and some of these are protected as National Park or Nature Reserves. In particular, the far north-west corner of NSW is protected as the Sturt National Park, whilst the Paroo River wetland system, including the Ramsar listed Peery Lake, is located between White Cliffs and Wilcannia and is protected within the Paroo-Darling National Park. Parts of the Ramsar listed Macquarie and Gwydir wetlands also fall in the plan area and are protected in the Macquarie Marshes Nature Reserve and State Conservation Area and the Gwydir State Conservation Area. Also of note is the vegetation of the Pilliga Forest, the largest native forest in inland NSW, located between Coonabarabran and Narrabri. It is protected in the Pilliga West State Conservation Area and Pilliga and Pilliga West National Parks, all of which are within the GAB Shallow plan area.

Agriculture is the largest user of GAB Shallow groundwater. Much of the land use overlying these water sources, however, relies on water from other water sources in the same geographic area, particularly the reliable good quality water of the deep GAB groundwater sources.

The pastoral industry presently accounts for approximately 99 per cent of the total GAB Shallow groundwater use. Other smaller volumes of water are used for irrigation, industrial purposes, mining and town water supply.

## Climate

The plan covers approximately 162,443 km<sup>2</sup> or 22 per cent of NSW. Given the extent of the plan, the climate is varied and only discussed in the most general terms in this document.

The north-western catchments of NSW experience a semi-arid climate characterised by hot dry summers and milder dry winters. Rainfall generally is highest in the summer months and lowest from April to September. Average annual rainfall ranges from about 600 millimetres in the east to less than 150 millimetres in the far west, but is significantly variable.

## Entitlement and use

There are approximately 31 water licences in the area covered by the plan, totaling 5,079 megalitres a year (ML/year) of entitlement (see Table 1). The vast majority of these are for stock and domestic purposes, with small volumes used for other purposes. Licensed entitlement in the GAB Shallow groundwater sources is a small fraction of the sustainable yield.

The plan allows for changes to these figures as a result of the granting, issuing or cancellation of licences, the variation of local water utility licences or changes due to the conversion of *Water Act 1912* entitlements that are currently non-volumetric. At the time of writing, there were 28 such licences, requiring conversion, which are excluded from the figures in Table 1 below.

**Table 1 Total entitlement and approximate number of licences for each groundwater source**

Groundwater Source	Entitlement (unit shares)	Approximate number of existing licences
GAB Central Shallow	11	6
GAB Surat Shallow	5,068	25
GAB Warrego Shallow	146	1
<b>Total</b>	<b>5,225</b>	<b>32</b>

Extraction for basic landholder rights is the major use of water from the GAB Shallow groundwater sources. As a licence is not required for this extraction, estimates of basic landholder rights for stock and domestic purposes are shown separately in Table 2. These estimates were based on approximately five per cent of the water needs of these users across the deeper NSW GAB groundwater sources.

**Table 2 Total estimated requirements of domestic and stocks rights for each groundwater source**

Groundwater Source	Estimated requirements (ML/year)
GAB Central Shallow	1,162
GAB Surat Shallow	978
GAB Warrego Shallow	650
<b>Total</b>	<b>2,790</b>

## Local water utility requirements

Extraction for town water supplies currently only occurs in the NSW GAB Central Shallow groundwater source, where one licence with an entitlement of 146 ML/year has been issued to support the township of Tibooburra's water needs.

## Developing the plan

### Scope of the plan

For the purposes of water planning in NSW, aquifer types have been grouped into four basic categories:

- Porous rock aquifers found in rock formations such as sandstone, siltstone or conglomerate. Groundwater occurs within the pore space in the rock matrix.
- Fractured rock aquifers found in rock formations such as granite, basalt, meta-sediments and limestone. Groundwater in these rocks occurs mainly within the fractures and joints as well as in solution channels in limestone.
- Coastal sand aquifers, where groundwater is contained in the pore spaces in the unconsolidated sand sediments.
- Alluvial aquifers, where groundwater is contained in the pore spaces in the unconsolidated floodplain material.

All groundwater sources covered by this plan contain a combination of porous rock and alluvial aquifers. The connectivity characteristics of these groundwater sources are given in Table 3. It is based on principles and recommendations in *Towards a National Framework for Managing the Impacts of Groundwater and Surface Water Interaction in Australia* by Sinclair Knight Merz (2006). When developing the plan, the level of connectivity, the relative level of impact and the timing of connection between the surface water and aquifers has been considered. Those aquifer types that have a significant level of connection and a high possibility of impact on the instream values of the related surface water system generally have rules developed that specifically consider this connection.

**Table 3 Connectivity between aquifer types and surface water**

Aquifer type	Level of connection between surface and groundwater	Level of impact on instream values	Estimated travel time between groundwater and unregulated river
Porous Rock	Low – moderate	Low since not major contributor	Years to decades
Alluvial aquifers	Low – moderate	Low since not major contributor	Years to decades

### Water management units

The plan covers a number of **water management areas** including the Border Rivers, Central West, Gwydir, Namoi and Western. 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 planning units to which the plan provisions may apply. Some surface water sharing plans include **extraction management units**. These are the highest management unit in which rules apply. They may be as large as a water management area but with different boundaries to a water management area and they cover one or several water sources. Extraction management units are usually defined for the purpose of establishing a geographic area over which the long-term average annual extraction limit (LTAAEL) for surface water applies. The plan does not establish extraction management units.

The highest level of managements unit described in this plan is the **water source**. There are three water sources established in the plan. Water sources in this context are one or more places where

water occurs naturally below the surface of the ground. These have 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 and trading rules are also generally applied at the water source level. The spatial extent of the water sources in this plan is shown in Appendix 1.

A water **management zone** is the next level down in the planning unit hierarchy and is part of a water source and is the level at which more refined implementation of access or trading rules are applied. There are no water management zones in this plan.

The plan provides for groundwater sources and management zones to be changed during the life of the plan.

## Project groups

### State Interagency Panel

The State Interagency Panel has overall responsibility for the statewide 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 statewide significance.

The State Interagency Panel is chaired by the NSW Office of Water. The group has representatives from the Office of Water, the NSW Office of Environment and Heritage (OEH) and agriculture, fisheries and aquaculture specialists from the NSW Department of Primary Industries (DPI). There are also three catchment management authority (CMA) representatives. The Office of Water is responsible for the overall project management.

### State Groundwater Panel

The plan rules have been recommended by the State Groundwater Panel. This is an interagency group consisting of representatives from the Office of Water, OEH, DPI and CMAs. Appendix 2 lists the names of the State Groundwater Panel representatives and their areas of expertise. The State Groundwater Panel had access to staff from the agencies to provide technical and scientific information. The key roles of the State Groundwater Panel were to review, and where appropriate modify the outcomes of the regional assessment and the proposed groundwater sharing rules produced by the regional working groups to ensure integration and overall consistency across groundwater sources.

Because this plan covers only groundwater and no surface water sources, it was reviewed and endorsed only by the State Groundwater Panel and not by the State Interagency Panel.

### Regional Assessment Working Groups

The regional assessment working groups used local knowledge and expertise to do a risk assessment for each groundwater source in their region and propose plan provisions. Long-term average annual extraction limits and water reserved for the environment were defined based on these risk assessments. These assessments and the plan provisions were reviewed by 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 an intergovernmental agreement, the National Water Initiative, which 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, the need to service rural and urban communities, and 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 (refer to the National Water Commission website [www.nwc.gov.au](http://www.nwc.gov.au) in the Water Reform section for details). 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 National Water Initiative sets outcomes, guidelines and timelines for water plans and planning processes. The National Water Commission (NWC) 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 on implementing the National Water Initiative.

### Natural Resources Commission

The macro water sharing plans also comply with the NSW Natural Resources Commission statewide standards and contribute to the relevant statewide targets such as Targets 5 and 6 (see [www.nrc.nsw.gov.au](http://www.nrc.nsw.gov.au) for details) which is a requirement of the State Plan, Priority E4 (see [www.nsw.gov.au/stateplan](http://www.nsw.gov.au/stateplan) for details). The Natural Resources Commission was established in 2003 to provide the NSW Government with independent advice on natural resource management issues. To achieve this it has developed and recommended a Standard for Quality Natural Resource Management and 13 statewide targets for natural resource management in NSW, which have been embedded in the NSW State 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 Natural Resources Commission reviews water sharing plans against this Standard and its associated targets.

**Table 4 Contribution of the plan to the relevant Natural Resources Commission statewide targets**

Relevant statewide target	Contribution by water sharing plan
By 2015 there is an increase in the recovery of threatened species populations and ecological communities (Target 3)	Rules developed to help protect specific groundwater dependent ecosystems (GDEs).
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 which protect significant GDEs
By 2015 there is an improvement in the condition of important wetlands, and the extent of those wetlands is maintained (Target 8)	Rules developed to help protect specific GDEs, including wetlands.
Natural resource decisions contribute to improving or maintaining economic sustainability and social well-being (Target 12)	Plans provide a defined share of water and defined security of access. Water markets encourage movement of water licences to high-value uses. Rules developed based on risk assessment which considered community dependence on water extraction.

### Catchment action plan

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

- Border Rivers / Gwydir Catchment Action Plan, June 2006, Border Rivers Gwydir Catchment Management Authority, [www.brg.cma.nsw.gov.au](http://www.brg.cma.nsw.gov.au)
- Central West Catchment Action Plan, February 2007, Central West Catchment Management Authority, [www.cw.cma.nsw.gov.au](http://www.cw.cma.nsw.gov.au)
- Namoi Catchment Action Plan, January 2007, Namoi Catchment Management Authority, [www.namoi.cma.nsw.gov.au](http://www.namoi.cma.nsw.gov.au)
- Western Catchment Action Plan, January 2007, Western Catchment Management Authority, [www.western.cma.nsw.gov.au](http://www.western.cma.nsw.gov.au)

One of the CMAs responsibilities, as observer, is to provide the State Groundwater Panel with advice on the alignment of the proposed classification and extraction limits and rules with the priorities in their catchment action plan.

### Basin Plan

The Commonwealth *Water Act 2007* requires the Murray-Darling Basin Authority (MDBA) to prepare and oversee a Basin Plan. This 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 the sustainable diversion limits come into effect, they will set limits on the taking of both groundwater and surface water from the Basin.

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

## Other considerations

### Protecting Aboriginal values

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

Aboriginal communities have indicated that water sharing rules should protect natural instream values and groundwater dependent ecosystems. Whilst Aboriginal groups acknowledge the rights of commercial water users, they believe that this entitlement should not be at the expense of the environment or cultural values. In their view, the priority for water sharing plans should be to provide for natural flowing rivers with healthy aquatic biodiversity and groundwater dependent ecosystems. This is consistent with the proposed provisions of the plan.

Further opportunities for granting licences for Aboriginal cultural purposes using water of the GAB shallow groundwater sources are included in the plan. These can be used for purposes such as manufacturing traditional artefacts, hunting, fishing, gathering, recreation and ceremonial purposes. Further meetings are planned with the Aboriginal community following the public exhibition period to inform future plan reviews.

For more information, see the fact sheet *Macro water sharing plans. Information for Aboriginal water users* and the detailed information on the program, *Facilitating the engagement of the Aboriginal Community in the New South Wales water sharing planning*, which are both available on the Office of Water website at [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

### Key environmental assets

There are a number of significant environmental assets within the GAB shallow groundwater source plan area, some of which are sensitive to water extraction. A list of the high priority groundwater dependent ecosystems (GDEs), such as springs, wetlands and vegetation communities is included in the plan (see Appendix 4 of this document). The plan provides for changes to be made during this list during the life of the plan.

The plan sets out specific provisions for protection of the listed GDEs. These and other environmental assets were also considered when assessing the environmental value of the groundwater source and its risk from extraction when determining the long term average annual extraction limit for each water source.

It is recognised that there are varying levels of risk to aquifers from groundwater extraction across the plan area. This is reflected in the rules which set different minimum distance conditions for extraction from GDEs across the three groundwater sources.

### Key economic and social assets

The plan recognises the economic benefits to the region that are generated by commercial users such as irrigators and industry. There are varying levels of community dependence on access to

groundwater across the plan area. This is largely a reflection of the availability of alternative sources of water (e.g. regulated rivers and unregulated rivers in the east of the plan area and water from the deeper NSW GAB basin). Accordingly, larger portions of the recharge are available for extraction in the two western groundwater sources, (as compared to the GAB Shallow Surat groundwater source).

Table 5 summarises the social and economic assessment for the GAB Shallow groundwater sources.

**Table 5 Water sources with a high risk to financial and/or social assets**

Groundwater source	Factors considered that rate the risk as high
GAB Central groundwater source GAB Warrego Groundwater source	The risk to security of access from extraction is considered <b>moderate</b> as there is no access to regulated or unregulated supplies. There is no reticulated water and limited availability for on-farm storage. The risk to dependence on groundwater usage is considered <b>low</b> as there is limited entitlement in relation to annual recharge.
GAB Surat groundwater source	The risk to security of access from extraction is considered <b>low</b> as there are alternative sources of water available for much of the groundwater source. There is no reticulated water and limited availability for on-farm storage. The risk to dependence on groundwater usage is considered <b>low</b> as there is limited entitlement in relation to annual recharge.

### Protecting basic landholder rights

For groundwater, basic landholder rights (BLR) includes water for domestic and stock purposes which is extracted from any aquifer underlying the landholder's property. It also includes water extracted for native title purposes. Under Section 52 of the *Water Management Act 2000*, groundwater may be extracted to meet defined domestic and stock purposes without a licence, although the work (usually a bore) must still be approved by the NSW Office of Water.

The principles of the *Water Management Act 2000* also require that water sharing must protect BLR. The plan does this by including an estimate of the water requirements for domestic and stock users (see Table 2). There are currently no extractions to provide for native title rights. However, these rights may be activated during the term of the water sharing plan. Further, there are usually less stringent rules applying to works in the plan for BLR users compared with the rules for other extraction.

Domestic and stock rights can be restricted by the Minister under Section 324 of the *Water Management Act 2000*, for instance, to protect the environment or public health, or to preserve existing basic landholder rights. These restrictions are outside the framework of the plan. The NSW Office of Water is also developing a 'reasonable use guideline' which will limit extractions under domestic and stock rights to a reasonable volume and more clearly define what is considered to be a reasonable purpose, which is important where these extractions are not metered.

### 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.

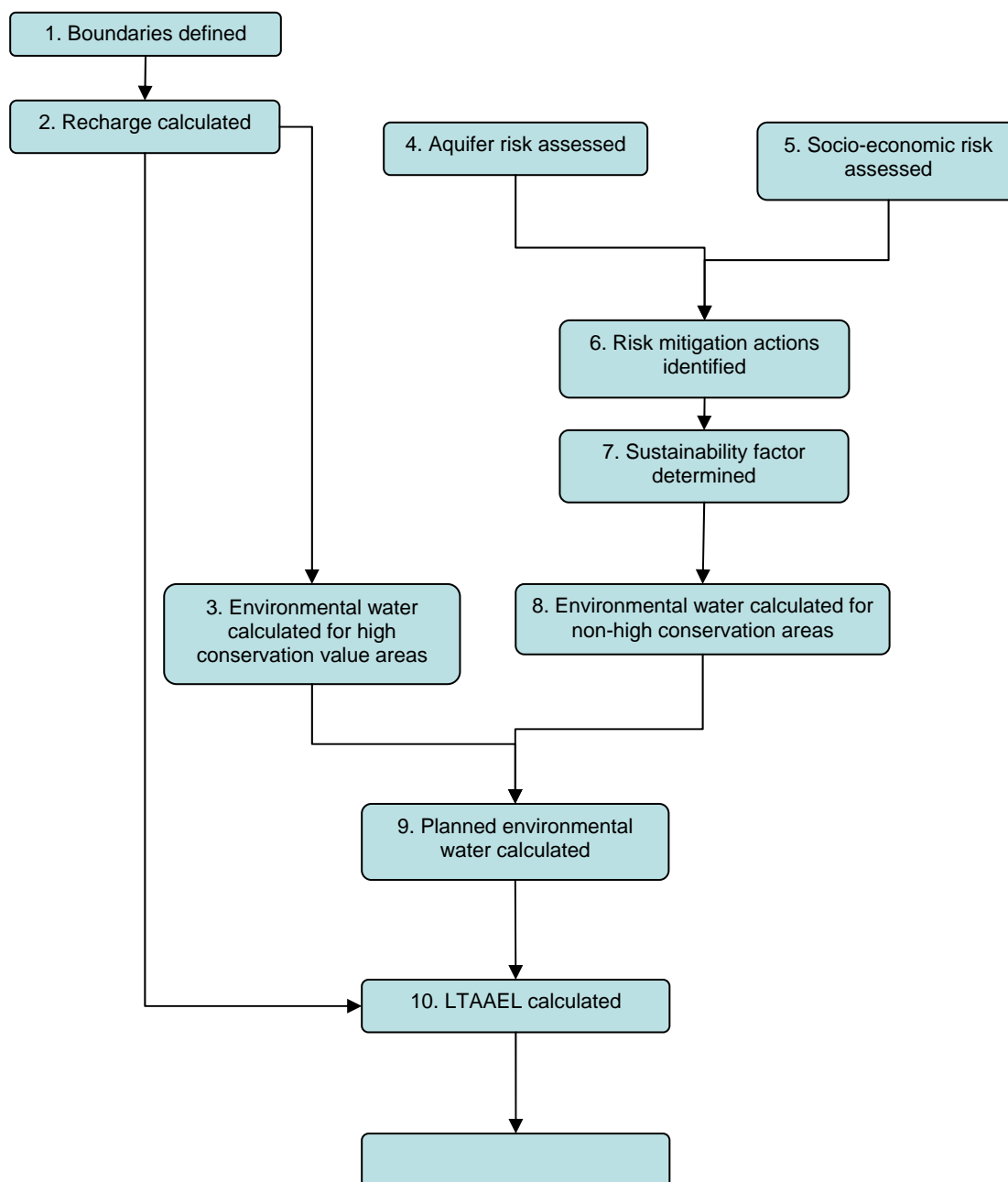
## Rules for groundwater sources

### Risk assessment approach to determining sustainable limits

The plan was developed based on the groundwater ‘macro planning’ risk assessment process. This is the current approach of the NSW Office of Water to developing water sharing plans and is described in *Macro water sharing plans - the approach for groundwater. A report to assist community consultation*. The macro approach is a risk-based approach based on best available information that gave a relative assessment for groundwater sources and provided the basis for rules for water access and for managing water supply works that relate to groundwater extraction. The process used assessments (‘high’, ‘moderate’ and ‘low’) to indicate different levels of risk. The adopted approach helped to clarify a range of values and risks, indicating where an optimal balance might be between extraction and retention of groundwater recharge in an aquifer to meet environmental needs. In some areas, natural assets need strong protection; in others there is more socio-economic reliance on groundwater for extraction. The broad scale relative assessments allowed the most appropriate provisions to be developed for inclusion in water sharing plans.

The environmental values of the three NSW GAB Shallow groundwater sources were weighed up against the socio-economic dependence and consideration given to actions that could reduce the risk to those environmental values. As a result, a ‘sustainability index’ was determined for each of these groundwater sources. This factor then went towards determining the volume of average annual recharge to each aquifer which is reserved as environmental water and the volume which may be available for extraction. Rules were also then developed for the water source and endorsed by the State Groundwater Panel. An outline of the risk assessment process for groundwater is detailed in Figure 1.

Figure 1 Macro planning groundwater risk assessment process



## Recharge calculations

Recharge is the volume of water that infiltrates into an aquifer. It is expressed as a volume in megalitres per year (ML/year). Recharge usually comes from rainfall and from surface water, such as river flows. The recharge calculations for all of the NSW GAB shallow groundwater sources are based solely on rainfall recharge. This approach recognises the relatively minor contribution of other sources of recharge, such as river recharge or upward recharge from the underlying NSW GAB groundwater sources, to the groundwater sources covered by this plan. It is calculated based on a percent of infiltration of average annual rainfall over the water source area. This approach is precautionary and goes towards the determination of the volume of groundwater reserved as planned environmental water and the volume that is potentially available for extraction in each groundwater source.

The average annual rainfall recharge volumes for the NSW GAB shallow groundwater sources are displayed in Table 6. The recharge figure for high conservation value areas within each of the groundwater sources is treated separately from the rest of the recharge in that 100 per cent of this recharge is reserved as planned environmental water, while the percentage of the recharge, for the remainder of the water source that is reserved as environmental water is determined by the sustainability factor.

**Table 6 Average annual recharge for the NSW GAB Shallow Groundwater Sources**

Water Source	Area (km2)^	Average annual rainfall (mm/yr)	Infiltration rate (%)	High environmental value areas Estimated average annual rainfall recharge (ML/yr)	Non-high environmental value areas Estimated average annual rainfall recharge (ML/yr)	Total estimated average annual rainfall recharge (ML/yr)#
GAB Central Shallow	64,299	202	2	17,187	242,587	259,775
GAB Surat Shallow	64,301	454	2	10,671	573,338	584,009
GAB Warrego Shallow	33,843	297	2	8,017	192,850	200,867
<b>Total</b>	<b>162,443</b>			<b>35,875</b>	<b>1,008,775</b>	<b>1,044,651</b>

Notes:

1. Average annual rainfall recharge (ML/year) = [(water source area (ha) x mean rainfall (mm))/100] x % infiltration rate.
2. For the purposes of defining recharge, high environmental value areas include national parks, nature reserves, historic sites, Aboriginal sites, state conservation areas and Karst conservation areas.

## Risk assessment

The aquifer risk assessment considered the risk that groundwater extraction placed on the groundwater source and its high priority groundwater dependent ecosystems and identified risks to ecological, water quality and aquifer integrity assets. The socio-economic risk assessment looked at the dependence of local communities on groundwater extraction in terms of the risk to financial and sociological assets. An overall risk valuation was attained for the groundwater source, which is equal to the highest value attained on any criterion, less any mitigation measures.

Mitigation measures, applied through rules in the water sharing plan, can reduce the impact of extraction on a groundwater source. For example, a groundwater source which is at high environmental risk may have its risk reduced to moderate if the effect of extraction can be successfully mitigated. Mitigation measures were not applied to any of the groundwater sources.

General details of the risk assessment process are presented in the report *Macro water sharing plans - the approach for groundwater. A report to assist community consultation*, available on the NSW Office of Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au).

## Sustainability factor

The recharge volume calculated for the area outside the high environmental value areas of each groundwater source is split between the environment and water potentially available for extraction. The sustainability factor was based on a matrix and determined the percentage of recharge in these parts of each groundwater source that was reserved as planned environmental water. The remaining

percentage in the non-high conservation area was included in the long-term average annual extraction limit (LTAAEL), that is, the volume potentially available for extraction.

The sustainability factors for the groundwater sources covered by the plan are in Figure 2.

**Figure 2 Sustainability factors for the NSW GAB shallow groundwater sources**

High environmental risk	5%	25%	50%
Moderate environmental risk	25% GAB Surat Shallow	50%	60%
Low environmental risk	50%	60% GAB Central Shallow GAB Warrego Shallow	70%
	Low socio-economic risk	Moderate socio-economic risk	High socio-economic risk

## Defining planned environmental water

Planned environmental water is derived from the average annual rainfall recharge volumes and storage volumes. A percentage of rainfall recharge from the high environmental value areas (in this plan 100 per cent) has been added to a percentage of rainfall recharge from the non-high environmental value areas (dependent on the sustainability factor) for each water source. In addition, 100 per cent of the total volume in storage has been reserved as planned environmental water. Details of the planned environmental water reserved for each water source in the plan are in Table 7.

### Annual rainfall recharge reserved in high environmental value areas

Groundwater extraction is generally not permitted in areas such as national parks and reserves to ensure protection of groundwater dependent ecosystems. The approach to restrict extraction and reserve the annual rainfall recharge volumes as planned environmental water in these high environmental value areas is consistent with the precautionary principle.

### Annual rainfall recharge reserved in non-high environmental value areas

Following the results of the risk assessment each groundwater source was placed in the sustainability matrix to provide the percentage of recharge in the non-high environmental value areas to be reserved as planned environmental water. This percentage is 100 minus the sustainability factor percentage.

A minimum 30 per cent to a maximum 95 per cent of the long term average annual rainfall recharge volume in the non-high environmental value area of each groundwater source may be reserved as planned environmental water for a groundwater source depending on the outcomes of the risk assessment. This builds on the original *NSW Groundwater Dependent Ecosystem Policy (2002)* which recommended a minimum of 30 per cent.

In the plan a minimum of 40 per cent and a maximum of 75 per cent of the rainfall recharge has been reserved as planned environmental water in the non-high environmental value areas.

**Table 7 Planned environmental water from rainfall recharge for the NSW GAB shallow groundwater sources**

Water source	High environmental value areas Average annual rainfall recharge (ML/yr)	% of average annual rainfall recharge from high environmental value areas reserved for the environment	Non-high environmental value areas Average annual rainfall recharge (ML/yr)	% of average annual rainfall recharge from non-high environmental value areas reserved for the environment	Total Planned Environmental Water (ML/yr)
	Column (a)	Column (b)	Column (c)	Column (d)	[a x b] + [c x d]
GAB Central Shallow	17,187	100	242,587	40	114,222
GAB Surat Shallow	10,671	100	573,338	75	440,675
GAB Warrego Shallow	8,017	100	192,850	40	85,157
<b>Total</b>	<b>35,875</b>		<b>1,008,775</b>		<b>640,054</b>

## Defining the long-term average annual extraction limit

The percentage 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); this is the estimated sustainable limit for each of the water sources. The LTAAEL for the groundwater sources in the NSW GAB Shallow is set out in Table 8. The LTAAEL was calculated by applying the sustainability factor derived from the risk assessment process, which determined the percentage of the average annual rainfall recharge over the non-high environmental areas that can be potentially made available for extraction.

**Table 8 LTAAEL for the NSW GAB shallow groundwater sources**

Water source	High environmental value areas Average annual rainfall recharge (ML/yr)	% of average annual rainfall recharge from high environmental value areas made available for possible extraction	Non-high environmental value areas Average annual rainfall recharge (ML/yr)	Sustainability factor (% of average annual rainfall recharge non-high environmental value areas made available for possible extraction)	LTAAEL (ML/year)
	Column (a)	Column (b)	Column (c)	Column (d)	[a x b] + [c x d]
GAB Central Shallow	17,187	0	242,587	60	145,552
GAB Surat Shallow	10,671	0	573,338	25	143,335
GAB Warrego Shallow	8,017	0	192,850	60	115,710
<b>Total</b>	<b>35,875</b>		<b>1,008,775</b>		<b>404,597</b>

## Water sharing rules

### Managing extraction to the LTAAEL

Total extractions in the groundwater sources are managed to the LTAAEL and the long-term groundwater storage extraction limit. A growth in use response will be triggered if average annual usage over a three year period in a water source exceeds the LTAAEL by more than five percent. Growth in use is managed through a reduction (from 100 per cent) in the available water determination for aquifer access licences in the water source. The AWD will be reduced by an amount necessary to return total water extractions to the LTAAEL.

### Unassigned water

Unassigned water is the water potentially available for extraction under the LTAAEL that is not yet allocated to an access licence and not estimated to be required to meet current and potential future priority requirements for extraction such as basic landholder rights extraction, extractions by specific purpose access licences such as major and local utilities (town and urban water supply) and Aboriginal cultural or other exemptions under the *Water Management Act 2000*.

Without other constraints, the unassigned water component in some groundwater sources could theoretically become fully assigned to new entitlements by the fifth year of the plan. To avoid this occurring, a staged process for any release of new entitlements has been developed for those systems that have a defined volume of unassigned water.

There will be no unassigned water made available through the controlled allocation process where entitlements plus basic landholders' rights equal 90 per cent or more of the LTAAEL. In groundwater sources where total entitlement plus basic landholder rights is less than 90 per cent there may be trading in existing water entitlement. However, in these water sources there is also the potential for the Minister to issue new entitlement through a controlled allocations order under the *Water Management Act 2000*.

The current and potential future priority requirements for extraction must be accounted for (including an estimate for growth) before defining the amount that could be released as a controlled allocation. Any increase in these priority requirements over and above the LTAAEL must be met through a reduction in available water determinations to aquifer access licences. Estimating and reserving water to meet future priority requirements before releasing water through any controlled allocation will prevent over-allocation or sending misleading signals to the water market.

In water sources, such as the NSW GAB Shallow groundwater source, that, after consideration of current and future priority requirements, have unassigned water only a percentage of this volume may be release through the controlled allocation process before a review is initiated. The trigger for the review is based on the sustainability factor determined through the risk assessment for each water source. The review required will be a review of recharge, environmental needs and priority extraction requirements. That is, the percentage of unassigned water that can be allocated under a controlled allocation before a review is equal to the sustainability factor for that water source. Unassigned water allocated below the trigger is considered a low risk of controlled allocation creating unsustainable levels of licensed entitlement. Controlled allocation above the trigger is a more uncertain risk of over-allocation and a review will therefore be undertaken before additional controlled allocations are made.



## Aquifer interference

Activities which intersect or 'interfere with' an aquifer may involve:

- the extraction of groundwater that flows into a void to allow the activity to operate safely. This is often called de-watering, and the water extracted is often referred to as 'incidental groundwater'
- other impacts resulting from the intersection of the aquifer, such as changes to groundwater flow paths and gradients, subsidence, compaction of the aquifer structure, and artificial aquifer recharge.

Volumes of water incidentally taken in the course of aquifer interference activities, such as the water intercepted during mining operations, have in the past required a licence under the *Water Act 1912*.

Operators of these activities will continue to be required to hold an access licence under the *Water Management Act 2000* and sufficient account volume to account for incidental water taken. This includes activities where extraction associated with aquifer interference activity was occurring at the commencement of the plan.

## Protecting environmental values and groundwater dependent ecosystems

The groundwater reserved for the environment, or 'planned environmental water' has been detailed above in the section titled *Defining planned environmental water*. This is part of the defined environmental water in the plan. All of the aquifer storage volumes in NSW GAB Shallow groundwater sources are also reserved for the environment.

The plan also includes a number of additional provisions that protect environmental assets. These include the identification of high priority (high conservation value) groundwater dependent ecosystems (GDEs). These GDEs are listed in schedules to the plan. The GDE lists were developed through an interagency expert panel which included karst, wetlands, vegetation and groundwater experts.

The GDE schedules may be updated after gazettal of the plan. Additional protection for these identified GDEs and for protecting base flow in connected rivers is afforded through specific rules for granting or amending water supply works approvals. See section titled '*Water supply works approvals*' for detail. The distance rules cover new or replacement works such as bores, and stipulate a minimum distance these works are required to be located from high priority GDEs or the associated river.

There are also powers in Section 324 of the *Water Management Act 2000* for managing the environmental impacts of existing works within these groundwater sources, such as high priority GDEs.

## Water supply works approvals

The plan contains rules for granting or amending water supply work approvals and the management of existing works for groundwater sources. These rules determine where water supply works can be located and how existing works may be managed where they are already within the distance restriction. For new and replacement works there are rules to:

- minimise interference between neighbouring works
- locate works away from contaminated sites
- protect water levels for high priority GDEs
- protect groundwater dependent culturally significant sites and
- manage surface and groundwater connectivity.

Note also that powers in Section 324 of the *Water Management Act 2000* can be used to manage temporary local impacts on new and existing works.

The development of rules for the granting or amending of water supply works and management of existing works has followed a two-stage process:

- Stage 1: regional staff identified draft recommendations for rules; and
- Stage 2: the State Groundwater Panel reviewed the regional recommendations and recommended rules which were consistent across groundwater aquifers in the state.

Note that while there is a need for consistency across aquifer types, a change to the rules may have been warranted to cater for local conditions.

This work was reviewed and reconsidered in light of the significant progress made on rules development by the State Groundwater Panel, as a result of the development of draft water sharing plans in other areas of the state.

For details about the proposed rules for water supply works approvals for each groundwater source covered by the plan, refer to individual rule summary sheets or the plan document.

## Managing connectivity and access rules

Groundwater and surface waters are inextricably linked. The actual connections between surface and groundwater systems vary significantly between systems. For example, surface water recharging alluvial aquifers may emerge again at a discharge point in the river within hours. In contrast, water recharging aquifers in other types of groundwater systems may not discharge to streams for many years or decades. The connection characteristics need to be considered in linking surface water and groundwater planning, because in some cases, the same water is being accessed.

All groundwater sources within the plan are considered to have a relatively low connection to the surface waters in the same areas.

## Available water determinations

Available water determinations are primarily used to credit water into a licence's water allocation account. The AWD for groundwater access licences in all the groundwater sources in the plan is one megalitre per unit share, that is, 100 per cent of entitlement, unless a growth-in-use response is required. If a growth-in-use response is required, the AWD will be reduced by the amount necessary to return the total water extraction to the LTAAEL.

## Carryover and water accounts

The plan sets out rules for the maximum volume of water that can be carried over from one water year to the next (see Table 9). Differences across groundwater sources reflect variations in the extent of alluvial material contained within the groundwater source.

**Table 9 Carry over limits for NSW GAB Shallow groundwater sources**

Water source	Maximum carryover permitted (% unit shares)
GAB Central Shallow	10
GAB Surat Shallow	25
GAB Warrego Shallow	10

Carryover is prohibited in allocation accounts for access licences that are for domestic and stock, local water utility, and salinity and water table management in all water sources covered by this plan.

## **Trading of access entitlement**

The water market is an effective and equitable way to reallocate water between users. Trading can occur either on a permanent or temporary basis. 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 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 existing users.

In most groundwater sources trading is allowed within a groundwater source, but no trading is allowed into or out of the groundwater source. Within this plan, however, trading is permitted between the GAB Central Shallow and GAB Warrego Shallow groundwater sources in recognition of the hydrological connection between the two groundwater sources. Trade that results in conversions of an access licence of one category to another category is prohibited except where permitted under the Minister's Access Licence Dealing Principles, and trade that results in interstate transfer and assignment of water allocations to or from these groundwater sources is permitted provided administrative arrangements have been agreed to and implemented by the states.

## Consultation

While developing the plan, the participating agencies (the NSW Office of Water, OEH, DPI and the CMAs) identified areas where better data was needed for making future water planning decisions. This input was essential in the finalisation of the plan.

With the CMA's support, 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 looked for stakeholders to provide:

- local knowledge and expertise – for example, there may have been other natural or socio-economic values that had not yet been considered by the State Groundwater Panel
- feedback on the practical elements of the proposed water sharing rules - to make certain they are easily implemented by the licence holders
- confirmation that there are no unintended outcomes from the plan – it was essential that this was given due consideration before the plan was finalised.

## Public exhibition of the draft water sharing plan

Public exhibition of the proposed water sharing plan was held from 6 December 2010 until 29 April 2011. The objectives of this consultation were to:

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

A public meeting was held on 4 April in Walgett to inform stakeholders of the draft rules and how they could make a submission. A total of four submissions on the draft plan were received as a result of the public exhibition, half of which were for both this plan and other plans also on public exhibition. These were reviewed by Office of Water staff and changes were made to the draft water sharing rules where appropriate.

## Refining water sharing rules as a result of public exhibition

Office of Water staff reviewed all the submissions and the matters raised at the meetings and, consequently made some changes to the initial draft water sharing rules. During this review process, submissions were incorporated into the assessment process. The State Groundwater Panel was not involved in this review process as the matters raised were not of a nature that required their input.

Table 10 outlines the changes to the proposed rules as a result of this consultative process as well as the inclusion of new data.

**Table 10 Changes to water sharing rules as a result of targeted consultation and updated data**

<b>Groundwater source</b>	<b>Change to water sharing rules</b>	<b>Justification</b>
General plan	Change in plan name (clause 1)	Change in plan name to improve clarity about the nature and geographical extent of groundwater sources included in the plan.
All groundwater sources	Amendment to the groundwater source definitions (clause 4).	These definitions more accurately describe the extent of the groundwater sources included in this plan.
General plan	Expansion of the list of groundwater sources excluded from this plan (clause 4)	Exclusions identify new water sharing plans which have been gazetted in the past 6 months, reflecting the progressive development of plans across NSW.
All groundwater sources	Reduction of the number of groundwater sources and changes to registered map to reflect this (clause 4)	Groundwater sources in place purely for administrative requirements were unwarranted. Original 8 groundwater sources have been merged into 3 groundwater sources. Total plan area unchanged.
All groundwater sources	Removal of management zones (clause 5)	Management zones in place purely for administrative requirements were unwarranted. All management zones have been removed.
General plan	Update of planned environmental water figures (notes within clause 16) and long-term average annual extraction limits (clause 24)	Based on new data and changes in groundwater source boundaries
General plan	Update of Schedule 3, High Priority Groundwater Dependent Ecosystems	Based on new data
All groundwater sources	Update of requirements for water (clauses 19, 22 and 23)	Based on new data and changes in groundwater source boundaries
All groundwater sources	Changes to rules for managing access licences (Clause 33), water supply works approvals (clause 34 to 36 and dealing rules (clause 43, 44 and 46)	Changes made to take account of changes in groundwater sources.
General plan	Removal of terms in the Dictionary (Schedule 1).	Removal of terms no longer used within the plan due to changes in groundwater definitions.

**Note:** Clause references in Table 10 relate to the exhibited draft plan and are different to those in the final gazetted plan.

## 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 life of the plan that either enables plan amendment or remaking of a better plan after ten 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 life of the plan through amending provisions and 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 of plan performance

The NSW 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 this 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 the State Interagency Panel, which has now been appointed by the Minister (for Primary Industries)
- an audit of the plan by the Natural Resources Commission to assess to what extent the water sharing provisions have contributed to the relevant statewide 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
- where established by the Minister, an annual review of Implementation Programs
- the application of information from the relevant monitoring and evaluation programs to inform progress against the relevant statewide targets and requirements of the National Water Commission under the National Water Initiative.

## Implementation

### Implementation programs

The Minister may elect to establish an implementation program, which sets out the means by which the objectives of this plan are to be achieved. The process for monitoring of the performance indicators will be outlined in the implementation program.

Where an implementation program has been established, it will be reviewed annually to determine whether it is being 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 licences undertake measurement of extraction. The NSW Office of Water will develop a measurement of extractions strategy to meet the objectives of the NSW Water Extraction Monitoring Policy.

Measurement of extractions may be via meters or other forms of monitoring devices fitted to approved works, or via alternate monitoring systems, to provide water extraction estimates. Different types of devices may 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.

Under the Water Use Monitoring Program assessment of water sources is being undertaken across the state to identify priority areas of measurement of extractions and to determine the most suitable measurement options. It is likely that this will be implemented in high priority areas initially, with roll out to all water sources over time, as appropriate.

Note: Decisions regarding the timetable for introduction of measurement of extractions are still under consideration. In the interim, water users are encouraged to use other forms of self-measurement to assist them to extract water in compliance with their licence conditions, which will be developed from the relevant plan provisions. Water users may install flow meters of their own volition. Meters need to meet new national water meter standards and be installed in accordance with the manufacturer's specifications.

## Compliance

The NSW Office of Water will undertake compliance activities as necessary to enforce compliance with legal entitlements including 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 or emailing [watercompliance@water.nsw.gov.au](mailto:watercompliance@water.nsw.gov.au). You can also get this information and more by visiting the NSW Office of Water website [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 below 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.

**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 or 1A of the *Threatened Species Conservation Act 1995* or Schedule 4 of the *Fisheries Management Act 1994*.

**Extraction of water:** The taking of water from a water source.

**Extraction management unit (EMU):** A group of water sources; defined for the purpose of managing long-term annual average extraction.

**Geological formation** means a fundamental lithostratigraphic unit used in the local classification of strata and classified by the distinctive physical and chemical features of the rocks that distinguish it from other formations.

**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 relying on groundwater for their species composition and their natural ecological processes.

**Long-term average annual extraction limit (LTAAEL):** The limit set for total extractions within a groundwater source.

**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 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.

**Sustainable yield:** That percentage of annual recharge which is allowed to be extracted from groundwater after considering the aquifer's ability to recharge and the needs of the environment.

**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 water source.

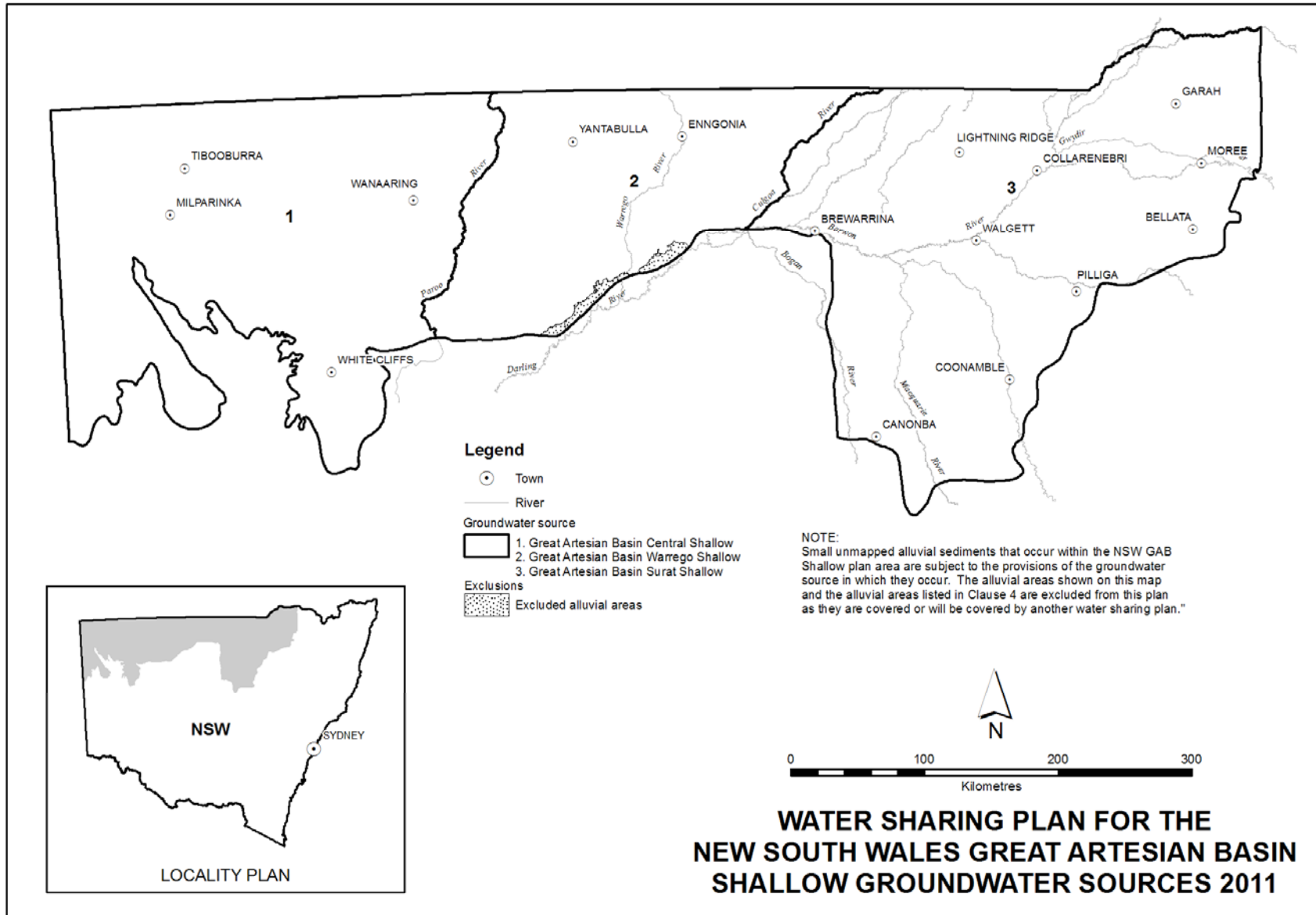
**Water year:** The 12 months running from 1 July to 30 June.



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## Appendix 1: Water sharing plan area



## Appendix 2: State groundwater panel and support staff - membership and expertise

Name	Agency	Role	Expertise
<b>Interagency Regional Panel</b>			
George Gates	NSW Office of Water	Agency representative	Extensive background, experience and expertise in hydrogeology and related groundwater management. Worked on developing groundwater policies and water sharing plans for NSW Office of Water and its predecessors. Current position is state groundwater manager.
Danny Norris	DPI (formerly I&I NSW)	Agency representative	Water policy implementation including water use, enterprise management and basic structural adjustment strategies for water users, water licensing, groundwater/surface water interactions, flow data analysis, local knowledge of flow behaviour of catchments.
Peter Lloyd Jones (formerly David Winfield)	OEH (formerly DECCW)	Agency representative	Measuring ecological response of environmental flows, regional input and delivery of water reforms / water sharing plan development, input into state water policy development.
Fiona Marshall	Hunter-Central Rivers CMA	Observer	Currently General Manager of Hunter Central Rivers CMA. Previous experience with CMA as Business Manager Investment. Experience with DIPNR and DLWC delivering programs such as Landcare, property planning etc to the community. Over 25 years experience in the natural resource field.
Alexandra Anthony	Murray CMA	Observer	Currently chair of Murray CMA, convenor of the Water Working Group for NSW CMAs, chair of the Murray-Lower Darling Environmental Water Advisory Group, chair of the Barmah-Millewa Consultation Reference Group, member of the Murray-Lower Darling state Water Customer Service Committee.
<b>Support Staff</b>			
Jeanine Murray	NSW Office of Water	Project coordinator (NSW GAB Shallow WSP)	Surface water and groundwater management, planning/ policy development and implementation
Cate Barrett	NSW Office of Water	Policy/technical support	Groundwater policy, aquifer recharge
Peter Cuel	NSW Office of Water	Water Licensing	Water licensing administration
Lyndal Betteridge	NSW Office of Water		Water policy and planning, utility planning arrangements, water sharing plan development and implementation, project management
Hari Haridharan	NSW Office of Water	Technical support	Aquifer framework, hydraulic parameters and groundwater flow path data, GDEs.

## Appendix 3: Reference materials

### General

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- NSW Department of Aboriginal Affairs, Aboriginal Language Research and Resource Centre web site (25 May 2011). Map of NSW Aboriginal languages [www.alrrc.gov.nsw.au](http://www.alrrc.gov.nsw.au)

## Appendix 4: Identified high priority groundwater dependent ecosystems

Identified high priority groundwater dependent ecosystems in the NSW GAB shallow groundwater sources.

Name	GDE type	Location	Easting (MGA 94)	Northing (MGA 94)	Zone (MGA 94)	Groundwater Source
Boongunyarrah Spring	Spring	Paroo River	315729.78	6740654.03	55	GAB Warrego Shallow
Bunnavinyah Spring	Spring	Culgoa River	441798.25	6766198.71	55	GAB Warrego Shallow
Coolabah Spring	Spring	Turners Creek	495218.41	6588867.61	55	GAB Surat Shallow
Coonbilly Springs	Spring	Paroo River	328908.36	6731808.34	55	GAB Warrego Shallow
Coorigul Spring	Spring	Narran River catchment	594250.27	6789966.4	55	GAB Surat Shallow
Cullawillalee Spring	Spring	Paroo River	315804.45	6742687.67	55	GAB Warrego Shallow
Cuddie Springs	Spring	Marra Creek	532025.04	6638689.85	55	GAB Surat Shallow
Cumborah Springs	Spring	The Big Warrambool Catchment (near Cumborah locality)	574262.2	6712547.63	55	GAB Surat Shallow
Goonery Spring	Spring	Paroo River	316793.79	6676000.32	55	GAB Warrego Shallow
Gooromere Springs	Spring	Culgoa River	467684.21	6779214.87	55	GAB Warrego Shallow
Gooroomero Spring	Spring	Culgoa River	464428.54	6781064.63	55	GAB Warrego Shallow
Gurrera Spring	Spring	Culgoa River	441807.68	6764352.07	55	GAB Warrego Shallow
Jacombe Spring	Spring	Paroo River	278037.88	6765849.64	55	GAB Warrego Shallow
Kullyna	Spring	Warrego River	385385.3	6738065.93	55	GAB Warrego Shallow
Lake Eliza Spring	Spring	Paroo River	310848.69	6742421.08	55	GAB Warrego Shallow
Lila Springs	Spring	Warrego River	407961.96	6730700.26	55	GAB Warrego Shallow
Mascot Springs	Spring	Paroo River	343366.82	6729986.58	55	GAB Warrego Shallow
Mother Nosey Spring	Spring	Paroo River	315804.45	6742687.67	55	GAB Warrego Shallow
Mud Spring	Spring	Paroo River	269853	6775112.99	55	GAB Warrego Shallow
Mulyeo Springs	Spring	Paroo River	250802.19	6608150.54	55	GAB Warrego Shallow
Native Dog Springs	Spring	Warrego River	385335.82	6732339.54	55	GAB Warrego Shallow
Nullyna Spring	Spring	Warrego River	382181.37	6736172.53	55	GAB Warrego Shallow
Old Geraba Springs	Spring	Culgoa River	441807.68	6764352.07	55	GAB Warrego Shallow
Old Gerara Springs	Spring	Culgoa River	440100.63	6760465.14	55	GAB Warrego Shallow
Old Morton Plains Spring	Spring	Culgoa River	475669.53	6782755.91	55	GAB Warrego Shallow
Peery Springs	Spring	Paroo River	744194.08	6599021.01	54	GAB Central Shallow
Picnic Sandhill Mudspring	Spring	Paroo River	272992.52	6774990.88	55	GAB Warrego Shallow

Name	GDE type	Location	Easting (MGA 94)	Northing (MGA 94)	Zone (MGA 94)	Groundwater Source
Pullamonga Springs	Spring	Paroo River	332084.01	6735551.17	55	GAB Warrego Shallow
Rattigan Swamp	Swamp	Paroo River	789822.48	6694242.15	54	GAB Central Shallow
Sandy Plains Spring	Spring	Culgoa River	467710.42	6769981.94	55	GAB Warrego Shallow
Sandy Springs	Spring	Culgoa River	459576.13	6777355.34	55	GAB Warrego Shallow
Sweet Water Spring	Spring	Warrego River	375522.9	6743318.09	55	GAB Warrego Shallow
Tanawanta Mud Springs	Spring	Paroo River	338336.29	6750421.96	55	GAB Warrego Shallow
Tharnowanni Spring	Spring	Paroo River	328161.39	6774104.78	55	GAB Warrego Shallow
Thooro Mud Springs	Spring	Paroo River	335154.13	6746681.25	55	GAB Warrego Shallow
Thooroo Springs	Spring	Paroo River	343084.82	6750303.94	55	GAB Warrego Shallow
Thully Spring	Spring	Culgoa River	435518.93	6712423.64	55	GAB Warrego Shallow
Tooloomi Spring	Spring	Culgoa River	459595.7	6771815.56	55	GAB Warrego Shallow
Tuneeilkeree Swamp	Swamp	Tuneeilkeree Swamp	503291.25	6758960.4	56	GAB Central Shallow
Tyngnyinia Springs	Spring	Paroo River	276557.89	6764157.47	55	GAB Warrego Shallow
Wapweela Spring	Spring	Paroo River	351119.27	6763514.28	55	GAB Warrego Shallow
Warroo Spring	Spring	Paroo River	269600.05	6782315.62	55	GAB Warrego Shallow
Wee Wattah Spring	Spring	Paroo Overflow	235049.94	6598528.75	55	GAB Warrego Shallow
Yantabangee Spring	Spring	Paroo River	769925.75	6605801.73	54	GAB Central Shallow
Yantabulla Spring	Spring	Paroo River	305839.35	6751574.97	55	GAB Warrego Shallow
Yarranoganny Spring	Spring	Warrego River	380412.15	6739676.7	55	GAB Warrego Shallow
Yongarinnia Spring	Spring	Paroo River	319225.72	6731643.07	55	GAB Warrego Shallow
Youngerina Springs	Spring	Paroo River	317525.95	6729597.2	55	GAB Warrego Shallow

**Note.** The GDEs identified in the above table are shown in Appendix 5.

**Note.** Some of the GDEs listed in this table are listed in other plans as well as this one, reflecting the movement of water through different unregulated river and groundwater sources (both overlying and below the NSW GAB Shallow groundwater sources).

## Appendix 5: Map of Identified high priority groundwater dependent ecosystems

