



Department of
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Water

Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012

Background document

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Water Sharing Plan for the Border Rivers Unregulated and Alluvial Water Sources Background Document

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Updated in June 2016 to incorporate amendments to the plan following the inclusion of the Tenterfield Creek water source

More information

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1. Introduction

Water sharing plans (plans) are being progressively developed for rivers and groundwater systems across New South Wales (NSW) following the introduction of the *Water Management Act 2000* (WMA 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 plans commenced in New South Wales, bringing these water sources and some 90 per cent of water extracted in New South Wales under the management and licensing provisions of the WMA 2000.

In recent years, plans for the unregulated¹ rivers and groundwater systems have been completed using a “macro” or broader-scale river catchment or aquifer system approach. Approximately 90 per cent of the water extracted in NSW is now covered by the WMA 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 sub-catchment, or in the case of groundwater systems, cover a particular type of aquifer (e.g. alluviums). These river basin or aquifer macroplans will generally apply to catchments or aquifers where there is less intensive water use.

In 2016, the Water Sharing Plan for Tenterfield Creek Water Source 2004 was merged into the Water Sharing Plan for the Border Rivers Unregulated and Alluvial Water Sources 2012. The intent of this merging is to reduce the overall number of plans (reducing resourcing requirements over time) as well as improving consistency between plan areas. It is intended that the Water Sharing Plan for the Border Rivers Unregulated and Alluvial Water Sources 2012 will continue until replaced by Water Resource Plans that is consistent with the Commonwealth Basin Plan (2012), prior to 2019.

The Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012 covers 13 surface water sources and four groundwater sources.

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 (for example above a set river flow rate)
- dealing rules – which control the trade of water, both the transfer of share components of an access licence and assignment of water allocation between access licences, as well as changing the location for water extraction.

In developing environmental water rules, access rules and dealing rules, other water management rules are considered, including:

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

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

- the purpose of the statutory plan
- a physical description of the NSW Border Rivers Catchment including land and water use
- the process of plan development including scope, history and basis for decisions
- the relationship between this 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:

¹ 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.

- protect the important water dependent environmental, Aboriginal cultural and heritage values
- protect basic landholder rights
- manage water extraction from the rivers and the closely linked aquifers 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
- allow for adaptive management, that is, to allow changes to the plan to be made as a result of more information that will become available during the life of the plan.

This document is part of a range of material available specifically on the water sharing plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012 including:

- the Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources (a legal instrument written in its required statutory format)
- Water sharing plans – Inland NSW unregulated and alluvial water sources – Overview
- rule summary sheets for each water source detailing the management rules.

In addition, general information on the macro planning process is available in the Water sharing plans section of the Department of Primary Industries, Water website www.water.nsw.gov.au. Information available for download or viewing includes:

- Macro water sharing plans: The approach for unregulated rivers. Report to assist community consultation – explains the method used to classify and set water sharing rules for unregulated streams across the state
- Macro water sharing plans – the approach for unregulated rivers. Access and trading rules for pools – explains the method used to set access and trading rules for pools in unregulated water sources across the state
- Macro water sharing plans: The approach for groundwater. Report to assist community consultation – explains the method used to classify and set water sharing rules for groundwater sources across the state
- Setting the water sharing rules – a one page brochure which outlines the key steps for developing the rules.

2. Purpose of the plan

2.1. Why are water sharing plans (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.

Under the *Water Management Act 2000* (the WMA 2000), the sharing of 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. Therefore, sharing water to licensed water users is effectively the next priority for water sharing. Amongst 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. Plans provide a legal basis for sharing water between the environment and consumptive purposes.

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 WMA 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 the WMA 2000, plans also set rules so that commercial users can also continue to operate productively. In general, commercial licences under the WMA 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 arrangements².

2.2. 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. Seven of the 13 unregulated water sources covered by the plan are considered to have a medium economic dependence on commercial extraction (refer to Table 1). The remaining six water sources are considered to have low economic dependence.

Table 1 - Water sources with a medium level of economic dependence

Water source		
Inverell	Ottleys Creek	Mole River
Glen Innes	Bonshaw	Croppa Creek and Whalan Creek
Tenterfield Creek		

² 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 NWI-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.

2.3. Environmental considerations

Plans are required to reserve water for the overall health of the river and to protect specific ecosystems that depend on river flows, such as wetlands, lakes and floodplains. This share of water reserved for the environment is also intended to sustain the river system's aquatic fauna and flora.

2.3.1. Unregulated water sources

To be healthy and reproduce successfully, the plants and animals that live in rivers and streams need floods (very high flows), freshes (high flows) and dry spells (low and very low flows). The environmental flow rules are designed to ensure the plants and animals in streams continue to experience all these different types of flow events.

There is evidence to suggest that low flows are essential for maintaining water quality, allowing passage over riffles for fish and other fauna to pools used for drought refuge, and maintaining those parts of aquatic ecosystems that are most productive. For example, the faster flowing riffle areas between pools usually contain the highest abundance and diversity of aquatic fauna.

In order to protect a proportion of these low flows for the benefit of the environment, the plan imposes new access restrictions on days when flows are low. This is achieved by establishing cease to pump rules that require users to stop taking water when flow declines below a set level. When the plan commences, surface water licences in all unregulated water sources will be subject to cease to pump rules (excluding licences held by town water suppliers, local water utilities, licensed stock and domestic users, and licences used for food safety and essential dairy care³).

Each unregulated water source was classified as having either high, medium or low instream values. Appendix 2 details the threatened species and communities considered when assessing the water source values that are impacted by extraction. High instream value water sources are, by default, protected by the plan by not allowing any trades in.

2.3.2. Alluvial groundwater sources

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 all of the alluvial groundwater sources covered by the Plan, 100 per cent of 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 the plan, environmental values for alluvial groundwater sources are protected by reserving the long term average volume of water stored in the aquifer and in some cases, a proportion of recharge to the groundwater sources as planned environmental water. Some groundwater sources are highly connected to surface water, so that taking water from one source affects the other. In groundwater systems defined as 'highly connected', surface and groundwater sharing rules may be linked to take account for the connectedness.

The plan also includes rules on the location of new works and extraction from existing works to protect high priority groundwater dependent ecosystems, high priority karst systems and other environmentally sensitive areas such as rivers or streams.

³ There are limited exemptions for licensed stock and domestic and town water supply purposes which allow access to very low flows. Refer to section 6.3.2 "Access to very low flow"

3. Scope of the plan

The plan covers thirteen surface water and four alluvial groundwater sources (refer to table 2 and Map 1). The plan does not cover the Barwon River downstream of the Mungundi Weir. This and other waters will be covered by the *Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources* once it is gazetted. The plan does not cover waters included in the Border Rivers Regulated River Water Sources; these waters are covered by the *Water Sharing Plan for the NSW Border Rivers Regulated River Water Source 2009*.

All the alluvial aquifers within the plan area are considered to be highly connected to the surface water. Due to the nature of the connectivity between the alluvial aquifers and the rivers system, the surface water and groundwater associated with the alluvial aquifers will be managed as a single resource. This approach is consistent with the national framework for managing the impacts of groundwater and surface water interaction. This also prevents “double – counting”, in other words, that water is not accounted for twice. For example, proposed increases in high flow extraction should not remove water already accounted for in assessments of likely inflows to the regulated river.

Incorporating all of these resources into the one plan recognises their interaction and allows for the development of water sharing rules that are linked and are equitable within and between these resources.

Table 2 Surface Water and Groundwater Sources

Surfacewater Sources		
Inverell	Glen Innes	Kings Plains
Mole River	Ottleys Creek	Beardy River
Reedy Creek	Bonshaw	Yetman
Croppa Creek and Whalan Creek	Camp Creek	Campbells Creek
Tenterfield Creek		
Groundwater Sources		
The Macintyre Alluvium	The NSW Border Rivers Upstream Keetah Bridge Alluvium	The Ottleys Creek Alluvium
The NSW Border Rivers Downstream Keetah Bridge Alluvium	-	-

3.1. Water management units

Surface water sharing plans can include the hydrological planning units discussed below. Groundwater systems are managed at the water source level.

Where appropriate, an **extraction management unit** (EMU), consisting of one or several water sources, is specified for the purpose of establishing a geographic area over which the long-term average annual extraction limit (LTAAEL) applies. An available water determination is made for each licence category within the EMU and any growth in extraction above the LTAAEL is managed across the EMU, not at an individual water source level.

The plan contains two EMUs for the unregulated rivers. The Border Rivers Extraction Management Unit was established in the *Water Sharing Plan for the Tenterfield Creek Water Source 2003* and the Croppa Creek and Whalan Creek Extraction Management Unit was established by the plan following consultation with stakeholders during public exhibition. Refer to section 9.3.2. Where an EMU is not specified, the LTAAEL applies to the **water source** and any growth in extraction above the LTAAEL is then managed at that level.

Regardless of whether an EMU is specified or not, daily access rules apply at the **water source** level.

The Border Rivers Extraction Management Unit is divided into 12 water sources and the Croppa Creek and Whalan Creek Extraction Management Unit is comprised of a single water source.

A **management zone** or **trading zone**, representing a portion of a water source, may then be specified so that more refined implementation of management or trading rules can be applied, if required.

Six unregulated water sources covered by the plan have been split into trading zones for more refined management. Trading zones are documented in Table 3 below. Refer also to Appendix 1, maps 2, 3, 4, 5 and 6) where trading zones are depicted graphically.

Table 3. Surface Water Source Trading Zones

Water Source	Trading Zone	Water Source	Trading Zone
Inverell	<ul style="list-style-type: none"> • Macintyre River • Macintyre River Tributaries 	Glen Innes	<ul style="list-style-type: none"> • Glen Innes Tributaries • Beardy Waters • Upstream Beardy Waters Dam • Severn River
Kings Plains	<ul style="list-style-type: none"> • Kings Plains • Upstream Nullamanna Road Crossing 	Mole River	<ul style="list-style-type: none"> • Mole River • Unregulated Dumaresq River • Bluff River and Brassington Creek and Tributaries • Deepwater River and Tributaries • Mole River Tributaries
Croppa Creek and Whalan Creek	<ul style="list-style-type: none"> • Croppa Creek & Whalan Creeks & Tributaries • Boomi River and the Tributaries and Effluents of both the Boomi River and Macintyre River 	Tenterfield Creek	<ul style="list-style-type: none"> • Zone 1 • Zone 2 • Zone 3 • Zone 4 • Zone 5

4. Description of the plan Area

The Border Rivers Catchment covers part of northern NSW and southern Queensland and comprises a major portion of the headwaters of the Barwon Darling River system. The NSW portion of the Border Rivers catchment has an area of 24,000 km² (DWR 1995) and is here after referred to as the NSW Border Rivers Catchment in this section of the background document. To the east of the NSW Border Rivers Catchment lies the Clarence River catchment and to the south is the Gwydir River catchment. The terrain grades from steep to undulating tablelands in the upper catchment, to rolling hills around Ashford and Texas before merging into the extensive floodplains west of Boggabilla.

The major unregulated rivers in the NSW Border Rivers Catchment include the unregulated Macintyre (Inverell water source) and Severn (Glen Innes water source) Rivers. Other important rivers include the Mole River (Mole River water source), Beady River (Beady River water source), Ottleys Creek (Ottleys Creek water source) and Croppa and Whalan Creeks (Croppa Creek and Whalan Creek water source).

Two major dams regulate water supply in the Border Rivers catchment. The Glenlyon Dam on Pike Creek in Queensland, supplies regulated flows for the Dumaresq, Macintyre and Barwon rivers. The Pindari Dam on the Severn River regulates flows for the Severn, Macintyre and Barwon Rivers.

The major regulated rivers in the NSW Border Rivers Catchment are the Macintyre, Severn and Dumaresq Rivers in the south-east and east. Other major rivers in the Border Rivers Catchment include the Severn River in the east, and Macintyre Brook and the Weir River in the north and north-west respectively. The state border follows the Dumaresq River and the Macintyre River below its junction with the Dumaresq River downstream to Mungindi.

The NSW Border Rivers Catchment contains 3 distinctive landform types - tablelands, slopes and alluvial floodplains. Across the catchment, vegetation varies from high altitude areas of the eastern catchment boundary, consisting of patches of extensively forested areas which graduate as you travel west to more open forest, shrub lands and grassy plains.

There are many wetlands, billabongs and flood-runners associated with the main rivers of the Border Rivers catchment. The Boobera Lagoon and Morrella water course, occurring in the NSW Border Rivers catchment which are of cultural significance, are part of a wetland complex recognised as one of the few permanent standing water bodies in the Murray Darling Basin (DLWC 1996).

4.1. Landuse history

There are approximately 35,600 people in the NSW Border Rivers catchment. Population is unevenly distributed across the catchment. Indigenous Australians comprise eight per cent of this population, as compared to state wide average of two per cent of the total NSW population (draft NSW Border Rivers catchment socio-economic data summary, water sharing planning support document (NSW Office of Water, Unpublished Report)).

The land and waters of the NSW Border Rivers Catchment contain places of deep significance to Aboriginal peoples. They are central to their religious and spiritual belief systems, often celebrated in ritual, ceremony, stories, dance and art works. Aboriginal nations and communities in the Border Rivers - Gwydir region include the Gamilaroi, Anaiwan, Banbain, Wirayarai, Guyambal, Gambuwai, Yogumbal and Gidabal language groups (refer to the Border Rivers Gwydir CMA website www.brg.cma.nsw.gov.au Cultural Heritage page for more information).

Landuse during the early years of settlement was almost exclusively pastoral. By the 1880s a thriving tobacco industry was established on alluvial terraces of the Dumaresq River around Texas. The industry endured several 'boom-bust' cycles, but declined substantially to the point where it no longer exists. Cereal cropping became established with improved mechanisation in the post World War II period with wheat, barley and sorghum being the most common crops planted (DWE, 2009).

Current landuse activities in the NSW Border Rivers Catchment include grazing, dryland farming, irrigated production, intensive industries such as feedlots, forestry and recreation. Grazing is the dominant land use in the NSW Border Rivers catchment. Both surface and groundwater water sources are available for irrigation. Cotton is the dominant irrigated crop, followed by: fodder crops, oats, barley, sorghum, vegetables, grapes and other fruit crops (Unpublished, NSW Office of Water).

There are areas within the catchment that remain vegetated and some of which are protected as National Park, State Forest or smaller Nature Reserve. Substantial portions of protected area occur in

the Reedy Creek and Campbells Creek water sources. Less substantial portions of protected area occur in Kings Plains and Beardy River water sources.

4.2. Climate

The climate is characterised by dry stable winters with sporadic, unreliable rainfall and warm to hot summers with moderate to heavy rainfall. The annual evaporation potential (as determined by pan evaporation) exceeds annual precipitation. The maximum and minimum temperatures of the higher altitude eastern region contrast with the maximum and minimum temperatures of the lower altitude of the western region.

Total average annual rainfall in the catchment varies from approximately 853mm in Tenterfield to 509mm in Mungundi. Average annual maximum temperatures vary from 21.4 degrees Celsius in Tenterfield to 27.6 degrees Celsius in Mungundi. Refer to the Australian Government website <http://www.bom.gov.au/climate> climate statistics page for additional information on rainfall and temperature in the catchment. A large proportion of this rainfall occurs in summer and is a result from tropical cyclones activity in far north Australia, thunderstorms and rain-bearing easterlies from the New England Tableland. Rainfall over the October to March period is generally of high intensity and consequently has great erosivity. On the other hand, very low rainfall in the western region can lead to drought conditions and low river flows. Snow can occur at the top of the catchment around Guyra and Armidale (refer to the Border Rivers Gwydir CMA website www.brg.cma.nsw.gov.au Climate page for more information).

4.3. Stream flows

For the most part there is minimal stream flow information as there are few gauges in the catchment and most streams in the plan are considered to be non-perennial. The majority of stream flow information is gathered in the regulated rivers including the Macintyre and Dumaresq. The catchment is characterised by more reliable flows in the east and less reliable and highly variable flows in the west. Flows are generally greatest in the summer months when seasonal rainfall is greatest.

Stream flow records are minimal in the planning area but records are available for some sites, including the 7 gauging stations listed in Table 4. Records from these gauges and others gauges with limited data were used to assist with the development of the plan.

Table 4 Key stream gauging stations in the plan area

Station name	Water source	Station no.	Catchment (km ²)	Period of record	
				Start	Finish
Wallangra Gauge (Macintyre River)	Inverell	416010	2 831	1991	Ongoing
Strathbogie Gauge (Severn River)	Glen Innes	416039	2 096	1925	Ongoing
Frazers Creek at Westholme	Kings Plains	416021	1 163	1971 2002	1989 2011
Mole River Gauge at Donaldson	Mole River	416032	1 163	1936	Ongoing
Ottleys Creek Gauge at Coolatai	Ottleys Creek	416020	1 779	1981	Ongoing
Haystack Gauge	Beardy River	416008	936	1936	Ongoing
Dumaresq Gauge	Reedy Creek	416026	530	1987	1989
Tullona Bore	Croppa Creek and Whalan Creek	416034	7 683	1979	1989
Clifton Gauge	Tenterfield Creek	416003	892	1921	Ongoing

4.4. Groundwater

The planning area overlies a number of groundwater sources of which four alluvial groundwater sources are covered by the plan. Groundwater sources excluded from the plan will be covered by other water sharing plans.

The level of irrigation development in these groundwater sources is relatively small by comparison to other larger groundwater sources in NSW (e.g. Great Artesian Basin Groundwater Sources). This relates to a number of factors including the relatively low yield of most sources (11L/s for the Macintyre Alluvium, 60 L/s for the NSW Border Rivers Upstream Keetah Bridge Alluvium, 1.3L/s for the Ottleys Creek Alluvium and 4.5 L/s for the NSW Border Rivers Downstream Keetah Bridge Alluvium and the presence of more reliable supply from regulated river flow and other underlying Great Artesian Basin aquifers.

The water quality of all groundwater sources is relatively good and suitable for most agricultural purposes. Aquifer recharge is provided by a combination of rainfall recharge, side slope runoff and leakage of surface water from the regulated Dumaresq River in the NSW Upstream Keetah Bridge Alluvium, and rainfall recharge and stream leakage in the Macintyre, Ottleys Creek and Downstream Keetah Bridge Alluviums. All groundwater sources are considered to be highly connected to surface waters.

Groundwater has been measured at the bores listed in Table 5 below.

Table 5 NSW Border Rivers Groundwater monitoring bores

Alluvial Groundwater Source	Bore Number	Period of record	
		Start	Finish
NSW Border Rivers Upstream Keetah Bridge	GW036697	3/05/1985	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040635	7/05/1991	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040636	26/07/1994	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040637	7/05/1991	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040638	7/05/1991	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040639	26/07/1994	29/08/2000
NSW Border Rivers Upstream Keetah Bridge	GW040640	7/05/1991	29/08/2000
NSW Border Rivers Upstream Keetah Bridge	GW040641	7/05/1991	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040642	3/08/1994	29/08/2000
NSW Border Rivers Upstream Keetah Bridge	GW040643	7/05/1991	30/05/2000
NSW Border Rivers Upstream Keetah Bridge	GW040644	3/08/1994	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040645	3/08/1994	29/08/2000

NSW Border Rivers Upstream Keetah Bridge	GW040646	7/05/1991	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040647	7/05/1991	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040648	7/01/1988	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040649	7/05/1991	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040650	27/07/1994	29/08/2000
NSW Border Rivers Upstream Keetah Bridge	GW040651	13/04/1999	29/08/2000
NSW Border Rivers Upstream Keetah Bridge	GW040652	7/05/1991	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040653	7/05/1991	29/08/2000
NSW Border Rivers Upstream Keetah Bridge	GW040654	13/04/1999	29/08/2000
NSW Border Rivers Upstream Keetah Bridge	GW040771	15/07/1994	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040829	16/06/1997	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040830	16/06/1997	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW040831	16/06/1997	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW093060	18/06/2009	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW093061	18/06/2009	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW093062	18/06/2009	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW093063	19/11/2009	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW093064	19/11/2009	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW093065	19/11/2009	Ongoing
NSW Border Rivers Upstream Keetah Bridge	GW967345	21/03/2006	15/02/2007
NSW Border Rivers Downstream Keetah Bridge	GW036684	19/05/1987	Ongoing

NSW Border Rivers Downstream Keetah Bridge	GW036686	18/05/1987	Ongoing
NSW Border Rivers Downstream Keetah Bridge	GW036693	19/05/1987	Ongoing
NSW Border Rivers Downstream Keetah Bridge	GW036696	19/05/1987	Ongoing
Macintyre	GW036685	19/05/1987	Ongoing
Macintyre	GW036688	19/05/1987	Ongoing
Ottleys Creek	GW036691	19/05/1987	Ongoing
Ottleys Creek	GW036692	19/05/1987	Ongoing

4.5. Climate change and variability

Following the November 2006 water summit on the southern Murray-Darling Basin (the Basin), the then Prime Minister and MDB state premiers commissioned CSIRO to report on sustainable yields of surface and groundwater systems within the Basin. The CSIRO Murray-Darling Basin Sustainable Yields Project assessment was undertaken for 18 regions including the Border Rivers. The CSIRO (2007) report made the following conclusions for the Border Rivers region:

- The recent climate (1997 to 2006) was similar to the long-term average climate
- The best estimate of climate change by 2030 would reduce average surface water availability by 10%.
- Likely future development of farm dams would have a minor impact on water availability.

However, CSIRO (2007) also report that the hydrological impacts of climate change in the MDB remain very uncertain. Rainfall-runoff modelling with climate change projections from global climate models indicates that future runoff in the Border Rivers region is more likely to decrease than increase. The extreme estimates (from different climate models under high global warming) range from a 28 percent reduction to a 20 percent increase in mean annual runoff (CSIRO, 2007).

Under the best estimate 2030 climate, there would be a 10 percent reduction in water availability, and 12 percent reduction in end-of-system flows and a 2 percent reduction in surface water diversions overall (CSIRO, 2007). The best estimate 2030 climate would increase the average period between beneficial floods into anabranches and billabongs by 26 percent above current.

4.6. Entitlement and use

There are approximately 398 surface water licences and 33 groundwater property account holders. There is approximately 30 805ML of surface water entitlement (unregulated river access licence) and 17 435 ML of groundwater entitlement (aquifer access and aquifer access (high security)). The majority of licences are used for irrigation, with a significant proportion also used for town water supply. There has been an embargo on granting new surface water licences in both the unregulated and regulated systems of the NSW Border Rivers Catchment since 1998. Alluvial aquifers were embargoed in 2008.

Estimates of water entitlement across the draft plan water resources are listed in Table 6.

Table 6 Entitlement* and licences number for each water source

Water Source	Entitlement (ML/year)	Number of licences
Unregulated water sources		

Inverell	7 399	118
Glen Innes	4 702	50
Kings Plains	620	23
Mole River	4 766	47
Ottleys Creek	1 821	8
Beardy River	476	9
Reedy Creek	TBD*	3
Bonshaw	51	1
Yetman	240	2
Croppa Creek and Whalan Creek	6 303	65
Camp Creek	82	4
Campbells Creek	120	1
Tenterfield Creek	4,223	67
Total	30 805	398
Alluvial water sources		
Macintyre Alluvial	1 558	4
NSW Border Rivers Upstream Keetah Bridge	15 392	26
NSW Border Rivers Downstream Keetah Bridge	485	3
Ottleys Creek	Nil	Nil
Total	17 435	33

* Surface Water entitlement figures are based on estimates of unregulated river access licence entitlement and Groundwater entitlement figures are based on aquifer access and aquifer (high security) access licence entitlement numbers. Entitlement figures will vary following the resolution of a number of matters including, the resolution of dual frontage licences where the Office of Water must determine which water source the licence belongs and determine the volume of water that should be licensed for extraction and the conversion of Class D and Class B licence quotas to the volume of water that should be licensed for extraction.

Water is also extracted from watercourses within the draft plan area through basic landholder rights and these extractions do not require a licence. Note. Whilst a licence is not required to extract BLR from groundwater, a works approval is required for the bore used to extract ground water.

4.6.1. Water extraction in the unregulated and ground water sources

Socio economic information contained in the draft NSW Border Rivers catchment socio-economic data summary, water sharing planning support document (NSW Office of Water, Unpublished Report) underpins this section of the background document and was used to inform water sharing planning provisions included in the plan. The draft document is based on socio economic information sourced from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) data collected in 2006. To better align the ABARES economic data with water source boundaries, water sources were grouped into a number of geographic sub-regions. These sub-regions are provided in Figure 1.

Water use in the NSW Border Rivers catchment is dominated by irrigated agriculture. Irrigation water is derived from groundwater and unregulated surface water sources. The gross value of irrigated agricultural production in the NSW Border Rivers Catchment was approximately \$54 million in 2006. Note. This estimate of irrigated agricultural production is likely to be an underestimate as no data was

available for the Upper Border Rivers sub-region in 2006 (refer to the text below that describes the composition of each sub-region).

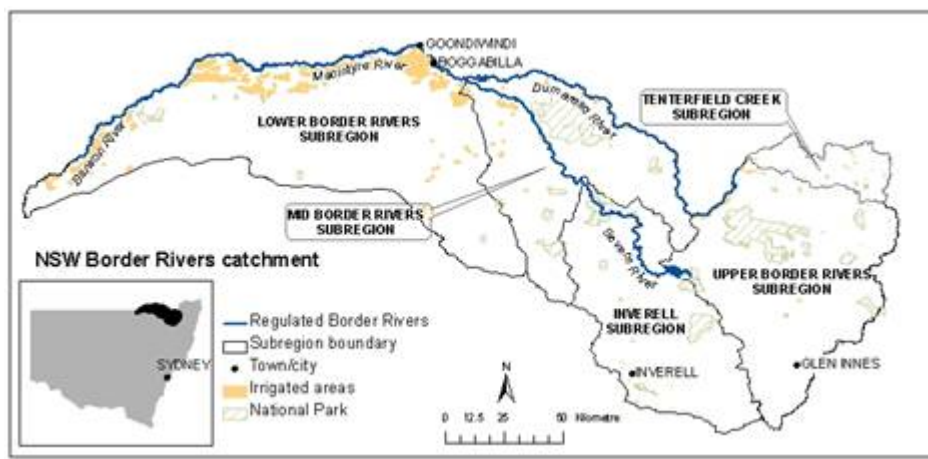
The Upper Border Rivers subregion (Glen Innes, Beardy River, Reedy Creek, Tenterfield Creek and Mole River water sources) represents the tablelands areas of the catchment. Grazing is the dominant land use. Tenterfield and Glen Innes are the major towns in these areas. Due to the low volume of extraction in the upper border rivers sub-region a very small proportion of agricultural production is irrigated. The predominant enterprise is sheep and other livestock, followed by hay production.

The Inverell subregion incorporates (Inverell and Kings Plains water sources) the tableland area and covers the headwaters areas of the Macintyre and Severn Rivers. Grazing is the dominant land use with cropping activities restricted to the valley floodplains. Inverell is the largest town in this area. Irrigated agriculture accounted for 9 per cent of the gross value of agricultural production in the Inverell sub-region. The predominant enterprise is cattle for meat producing followed by fruits and nuts, and sheep and other livestock.

The Mid Border Rivers subregion (Ottleys Creek, Yetman, Campbells Creek, Camp Creek and Bonshaw water sources) represents the western slopes areas which is characterised by a gently undulating topography. Irrigated agriculture accounted for 29 per cent of the gross value of agriculture in the mid border rivers. The predominant enterprise is cotton followed by cattle for meat and sheep and other livestock

The Lower Border Rivers subregion (Croppa Creek and Whalan Creek water source) represents the alluvial riverine floodplain at the western end of the catchment. Large scale irrigation enterprises are common in this area, which utilise unregulated river flows, regulated water releases from the upstream dams and also groundwater sources. Irrigated agriculture accounts for 23 per cent of the gross value of agricultural production in the lower border rivers sub-region. The predominant enterprise is cotton, along with cereals for grain and seed, and hay.

Figure 1. NSW Border Rivers Catchment Sub Regions



Source: NSW Office of Water (Unpublished report). Note the Tenterfield Creek Subregion is part of the *Water Sharing Plan for the Tenterfield Creek Water Source 2003*.

4.6.2. Water extraction in the alluvial water sources

Most alluvial groundwater licences are located in the NSW Border Rivers Upstream Keetah Bridge alluvium (approximately 79%) that extends along the main trunk of the regulated Dumaresq River upstream of Keetah Bridge to the end of the alluvium at the junction of the Dumaresq and Mole Rivers. In 2008 an embargo was placed on the granting of new access licences in the alluvial aquifers in the NSW Border Rivers Catchment.

The majority of groundwater entitlement is used for irrigation purposes. A small amount is used for town water supply purposes. Detailed water use is available for the NSW Border Rivers Upstream Keetah Bridge alluvium (refer to Table 5.) as a number of meters have been installed. Detailed water

use is not available in the remaining alluvial water sources as pumping is not generally metered. NSW is currently expanding the coverage of irrigation meters.

4.7. Local water utility requirements

A small number of Town Water Supplies (TWS) are located within the water sources covered by this Plan. The main towns serviced by these supplies include Glen Innes, Tenterfield and Deepwater (Glen Innes Severn Council) and Yetman and Bonshaw (Inverell Shire Council).

TWS's occurring in the NSW Border Rivers Catchment are shown in Table 7. TWS are generally exempt from surface water cease to pump rules.

Table 7 Town water supplies, location and entitlement volume in the plan area

Water source	Town Water supply	Location	Entitlement (ML/yr)	% of total entitlement
Glen Innes	Beardy Waters Town Water Supply	Beardy Waters (between Yarrowford and Stonehenge)	1 126	4
Mole River	Deepwater Town Water Supply	Deepwater River near Deepwater	64	Less than 1
Macintyre Alluvial	Yetman Town Water Supply	Macintyre Alluvial near Yetman	35	2
NSW Border Rivers Upstream Keetah Bridge Alluvial	Bonshaw Town Water Supply	NSW Border Rivers Upstream Keetah Bridge Alluvial near Bonshaw	10	Less than 1
Tenterfield Creek	Tenterfield Town Water Supply	Tenterfield Creek near Tenterfield	846	18

5. Developing the plan

5.1. Project groups

The Department of Primary Industries, Water was assisted by a number of internal and external panels when developing the plan. The role and composition of these panels are described below.

5.1.1. Interagency Regional Panel

The NSW Government established the IRP in 2010. The IRP was charged with completing all plans in the area (including the Draft Water Sharing Plan for the Gwydir Unregulated and Alluvial Water Sources Water Sharing Plan). This involved building on management directions proposed in 2006 for the Border Rivers and Gwydir WSPs by the previous IRP and developing management arrangements for the recently included highly connected groundwater sources that were incorporated into both WSP areas.

The plan rules were developed by the Border Rivers / Gwydir Interagency Regional Panel, which consists of representatives from the OEH and DPI and the Border Rivers-Gwydir Local Land Services / Catchment Management Authority (as an observer). Appendix 3 lists the names of panel representatives and their areas of expertise, and also lists their colleagues who they had access to for specific technical and scientific information.

The key responsibilities of the IRP were to:

- review the water source information provided by DPI Water
- assign economic, social and environmental values and undertake risk and value assessments to classify each unregulated water source,

- review existing and generic water sharing rules as to their applicability⁴
- make recommendations on the water access and dealing (trading) rules for each water source,
- assist with consultation on the proposed rules, and
- review submissions, from targeted consultation and public exhibition, and make changes where necessary to the water sharing rules.

To assist in guiding the decision making process the IRP had access to a range of DPI Water technical staff, reference material in addition to the knowledge and experience of stakeholders, agency staff and IRP members. In addition, the IRP was assisted by The Community Manual for Macro Water Sharing Plans: The approach for unregulated rivers. Report to assist Community Consultation. The manual explains the method used to classify and set indicative water sharing rules for unregulated streams across NSW. Refer to Appendix 4 for details of material available to the IRP to assist with developing the plan.

5.2. Policy context

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

5.2.1. Intergovernmental Agreement

An intergovernmental agreement (IGA) between NSW and QLD establishes water sharing arrangements for shared surface and groundwater sources. The IGA aims to ensure that shared Border Rivers water sources will be managed for environmental, social, cultural and economic values. The plan was written in a manner to allow for amendments to be made to the plan to reflect the evolving nature of the IGA.

5.2.2. National Water Initiative

The NSW Government is a partner to the National Water Initiative (NWI) which was signed by the Council of Australian Governments (CoAG) in June 2004. The NWI 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 NWI 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 in the Water Reform section for more information). 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 water interception
- monitoring and reporting on implementation.

The Intergovernmental Agreement on a NWI sets out outcomes and guidelines and timelines for water plans and planning processes. The National Water Commission (NWC) is an independent statutory

⁴ This includes reviewing water access conditions imposed on users through announcements or orders under the *Water Act 1912* during low flow conditions.

body responsible for providing advice to CoAG on the implementation of the NWI and national water issues and undertakes a biennial assessment of each states' progress with implementing the NWI for this purpose.

5.2.3. Natural Resources Commission

The macro plans also comply with the NSW Natural Resources Commission (NRC) state wide standards and contribute to the relevant state wide targets (refer to Table 8) such as Targets 5 and 6 (refer to the www.nrc.gov.au for details) which is a requirement of the State Plan, Priority E4 (refer to www.nsw.gov.au/stateplan for more information). The NRC 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 state wide 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 NRC reviews plans against this Standard and its associated targets.

Table 8 Contribution of the plan to the relevant NRC state wide targets

Relevant state wide target	Plan's contribution
By 2015 there is an increase in the recovery of threatened species populations and ecological communities (Target 3)	- some access and trading rules developed to help protect water dependent threatened species where these were identified and the risk to these from extraction is high
By 2015 there is an improvement in the condition of riverine ecosystems (Target 5)	- sets a defined share of water for riverine ecosystems - protection of very low flows - trading rules to maintain or reduce entitlement in high value streams - adaptive management, giving the ability to adjust rules once information becomes available or at the end of plan period.
By 2015 there is an improvement in the ability of groundwater systems to support their groundwater dependent ecosystems and designated beneficial uses (Target 6)	- sets distance rules to GDEs for new bores - extractions from alluvial aquifers managed using connected surface water rules - trading rules designed to protect groundwater sources - local area impact management rules
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 - protection of a proportion of wetland storage volume- trading rules to maintain or reduce entitlement in high conservation value water sources - protection of very low flows
Natural resource decisions contribute to improving or maintaining economic sustainability and social well-being (Target 12)	- plans provide a defined share to water and defined certainty of access - separation of land and water enhances trading and value of licences - establishment of perpetual and compensable water access licences provides security for business investment - water markets encourage movement of water licences to high value uses - rules developed which consider community dependence on water extraction

5.2.4. Catchment Action Plan

This plan is consistent with and contributes to the Border Rivers-Gwydir Catchment Action Plan (BRGCAP). The BRGCAP can be found on the [Local Land Services website www.lls.gov.au/](http://www.lls.gov.au/). The BRGCAP Water Theme has a resource condition target (the Water Catchment Target) for the region's rivers and aquifers which is to maintain or improve catchment condition by 2015.

Similar to the statewide targets on improvement in riverine ecosystems and the ability of aquifers to support groundwater dependent ecosystems, the plan will contribute to achieving the Water Catchment Target by:

- setting a defined share of water for riverine ecosystems
- protecting very low flows
- implementing trading rules to maintain or reduce entitlement in high conservation value streams
- adopting an adaptive management approach, giving the Minister the ability to adjust rules once information becomes available, or upon remake of the next plan.

One of the LLS/CMA's responsibilities, as observer, was to provide the IRP with advice on the alignment of the proposed classification and extraction limits and rules with the priorities in their BRGCAP.

5.2.5. 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' (SDLs). As the SDLs come into effect, they will replace the current Murray-Darling Basin Ministerial Council Cap on diversions in the Basin. Further details can be found on the MDBA website at www.mdba.gov.au in the Basin Plan section.

5.3. Other considerations

There are a number of policies and water related issues that require consideration with the development of this plan and the associated water sharing rules.

5.3.1. Murray-Darling Basin Cap

The NSW Border Rivers Catchment covers approximately 24,000 km² or around 2.0 per cent of the total area of the Basin and is subject to agreements and statutes which cover water management within the Basin. The plan for the NSW Border Rivers Catchment in turn has to be developed within the context of the Basin and existing Border Rivers wide commitments to water sharing.

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

- takes more water away from the river and may threaten its environmental health

- reduces water available to other legitimate businesses thus 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 a diversion limit – the Cap – in 1995.

Schedule F of the Murray-Darling Basin Agreement (the Agreement) was then introduced in 1996 and set the operating framework for the Cap. In NSW, the Cap is defined as the average yearly volume of water that would have been diverted under 1993/94 levels of development and management rules. There is no MDBMC Cap on groundwater diversions.

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.

In regulated water sources licences were volume based and diversions were metered with good records of past use for establishing the Cap. In unregulated water sources licences were area based and not metered so the assessment of Cap is more difficult. As part of a volumetric conversion process, irrigation licence holders were surveyed as to the area that they had irrigated over the six year period from 1993/94 and conversion rates developed to establish licensed entitlements and derive average levels of water use. There was no pattern of growth in irrigated areas over the survey period in any of the river systems, so the Cap is based on the information calculated as an average of the yearly assessments over the survey period.

The Cap for the unregulated rivers in the NSW Border Rivers Catchment is assessed and reported on a whole of EMU scale .

5.3.2. Related water sharing plans

A Water sharing plan is in place for The Regulated Border Rivers waters. *The Water Sharing Plan for the NSW Border Rivers Regulated River Water Source 2009* (the Regulated Plan) covers Border Rivers regulated waters. The Border Rivers Unregulated Extraction Management Unit (EMU) was established in the previous Tenterfield Creek Plan (refer to section 6.3.3. Managing Extraction for details on the purpose of the EMU).

Provisions of the plan are required to be consistent with the Regulated Border Rivers Plan as well as any adjoining water sharing plans including, the Draft Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources and the Draft Water Sharing Plan for the Gwydir Unregulated and Alluvial Water Sources Water Sharing Plans.

5.3.3. Protecting Aboriginal values

Aboriginal people have a spiritual, customary and economic relationship with land and water that provides an important insight into 'best practice' for natural resource management. The NSW Government is determined to ensure that Aboriginal culture is maintained across the state and that Aboriginal communities benefit from the new opportunities that the water market will bring.

Maintenance of the biological diversity of the waters of the catchment is a cornerstone principle for the wellbeing, identity and cultural heritage of Aboriginal communities. The rivers are also extremely important for fishing and food gathering. The nationally significant wetland Morella Watercourse/Boobera Lagoon/Pungbougol Lagoon, located 6 km south-west of Goondiwindi in New South Wales, is considered to be one of the most important Aboriginal places in eastern Australia. Whilst the draft plan was on public exhibition DPI Water initiated a process to identify and assess Aboriginal Cultural Assets. It is intended that these sites will be included in the plan and appropriate water sharing rules developed to maintain these assets (refer to section 9.3.3 for further information on the process for including sites in the plan).

Macro plans try to recognise the importance of rivers and groundwater to Aboriginal culture. The plans will allow Aboriginal communities to apply for a water access licence for cultural purposes such as manufacturing traditional artefacts, hunting, fishing, gathering, recreation, and for cultural and

ceremonial purposes. An Aboriginal cultural licence can also be used for drinking, food preparation, washing, and watering domestic gardens.

Aboriginal cultural licences allow communities to access water for important cultural purposes and the plan provides for them to be granted, throughout the plan area. These cultural licences are limited to 10 megalitres per year per application. For more information, see the fact sheet Macro water sharing plans - Information for Aboriginal water users, which is available on the DPI Water website.

5.3.4. Protecting basic landholder rights

Under the WMA 2000, extraction of water for **basic landholder rights** (BLR) does not require a licence, although in the case of accessing groundwater under BLR the bore must still be approved by DPI Water. BLR 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 WMA 2000 also require that water sharing must protect BLR. The plan does this by including an estimate of the water requirements for BLR at the start of the draft plan. There are currently no extractions for native title rights. However, these rights may be activated during the plan's ten year term.

Furthermore, the access rules apply to licensed water users but not to BLR. This in effect affords these BLR users 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. DPI 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.

The estimate of BLR for plan water sources draws on the reasonable take and use zones and the domestic and stock consumption allowances from the DPI Water's draft mandatory guidelines for take and use of water under domestic and stock rights (under development). Consideration is given to both surface and groundwater estimations simultaneously, effectively reducing the double counting of these rights in the estimations. The method is summarised as follows:

- Areas of significant reliance on groundwater and surface water are determined.
- 2005 land use data held by DPI Water is used to determine grazed area as defined by the draft mandatory guidelines and a consequent volume determined by applying the stock consumption allowance (megalitres per hectare) from the draft guidelines, to estimate stock watering use in each water source.
- ABS Population and Housing Census data by collector districts is used to calculate the number of houses in each water source and the domestic consumption allowance (megalitres per 'house') from the draft guidelines is applied to estimate the total domestic water use for each water source.

5.3.5. Protecting town water supply access

Towns have a higher priority for access to water than commercial licences. The plan recognises 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 town'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.

5.3.6. Development of future water supplies

Any development of new water storages in the NSW Border Rivers Catchment must be undertaken within the bounds of the plan and the WMA 2000. The plan is not prescriptive in endorsing any

particular option since economic considerations vary over time. Instead, the plan sets a framework within which development of future water supplies can occur.

5.3.7. 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 plans for inland aquifer systems in NSW, DPI Water has defined a highly connected system 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 amongst 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, 2008). Accordingly all alluviums in the plan are treated as a 'highly connected'. This approach is applied consistently to all inland water sources.

5.3.8. Granting new access licences

Plans make provision for the application for new access licences in addition to those prescribed by the Water Management (General) Regulation 2004. If additional licences are granted in a water source and usage is assessed to have exceeded the LTAAEL, then growth management provisions in the plan are implemented.

All of the water sources in the NSW Border Rivers Catchment have been embargoed under the *Water Act 1912* for the application of new licences. These various embargoes include:

Groundwater sources

- December 2008, an embargo on applications for groundwater licences was gazetted which applied one set of exemptions to all inland groundwater in highly committed aquifers including alluvial water sources in the NSW Border Rivers Catchment.

Unregulated water sources

- March 1993, an embargo order was made for unregulated surface water licence applications in unregulated areas including those in the NSW Border Rivers Catchment for properties with an authorised area greater than 10ha in size, and
- October 1998, an embargo order was made for all surface water licence applications in the unregulated areas in the NSW Border Rivers Catchment.

In consideration of the previous embargo orders on the water sources, the plan does not provide for additional applications for licences outside those provided for under the regulations. The Water Management (General) Regulation 2004 prescribes a number of different types of specific purpose access licences for which applications may be made. Clause 19 of the Regulation allows for applications to be made for the following specific purpose access licences:

- a local water utility [domestic and commercial] access licence, for the purpose of domestic consumption and commercial activities
- a domestic and stock [domestic] access licence, for the purpose of domestic consumption
- an unregulated river [town water supply] access licence, for the purpose of supply to communities for domestic consumption and commercial activities
- a Regulated River (high security) [town water supply] access licence, for the purpose of supply to communities for domestic consumption and commercial activities
- an aquifer [town water supply] access licence, for the purpose of supply to communities for domestic consumption and commercial activities
- any category of specific purpose access licence that has a subcategory 'Aboriginal cultural', for Aboriginal cultural purposes.

Under the plan, applications for specific purpose access licences may be made in accordance with Clause 10 of the Regulation, and an access licence may be granted in accordance with a dealing. The plan limits the application for an Aboriginal Cultural licence to 10ML /year /application.

5.3.9. Mandatory conditions

The plan sets out a number of provisions that will be applied as mandatory conditions to water access licences and water supply work approvals, developed by other rules contained within the plan. These mandatory conditions are designed to protect the rights of all users in the water source and the environmental water rules of the plan. They cannot be removed or altered unless the plan itself is amended.

6. Rules for unregulated water sources

6.1. Background

There are 13 unregulated water sources in the plan area. Initial classification of the unregulated water sources was undertaken in line with the macro classification process. Based on this classification and identified indicative rules, IRP recommended draft access and trading rules for each of the 13 unregulated water sources.

6.2. Classification method

The 'macro planning' process is the traditional approach of DPI Water to developing plans for unregulated rivers and is described in Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation⁵ (the manual). The application of the macro planning process has proven problematic for unregulated catchments, particularly in inland NSW, where many unregulated rivers have intermittent flows. These variable flows coupled with the opportunistic nature of unregulated diversions in this part of the state have warranted a refined approach. The refined approach has been used to guide the IRP in its development of water sharing rules (refer to section 6.3 for a description of access and dealing rules).

6.2.1. Developing access and dealings rules

Access rules

Under the macro planning process, generic access rules are determined by balancing the risk to instream values (a product of instream value and hydrologic stress) and the community dependence on extraction. The assumption under the refined approach for inland unregulated catchments is that hydrologic stress in each water source is 'high', which is considered to be a reasonable assumption given that:

- most inland unregulated streams have been embargoed since the early 1990's, and
- Stressed River Assessments⁶ show consistent scores of 'high' stress across the inland unregulated streams.

Under the refined approach, each unregulated water source is classified as having either high, medium or low instream values and community dependence on extraction, using the same method as is outlined in the manual. Generic indicative access rules balances instream values against community dependence (refer to table 9 below).

⁵ The document is available on the DPI Water website www.water.nsw.gov.au in the macro water sharing plan section

⁶ "Stressed River Assessment Report" for various catchments, NSW Department of Land and Water Conservation. Sydney 1999

Table 9: Generic access rules for rivers and creeks under the refined approach

Rule level	Indicative cease to pump rule	Indicative environmental rule	Instream value	Community dependence
1	No pumping unless flows exceed a specified level at the reference point	Consider commence to pump rule	High	Low
2	No pumping unless there is a visible flow at the reference point	Consider commence to pump rule	↑	↓
3	No pumping unless there is a visible flow at the pump site	Consider commence to pump rule		
4	Exception to no visible flow rule e.g. allow pool drawdown to a specified level		Low	High

For the majority of water sources, no rule other than a cease to pump when there is no visible flow in the vicinity of the pump site could be recommended due to:

- many existing licences have no access rules, therefore any change to access should be incremental to allow irrigators time to adjust,
- lack of appropriate reference points (e.g. river gauges) other than the pump site, and
- if there was a suitable river gauge within the water source, a flow rule using the gauge would be quite stringent and would impact significantly on current irrigation operations, given that many streams only flow intermittently.

This access rule provides, at a minimum, protection of natural pools which are important for drought refuge, as well as domestic and stock water supplies.

Dealings rules

The following principles apply for dealings (trading) between water sources under the refined approach:

- Trades into highly stressed water sources are only permitted if there is no net increase in entitlement,
- Trades into water sources with high instream values are prohibited, and
- Trades into downstream water sources are permitted regardless of stress or instream value, as long as the water sources have a direct hydrological connection (and do not cross a regulated river).

Regardless of stress or instream value, trades within a water source are permitted.

Exceptions to the classification approach

It is important to note that the refined approach is used as an indicative tool to develop initial classifications. While these classifications guide the water sharing rules, a major role of the Interagency Regional Panel is to use the local knowledge of panel members to check whether these classifications are realistic. Any amendments to either the classifications or the proposed management rules are to be based on local and technical knowledge of the water sources.

6.3. Water sharing rules

The refined approach has been used to guide the Interagency Regional Panel in its development of water sharing rules. Water sharing rules that the process focused on consist of:

- access rules – which determine at what flow levels, river heights, proportion of full capacity of a pool or times extraction is allowed
- dealing rules – which control the trade of water (both permanent transfer of access licence entitlements and temporary assignment of water allocation between access licences, the change of water sources and the location for extraction).

Other management rules that were considered in the development of the plan include:

- extraction limits – which set the total volume of water that can be extracted on a long-term average annual basis from the water source
- rules for granting new entitlement – what types of access licences may be granted
- rules for granting works approvals – what types of set back conditions are required
- rules for the protection of a specific environmental asset

6.3.1. Protecting environmental values

Plans are required to reserve water for the overall health of the river and aquifers and to protect specific ecosystems that depend on river flows, such as wetlands, lakes, estuaries and floodplains and groundwater dependent ecosystems. This share of water reserved for the environment is also intended to sustain the river and groundwater system's aquatic fauna and flora.

Instream value is the value of retaining water in a river. Three different types of values contribute to instream value: ecological (intrinsic), economic (non-extractive use) and place (cultural) values. Instream value is used in two ways in developing the plan; first to identify high conservation values areas to be protected and secondly to set access rules.

The NSW Border Rivers Catchment contains a significant number of threatened flora and fauna species, some of which are sensitive to water extraction (listed in Appendix 2). All of these species were considered when assessing the instream values of the water sources, which guided access rules as per the classification method above.

Key environmental assets identified in the unregulated water sources are protected by the dealings and access rules. Water sources with high instream values have indicative access rules designed to protect instream values and dealings rules (trade) to encourage extraction to shift from areas of high environmental impact to areas of lower impact.

Protecting high conservation value areas

Areas with high instream or Aboriginal values are considered to have high conservation value. Clause 25 of the Intergovernmental Agreement on a National Water Initiative requires plans to identify and acknowledge surface and groundwater systems of high conservation value. The plan identifies 9 water sources with high conservation value. Five water sources in the planning area have trading zones that designed to restrict trades into areas due to their high conservation values (refer to Table 3 above for a description of the trading zones and Appendix 1, Maps 2, 3, 4, 5 and 6 for maps that show trading zones graphically).

6.3.2. Access rules

Protecting pools, lagoons and lakes

Pools in NSW can provide an important source of water for licence holders, landholders and communities. Pools also have a key ecological function as a critical refuge and habitat for flora and fauna.

Pools include lentic water bodies (standing water) in or associated with unregulated rivers across NSW, including anything falling within the definition of a "lake" found in the Dictionary of the *Water Management Act 2000*, except for tidal pools and estuaries.

'Macro water sharing plans – the approach for unregulated rivers. Access and trading rules for pools' can be found on the DPI Water website at www.water.nsw.gov.au. This document has been developed to provide additional guidance for interagency regional panels in setting water access and trading rules for pools that are covered by unregulated river water sharing plans.

The approach uses an assessment of the environmental values of the pools to select rules that adequately protect these values while not having a disproportionate effect on water availability for

extraction. Because it is not practical to identify and create site-specific rules for every natural pool in a water sharing plan area, the focus of the approach adopted is to establish a default access rule of no drawdown below full pool capacity for the majority of pools. The default rule may then be modified by interagency regional panels in specific circumstances if it is justifiable and feasible to do so to allow limited access to pools based on local hydrological, environmental and socio-economic considerations.

Different default rules apply depending on the pool type. The default rules are for:

- Artificial pools created by structures covered by a water supply work approval
 - Existing licence conditions to continue
 - Exempt from the drawdown rule constraints that apply to natural pools
 - For in-river dams, consider a dead storage cease to pump rule if there are outlet works lower than the top of the crest of the weir.
- Natural pools
 - Users must cease to pump when the pool is less than its full capacity

'Full capacity' can be approximated by the greatest pool volume where there is no visible flow out of that pool.

The approach further differentiates between two categories of natural pools. Category 1 pools are natural pools that are any of the following:

- not a stream (regardless of size)
- on a flood-runner or floodplain
- on an effluent that only commences to flow during high flows.

Category 2 pools are all natural pools that are not in category 1 and can be found within the channels of perennial or intermittent rivers. As flows subside in the channels of intermittent rivers, pools remain and may be permanent or temporary in nature.

For category 2 pools where the default access rule for the water source or management zone is set at a reference point that is not the pump site (e.g. a rock bar, or gauging station), the default drawdown rule described above may be applied in addition to the cease to pump rule at the reference point.

The default trading rules for pools are as recommended for the water source. Where trades are permitted, interagency regional panels are able to set different trading rules to ensure that trades do not increase access to pools or result in third-party impacts to existing licence holders. Alternate trading rules are selected on a similar basis to the alternate water access rules – i.e. the rules should protect environmental values, basic landholder rights and minimise trading into areas of high competition. For example, interagency regional panels can consider restricting or prohibiting trade into pools that are isolated from the river, such as category one pools that fill from local run-off events.

Water sharing plans contain amendment provisions to allow for changes to be made to access and trading rules for a particular pool or category of pool should new information be gained through environmental and/or socio-economic studies relating to pools in a plan area. The IRP recommended setting a cease to pump rule of "no visible flow" at the pump site for all 13 water sources in the plan area. During public consultation six Mole River, four Tenterfield Creek and one Beardy River irrigator sought to be able to draw down their pools. The Interagency Regional Panel considered the irrigators requests and recommended to allow some draw down of instream pools in the Mole River, Tenterfield Creek and Beardy River. Refer to section 9.3.1 Management of Instream Pools in the Mole River, Tenterfield Creek and Beardy Rivers for more details.

Protection of regulated releases

The *Water Sharing Plan for the NSW Border Rivers Regulated River Water Source* (the Regulated Plan), commenced in 2009. The Regulated Plan contains provisions for the delivery of environmental water, as well as stock and domestic replenishment flows to unregulated water sources below the regulated river, which the plan must protect. Under the *Water Act 1912* the regulated releases are protected by various methods, including through licence conditions, by formal order and various ad hoc arrangements where licence holders ring State Water before they can pump.

Access to very low flow

Those activities that are considered critical human needs or animal health requirements are permitted to access the very low flow, i.e. below the cease to pump defined in the access rules. Although the level of extraction is small relative to entitlement, it is in direct competition for environmental water requirements at its most critical time. Licences with access to very low flows include:

- domestic supply
- town water supply, until major augmentation of the schemes infrastructure occurs
- fruit washing
- cleaning of dairy plant and processing equipment for the purpose of hygiene
- poultry washing and misting
- cleaning of enclosures used for intensive animal production for the purposes of hygiene.

The plan provides an estimate of the water requirements for domestic and stock rights within each of the water sources, noting that these rights may increase during the life of the plan. The plan cannot limit or restrict these rights, but the WMA 2000 itself provides for restrictions on basic landholders rights, through the mandatory guidelines that are currently under development.

6.3.3. Managing extraction

Unregulated extraction is managed at the Extraction Management Unit level. The Border Rivers Unregulated EMU which includes the 13 unregulated water sources within the NSW Border Rivers Catchment was established in the previous *Water Sharing Plan for the Tenterfield Creek Water Source 2003*. The Croppa Creek and Whalan Creek Extraction Management Unit that includes one unregulated water source was established following community consultation in regard to the Draft plan. Collectively these EMUs cover the whole of the NSW Border Rivers Catchment. Refer to section 9.3.2 for the background to the establishment of the Croppa Creek and Whalan Creek Extraction Management Unit and a description of the water sources included in each EMU.

Extractions from all unregulated water sources are managed according to a long-term average annual extraction limit. The long-term average annual extraction limit for the Border Rivers Unregulated EMU and the Croppa Creek and Whalan Creek Extraction Management Unit are managed separately according to the Cap level or LTAAEL for each EMU. The Cap level for each EMUs is equal to the total of the estimated annual extraction of water averaged over the period from July 1993 to June 1999 for those entitlements issued under Part 2 of the *Water Act 1912*, immediately prior to the commencement of Part 2 of Chapter 3 of the WMA 2000; plus an estimate of annual extraction of water under domestic and stock rights and native title rights for each EMU.

A growth in use response will be triggered in either EMU if average annual usage over three years from all water sources within the respective EMU, exceeds the LTAAEL by more than 5 per cent. The growth in use response will apply to the EMU in which the LTAAEL or Cap has been exceeded.

6.3.4. Available water determination

The maximum available water determination (AWD) for a water source is used to manage growth in extractions, above the Long Term Average Annual Extraction Limit (LTAAEL) i.e. if growth occurs then the maximum AWD will be reduced to respond to less than 1 ML/unit share.

Available water determinations are primarily used to credit water into a licences water allocation account. Specific purpose access licences such as domestic and stock or local water utility access licences, will generally always receive 100 per cent of their share component, although in years of exceptional drought, daily access rules may limit extraction so that the full annual entitlement cannot be realised.

The AWD for unregulated river access licences will be 1 mega litre per unit share, unless a growth in use response is required. However for the first year of the plan, a one-off announcement of two megalitres per unit share will be made to allow the operation of three year accounting rules described above. The AWD for unregulated river (special additional high flow) access licences will be one megalitre per unit share, unless a growth in use response is required.

6.3.5. Carryover and water accounts

A water allocation account will be established for each water access licence. Water is credited to the account when an AWD is made, and debited when water is extracted. A licence holder's account is not permitted to go into debit.

Unregulated rivers have enormous variation in annual flow volumes between years. As such unregulated river access licence account management will operate under three year accounting rules, subject to compliance with the daily access rules. Available water determinations combined with the carryover allowance will enable licence holders to use up to twice their water allocation in a year provided that over a consecutive three year period they do not exceed the sum of their water allocations for those three years⁷.

For the first three years of the plan, this maximum volume that may be taken may not exceed a volume equal to three times the access licence share component (where this is expressed in megalitres), or 3 megalitres per unit share (where the share component is expressed in unit shares). This restriction in the first three years is due to the allocation of 200 per cent (where share component is expressed as a volume) or 2 megalitres per unit share (where share component is expressed in unit shares), made in the first year of the plan to allow the operation of these accounting rules from year one of the plan.

The maximum amount of unused water allocation that can be carried over from one water year to the next in unregulated river access licence accounts will be 100 per cent of the share component (where this is expressed in megalitres), or 1 megalitre per unit share (where share component is expressed in unit shares).

Example of unregulated river access licence three year accounting rules

An example of three year accounting for an unregulated river access licence holder with a share component of 50 shares is shown in Table 10.

Table 10 Example of unregulated river access licence accounting rules

Year	Account balance (ML at start of year)	AWD (ML/unit share)	Usage (ML)	Account balance (ML at end of year)	Carryover (ML)
1	0	2	0	100	50*
2	50	1	50	50	50
3	50	1	100**	0	0
4	0	1	0***	50	50

* Only 50 ML can be carried over as carryover is limited to 1 ML/unit share. The remaining 50 ML is forfeited.

** 100 ML is also the maximum that can be extracted in this year i.e. twice the allocation for the year which is 2x 50 ML = 100 ML.

*** Although with the AWD there is 50 ML in the account, no water is available for extraction as the maximum extraction over three years is the sum of AWDs in those three years which in this example is 150 ML and this was extracted in year two and three so no extraction can occur in year 4.

6.3.6. Water interception activities

A change in landuse activities can potentially result in the interception of significant quantities of water. Examples of activities that can impact on water quantity include increased farm dam capacity or the development of significant areas of new forestry plantations in a catchment. Under the National Water Initiative (NWI), significant interception activities should be accounted for within a plan's extraction limit.

Exemptions for farm dams

Farm dams currently require an access licence only when:

⁷ Given the opportunistic and unreliable nature of access to water under Unregulated River (special additional high flow) access licence annual accounting provisions apply. Under an annual accounting system no allowance for the carry over of water in the associated water access licence allocation account from one water year to the next is provided. This means water may only be taken in the water year that it is available and where the water account balance of the same year allows water to be taken.

- they are located on a third order (or greater) river, irrespective of the dam capacity or purpose;
- they exceed the maximum harvestable right dam capacity for the property, which enables the capture of 10 per cent of the mean annual runoff from the property, or
- they are on a permanent (spring fed) first or second order stream.

Unlicensed extraction from farm dams that doesn't match any of the above criteria is permitted as a component of the basic landholder rights, called the harvestable right. The full activation of harvestable rights within the area of the plan is considered highly unlikely, therefore the plan allows for an estimate of the current activation of these rights within the extraction limit. The plan cannot actually limit these rights. The provisions relating to harvestable rights are unaffected by any of the rules identified in the plan. However, the uptake of harvestable rights will be monitored to determine if at any stage total unlicensed dam capacity has increased to a level considered significant in relation to interception and to inform the implementation of the NWI.

Acknowledgement of floodplain harvesting activities

Floodplain harvesting is the collection, extraction or impoundment of water flowing across floodplains, excluding the following types of water extraction:

- taking of water under any other type of water access licence that is not a floodplain harvesting access licence or an applicable water access licence exemption
- taking of water under a basic landholder right, including the harvesting of rainwater runoff
- runoff of irrigation water and stormwater which is subsequently captured in tailwater return systems or other means in accordance with licence conditions or methods which have been approved by the Office

Floodplain harvesting works can generally be put into two categories:

- purpose-built works specifically built to facilitate floodplain harvesting, including pumps structures or other works that divert water into or from storages, supply channels, depressions or otherwise impound flows.
- works built for multiple purposes that have the effect of facilitating floodplain harvesting, such as:
 - levees, conveying works and off-river storages constructed in billabongs or depressions
 - below-ground level channels from which the water is delivered into storages.

Floodplain flows can originate from local runoff that has not yet entered the main channel of a river, or from water that has overflowed from the main channel of a stream during a flood.

In unregulated river water sources, floodplain harvesting has generally already been recognised and licensed as part of the process that converted area based water licences to volume based licences.

However, further volumetric entitlements, measurement and long-term limits for floodplain harvesting may be established through the in the future under the NSW Floodplain Harvesting Policy.

Risk of interception through forestry expansion

The projected growth in commercial forestry plantations in the NSW Border Rivers Catchment is considered negligible (CSIRO, 2007).

6.3.7. Construction of dams

There are two types of dams:

Off-river dams

Capture of water in a runoff harvesting dam requires no licence if the dam is within the maximum harvestable right dam capacity for the property on which it is located. Extraction of water beyond the permissible harvestable right is covered by a category of access licence established by regulation under section 57 (1) (l) of the WMA 2000.

In river dams

Under the NSW weirs policy on river dams on third order streams or greater are permitted subject to:

- the Farm Dams Policy (harvestable rights)
- the State Weirs Policy
- a minimal harm test under the WMA 2000.

Under the Farm Dams Policy, a farm dam that is less than the maximum harvestable rights dam capacity is considered a basic landholder right and can be built on a first or second order stream without the need for a water access licence.

Under the State Weirs Policy, the construction of new weirs is discouraged, but can be done where “it can be demonstrated that the primary component of the proposal is necessary to maintaining the essential social and economic needs of the affected community” (DLWC, 1997).

Assuming the instream storage can meet these criteria then an application could be made and these would be assessed against the minimal harm test under the *WMA 2000*.

The plan will not permit applications for dams in high conservation areas.

6.3.8. Dealings rules

Trading rules under the macro planning process for inland catchments are guided by the following principles:

- Where instream values are considered high, no trades are permitted into that water source
- Where a water source is under high hydrologic stress (which is a default assumption, because of the lack of flow and usage data available) no trades are permitted into the water source
- Trades into downstream water sources are permitted regardless of stress or instream value, as long as the water sources have a direct hydrologic connection
- Trades through a Regulated River are not permitted, e.g. a licence cannot be traded from an unregulated water source upstream of the regulated reach to a water source downstream of the regulated reach

As a result of these principles, trades are not permitted into any unregulated water sources in the plan area. It is the opinion of the IRP that the high hydrologic stress in all water sources across the catchment mean that allowing trades between water sources would result in unacceptable environmental and/or third party impacts. Trading zones have been established in the Inverell (refer to Map 2), Glen Innes (refer to Map 3), Kings Plains (refer to Map 4), Mole River (refer to Map 5), Croppa Creek and Whalan Creek Water Sources (refer to Map 6) and Tenterfield Creek (refer to Map 7). Trading rules that apply within and between trading zones are provided in Table 11 below.

Table 11 Trading rules for unregulated water sources

Inverell Water source	
Trading rules for Macintyre River Trading zone	
INTO trading zone	Trades permitted from the Macintyre River Tributaries Trading zone.
WITHIN trading zone	Trades permitted, subject to assessment.
Trading rules for Macintyre River Tributaries Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment.
Glen Innes water source	
Trading rules for Glen Innes Tributaries Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment.
Trading rules for Beardy Waters Trading Zone	
INTO trading zone	Not permitted.

WITHIN trading zone	Trades permitted, subject to assessment.
Trading rules for upstream Beardy Waters Dam Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment
Trading rules for Severn River Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment.
Kings Plains Water source	
Trading rules for Kings Plains Trading Zone	
INTO trading zone	Trades permitted from the Nullamanna Road Crossing Trading Zone only.
WITHIN trading zone	Trades permitted, subject to assessment.
Trading rules for Upstream Nullamanna Road Crossing Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment.
Mole River Water source	
Trading rules for Mole River Trading Zone	
INTO trading zone	Trades permitted from the Bluff River and Brassington Creek and Tributaries Trading Zone, Deepwater River and Tributaries Trading Zone, and the Mole River Tributaries Trading Zone only.
WITHIN trading zone	Trades permitted, subject to assessment.
Trading rules for Unregulated Dumaresq River Trading Zone*	
INTO trading zone	Trades permitted from the Mole River Trading Zone and the Mole River Tributaries Trading Zone.
WITHIN trading zone	Trades permitted, subject to assessment.
Trading rules for Bluff River and Brassington Creek and Tributaries Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment.

Trading rules for Deepwater River and Tributaries Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment.
Draft trading rules for Mole River Tributaries Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment.
Croppa Creek and Whalan Creek Water Source	
Draft trading rules for Croppa Creek & Whalan Creeks And Tributaries Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment.
Draft trading rules for Boomi River and the Tributaries and effluents of both the Boomi River and the Macintyre River Trading Zone	
INTO trading zone	Not permitted.
WITHIN trading zone	Trades permitted, subject to assessment.
Tenterfield Creek Water Source	
Trading rules for the Creeks and Tributaries of Zone 1	

INTO trading zone	Not permitted
WITHIN trading zone	Not permitted between trading zones. Permitted within trading zone, subject to assessment
Trading rules for the Creeks and Tributaries of Zone 2	
INTO trading zone	Not permitted
WITHIN trading zone	Not permitted between trading zones. Permitted within trading zone, subject to assessment
Trading rules for the Creeks and Tributaries of Zone 3	
INTO trading zone	Not permitted
WITHIN trading zone	Not permitted between trading zones. Permitted within trading zone, subject to assessment
Trading rules for the Creeks and Tributaries of Zone 4	
INTO trading zone	Not permitted
WITHIN trading zone	Not permitted between trading zones. Permitted within trading zone, subject to assessment
Trading rules for the Creeks and Tributaries of Zone 5	
INTO trading zone	Not permitted
WITHIN trading zone	Not permitted between trading zones. Permitted within trading zone, subject to assessment

7. Rules for alluvial groundwater sources

7.1. Background

The plan includes the alluvial aquifers occurring along the regulated Dumaresq River and Macintyre Rivers and Ottleys Creek. All groundwater sources covered by the plan are considered to be highly connected to surface waters.

The NSW Border Rivers Upstream Keetah Bridge Alluvium Groundwater Source (total length about 130 km) is defined as the unconsolidated alluvial deposits associated with the reach of the regulated Dumaresq River that extends upstream of Keetah Bridge to the end of the alluvium at the junction of the Dumaresq River and the Mole River. The NSW Upstream Keetah Bridge Alluvium is comprised of sediments ranging from large boulders, to cobbles, gravels, sands, silts and clay. The floodplain is up to 4.5 km wide and the sediments have a maximum thickness of 100 m. The NSW Upstream Keetah Bridge Alluvium is recharged by rainfall, side slope run on and stream flow leakage from the regulated Dumaresq River. The groundwater quality is good and suitable for all purposes. It is used for irrigation (predominantly Lucerne and fodder crops), domestic and stock, and provides Bonshaw with a supplementary town water supply. Bore yields of up to 60 L/s are common from this water source.

The NSW Border Rivers Downstream Keetah Bridge Alluvium Groundwater Source (total length about 53 km) is defined as the unconsolidated alluvial deposits associated with the reach of the regulated Dumaresq River that extends downstream of Keetah Bridge to the end of the alluvium, which is approximately 20 km downstream of Boggabilla (Note: The regulated Dumaresq River becomes the regulated Macintyre River downstream of its junction with the regulated Macintyre River). The Downstream Keetah Bridge Alluvium is comprised of sediments ranging from cobbles, to gravels, sands, silts and clay. The floodplain ranges from 500 m to 7 km wide and the sediments have a maximum thickness of 35 m. The NSW Downstream Keetah Bridge Alluvium is recharged by rainfall, side slope run on and stream flow leakage from the regulated Dumaresq and Macintyre Rivers. The groundwater quality is variable and suitable for most purposes. Bore yields of up to 4.5 L/s are common from this water source.

The Macintyre Alluvium Groundwater Source (total length about 55 km) is defined as the unconsolidated alluvial deposits associated with the reach of the regulated Macintyre River upstream of the junction of the Macintyre River and Ottleys Creek to the end of the alluvium which is about 3.2 km downstream of the junction of the Macintyre River and Ena Creek. The Macintyre Alluvium Groundwater Source is comprised of sediments ranging from cobbles, gravels, sands silt and clay. The floodplain ranges from 675 m to 4.8 km wide and the sediments have a maximum thickness of 42 m. The Macintyre Alluvium Groundwater Source is recharged by rainfall, some side slope run on and stream flow leakage from the regulated Macintyre River. The groundwater quality is good and suitable for most purposes. Bore yields are low, up to 11 L/s is common from this water source.

The Ottleys Creek Alluvium Groundwater Source (total length about 44 km) is defined as the unconsolidated alluvial deposits associated with the reach of the unregulated Ottleys Creek between the confluence of Ottleys Creek and the Macintyre River to the end of the alluvium about 2.4 km downstream of where Blue Nobby Road crosses Ottleys Creek. The Ottleys Creek Alluvium Groundwater source is comprised of sediments ranging from gravels, to sands silt and clay. The floodplain ranges from 230 m to 4.7 km wide and the sediments have a maximum thickness of 24 m. The Ottleys Creek Alluvium is recharged by rainfall, some side slope run on and stream flow leakage from the Ottleys Creek. The groundwater quality is good and suitable for most purposes. The irrigation purposes this water is used for is unknown,

7.1.1. Hydrogeological modelling

A conceptual groundwater model was developed to evaluate the effect of pumping on a highly connected regulated river. Scenarios were run to identify how sensitive the model area was to changes in aquifer properties, pumping rates, bore distances from the river and recharge rates. A fully calibrated model (requiring observed data and more accurate aquifer properties) was not attempted.

The model was developed using Groundwater Vistas 4 / Modflow2000 platform and is represented by a single layer bounded on one side by an impermeable slope, on the opposite side by the river and with an impermeable layer below. The model area was divided into a spatial grid of constant elevation and the hydraulic head calculated for each cell and each stress period, over a total period of 365 days.

This hydrogeological model was used as a tool to more accurately define recharge and to evaluate impacts of an average annual pumping regime on the regulated river (Broadstock, 2009).

Key observations from the hydrogeological analysis

The results of the highly connected aquifer model show that:

- the main source of groundwater pumped under an average annual pumping regime can be traced from the Regulated River
 - up to 85 per cent of recharge to the unregulated alluvium is consumed through vegetation as evapotranspiration
 - increasing the pumping rate increases the impact on the river
 - increasing the distance of the pumping bore from the river decreases the impact on the river.
- (Broadstock, 2009).

7.2. Water sharing rules

7.2.1. Protecting environmental values

Plans are required to reserve water for the overall health of the river and aquifers and to protect specific ecosystems that depend on river flows, such as wetlands, lakes, estuaries and floodplains and groundwater dependent ecosystems. This share of water reserved for the environment, is also intended to sustain the river and groundwater system's aquatic fauna and flora.

The plan protects environmental values in these alluvial groundwater sources by reserving the long-term average volume of water stored in the aquifers and, in some cases, a proportion of recharge to the groundwater source as planned environmental water. Estimates of rainfall recharge have been derived using the macro method⁸, but these groundwater sources also have significant recharge from other sources, e.g. river recharge. Exact figures for the total recharge volume (and therefore the environmental water component) in these highly dynamic systems are not possible as the amount of recharge will depend on the amount of groundwater pumped.

Hydrogeological modelling of highly connected groundwater sources acknowledges that significant volumes of recharge to the groundwater source are either accessed and removed by vegetation through evapotranspiration or are discharged as base flows to rivers. Setting the LTAAEL at current average usage or an estimate of current average usage protects and maintains environmental water for these functions.

Groundwater dependent ecosystems

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 EECs.

On commencement of the plan no high priority GDEs had been identified however investigations are ongoing and some may be identified during the term of this Plan. The full list of potential GDEs will be identified on the DPI Water GDE Register and as a precautionary approach, will be considered by staff in the assessment of any application for a water supply work approval within the area of the Plan. If it becomes verified as a high priority GDE, the Plan will be amended to include the GDE.

The methodology utilised for the identification and scheduling of high priority GDEs in the macro planning process involves two stages consistent with the NSW State Groundwater Dependent Ecosystem Policy (DLWC, 2002).

7.2.2. Rules for water supply works approvals

In accordance with the principles of the WMA 2000, the plan sets rules to minimise the cumulative impacts resulting from groundwater extraction. To do this, the plan specifies rules which prohibit

⁸ The macro method for groundwater is outlined in *Macro water sharing plans - the approach for groundwater. A report to assist community consultation*. The report is available online at www.water.nsw.gov.au

new/amended works from extracting water within certain distances of other water users, contaminated sites, GDEs and groundwater dependent culturally significant sites. This is to prevent unacceptable or damaging levels of drawdown of water 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 DPI and OEH to incorporate a socio-economic and environmental perspective. These panels compiled distance rules for common groundwater aquifer types (for example fractured rock, alluvium, coastal sands and porous rock) based on previous studies, substantial local knowledge and experience.

The standard set of distance rules developed by regional and state panels then went to the State Groundwater Panel for approval. The State Groundwater 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. This process has resulted in consistent rules across aquifer types considered the most current thinking in terms of managing local impacts of extraction and protecting GDEs. However, the plan development process allows for changes to the rules to cater for local conditions. The distance criteria may be altered due to a number of different factors, such as lot size where property sizes may lead to different interference distance criteria, aspects of the local hydrology and groundwater dependence of town water.

The IRP considered the standard distance rules and recommended to adopt the standard distance rules in the draft plan. However, following representations from irrigators in the NSW Upstream Keetah Bridge Alluvium and advice from the DPI Water hydrogeologist the IRP recommended to alter a number of standard rules. Refer to section 9.3.4 for information on what rules were amended and the reasons why these rules were amended. For details about the distance rules for each groundwater source covered by the plan refer to Part 9, of the plan.

For new / replacement works there are rules to:

- minimise interference between neighbouring works
- locate works away from contaminated sites
- protect water levels in groundwater dependent ecosystems (GDEs)
- protect groundwater dependent culturally significant sites
- manage surface and groundwater connectivity
- manage temporary local impacts that may affect water levels, water quality and aquifer integrity.

For existing works there are also rules to:

1. protect water levels in groundwater dependent ecosystems (GDEs)
2. manage surface and groundwater connectivity
3. manage works near contaminated sites
4. manage temporary local impacts that may affect water levels, water quality and aquifer integrity.

7.2.3. Managing extraction

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

In highly connected river - aquifer systems, extraction in one water resource area can reduce water availability in the other. The surface waters of these highly 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. The Murray-Darling Basin Ministerial Council Cap does not apply to groundwater.

NSW Border Rivers Upstream Keetah Bridge Alluvial Groundwater Source

The LTAAEL for the NSW Border Rivers Upstream Keetah Bridge Alluvial is equal to 8 085.3 megalitres per year, defined by the sum of:

- average usage (1998/99-2007/08) from bores metered by State Water; plus,
- an estimate of usage by the current utilisation of basic landholder rights; plus,
- the amount of entitlement in ML held by local water utilities.

The LTAAEL was based on the sum of each individual's maximum 5 year average usage over the metered period from 1 July 1993 and 30 June 2010. The maximum recorded annual usage from the NSW Upstream Keetah Bridge Alluvial groundwater source was 7 126 ML in water year 2003/2004. Setting the LTAAEL at current use should have no immediate impacts for users, but will limit future development potential from this water source.

On commencement of the plan it is unlikely that QLD will have finalised all management arrangements for their component of the shared groundwater sources. It is likely that QLD will base their extraction limit for the Upstream Keetah Bridge Alluvial Water Source on a recharge model that is yet to be developed. In the event that a model is developed and better information becomes available an amendment clause has been included in the plan to allow for such information to be considered when setting future LTAAELs.

During public exhibition and community consultation the methodology for establishing the LTAAEL was questioned by a number of groundwater irrigators. It was suggested by some irrigators that rather than basing the LTAAEL on usage an alternative 'sustainable yield' type approach based on a greater level of recharge than DPI Water estimate should be used. The IRP considered the alternative approach and endorsed the existing methodology based on historical usage. In endorsing the existing methodology the IRP noted that:

- the recommended approach should allow existing irrigation industries – both the regulated river and the alluvial aquifer irrigation – to continue to extract current levels of water
- the plan includes an amendment provision that enable future LTAAELs to consider additional information (e.g. a calibrated and verified recharge model) and that stakeholder should be consulted when considering an alternative approach
- the highly connected nature of the aquifer with Regulated Dumaresq River where any increase in groundwater extraction will come from the regulated river, at the expense of the regulated river users
- the LTAAEL is greater than the maximum year of historical use (LTAAEL 8,085.3 ML vs maximum ever used 7,126 ML).

NSW Border Rivers Downstream Keetah Bridge Alluvial Groundwater Source

- The long-term average annual extraction limit (LTAAEL) for the NSW Border Rivers Downstream Keetah Bridge Alluvial is equal to 316.4 megalitres per year, defined by the sum of:
- an estimate of usage, plus
- an estimate of usage by the current utilisation of basic landholder rights.

Note. There are no local water utilities in this alluvial water source.

Ottleys Creek Alluvial Groundwater Source

The LTAAEL for the Ottleys Creek Alluvial is equal to 29.7 megalitres per year, comprising:

- an estimate of usage by the current utilisation of basic landholder rights.

Note. There are no local water utilities and no licensed entitlement in this alluvial water source.

Macintyre Alluvial Groundwater Source

The LTAAEL for the Macintyre Alluvial is equal to 373 megalitres per year, defined by the sum of:

- an estimate of usage; plus,

- an estimate of usage by the current utilisation of basic landholder rights; plus,
- the amount of entitlement in ML held by local water utilities.

Compliance with extraction limits

Extractions are managed to the LTAAEL, should growth in extraction above the LTAAEL be assessed to have occurred, an appropriate growth in use response will be taken. The current state wide position is to set the LTAAEL for highly connected and alluvial systems at current average usage. Therefore, the growth in use response described in the plan is one which 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. Commencing in year six of the plan, a response is triggered if the average usage over a period of five years exceeds the LTAAEL by 10 per cent.

7.2.4. Available water determination

The maximum available water determination (AWD) for a water source is used to manage growth in extractions above the LTAAEL, if growth is assessed to have occurred, then maximum AWDs will be reduced to respond to this growth i.e. a maximum AWD of less than 1 megalitre per unit share.

Available water determinations are primarily used to credit water into a licence's water allocation account. AWDs will be applied differently for the licences within the Macintyre Alluvial groundwater source and the remainder of the alluvial groundwater sources within the plan area.

Macintyre Alluvial groundwater source

To recognise the connection between the Macintyre Alluvial groundwater source and the Macintyre Regulated River, the AWD for licences within the groundwater source has two components:

- a river recharge component (this is based on the percentage of the Macintyre Alluvial groundwater source LTAAEL derived from river recharge) that will fluctuate in accordance with the availability of resources in the regulated river i.e. if the AWD for high security licences within the Macintyre Regulated River is zero then the AWD for the groundwater source would also be zero, and
- a rainfall and other recharge component (this is based on the percentage of the LTAAEL derived from rainfall/ other sources of recharge) that will be consistently available on a long-term average basis.

The river recharge component will be linked to the AWD for Macintyre Regulated River (high security) access licences. This is in recognition of the need to not increase Regulated River losses during periods of reduced surface water availability. If these losses were allowed to exacerbate reduced water availability, then this potentially impacts future allocations for high priority surface water licences. Linking AWDs will therefore protect against increasing losses from the Macintyre Regulated River to the groundwater, during times of reduced allocations for the Macintyre Regulated River.

$$\text{AWD for Macintyre Alluvial Groundwater Source} = (\text{Regulated River HS AWD} \times 0.6 + 0.4),$$

Up to the maximum AWD for Macintyre Alluvial Groundwater Source

The linking of the Macintyre Alluvial groundwater source AWD is a change from current management, but is believed to have limited impacts, as the AWD for Macintyre Regulated River (high security) access licences is rarely less than 1 megalitre per unit share.

7.2.5. Carryover and water accounts

The alluvial groundwater sources generally have a small storage volume and a large entitlement to LTAAEL ratio. As such, no carryover of entitlement from one year to the next is allowed and the maximum amount of water permitted to be taken from this water source in any one water year is equal to the water allocation accrued in the water access licence account for that water year.

7.2.6. Managing connectivity

Consistent with the state wide approach, extraction from highly connected aquifer access licences that relate more closely to the regulated river will be managed annually i.e. via AWDs (see below "available

water determinations”), whilst highly connected aquifer access licences that related more closely to unregulated water sources will be managed according to daily access rules.

7.2.7. Access rules

Daily flow access conditions will not apply to groundwater licences in the plan area. This is consistent with the application of management in highly connected regulated and alluvial systems across the state, whereby annual management (i.e. by Available Water Determinations) is deemed more appropriate than daily management, for these linkages.

Under DPI Water policy, daily flow access conditions can be applied to highly connected alluvial groundwater sources which are linked to river flow in the relevant unregulated water source/management zone. Groundwater rules generally relate to the relevant surface water access rule, with a time lag of between 14 and 28 days. The lag has been introduced, recognising the lesser level of connection between surface and groundwater moving away from the river and therefore recognising the longer time it takes between extraction and surface water impacts, in these areas.

In order to apply access rules to aquifer access licences, the relevant surface water access rules must be defined at a telemetered gauge or other flow reference point. As flows in the relevant surface water sources are not perennial along the length of the stream, unregulated access licences are managed by access rules preventing drawdown of natural pools only and as such, no access rules can be applied to the respective highly connected alluvial groundwater sources.

7.2.8. Dealings rules

The water market is an effective and equitable way to reallocate water between users. The National Water Initiative (NWI) 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 existing users.

The Minister’s Access Licence Dealing Principles Order 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; hence no trades are allowed into or out of any of the alluvial groundwater sources covered by the plan.

Within each alluvial groundwater source, trades are generally permitted subject to assessment.

8. Impact of water sharing rules

The IRP considered the likely social, economic and environmental impacts of water sharing rules that were proposed in the draft plan. Water sharing rules were made available during public exhibition and road tested during targeted consultation and public exhibition. Water sharing rules included in the plan have been designed to strike a balance between socio-economic and environmental interests. Section 9.0 Consultation provides more details on the consultation process and consideration made when revising water sharing rules that were proposed in the draft plan.

9. Consultation

The Interagency Regional Panel's recommended rules underwent targeted consultation with specific interest groups⁹ and water users where significant changes in management were proposed before the plan was drafted. Formal public exhibition¹⁰ of the draft plan ensured wider public consultation.

While developing the plan, the participating agencies (DPI Water, OEH, DPI and the CMAs) identified areas where better information was needed for making future water planning decisions. Similarly, the community might have suggested areas where further analysis or data gathering is required. This local input was essential in the finalisation of the plan.

CMAs manage the public consultation process, and ensure that all stakeholders and interested parties have an opportunity to examine and comment on the proposed water sharing rules. In particular, the Border Rivers Gwydir Catchment Management Authority (BRGCMA) looked for stakeholders to provide:

- local knowledge and expertise – for example, there may be other natural or socio-economic values that have 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 easily implemented by the licence holders
- confirmation that there are no unintended outcomes from the plan – it is essential that this be given due consideration before the plan is finalised
- specific comments on the Minister's notes included in the draft plan.

9.1. Public exhibition of the draft water sharing plan

Public exhibition of the draft water sharing plan was held in the plan area from 6 December 2010 to 17 June 2011, with three public meetings held in Texas, Tenterfield and Inverell in April 2011. The objectives of this consultation were:

- to provide background to stakeholders as to why the water sharing plan was being developed, how it has been developed to date, what rules were proposed in the various areas and how stakeholders could provide feedback
- 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.

Submissions were required to be made in writing. Comments and enquiries made at the public meetings were also noted.

⁹ 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 rules potential impacts.

¹⁰ 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.

9.2. Targeted consultation on the draft rules

Targeted consultation on the proposed rules for the draft plan commenced in November 2010. Initial targeted consultation was held with:

- local government (briefings were attended by Tenterfield Shire, Inverell, Moree Plains and Uralla Shire Councils)
- aboriginal communities
- and key stakeholders briefing attendees included, Border Rivers Food & Fibre, Dumaresq Valley Irrigators Association and the Mole and Sovereign Water Users Association).

The objectives of this consultation were:

- to provide background for key stakeholders as to why the 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 informally consult and to test the suitability of the proposed water sources and management zones, flow reference points and access and trading rules where significant changes were proposed from current management.

Additional targeted consultation was held with licence holders and key stakeholders in May 2011 to discuss a number of issues that were raised by key stakeholders during public meetings and or submissions on the draft plan. Mole River and Beardy River licence holders were consulted specifically on draw down arrangements in 2011 (refer to section 9.3.1 for more information) and key stakeholders were kept up to date on the planning process pre and post IRP meetings via mail, e-mail and teleconferences.

9.3. Refining water sharing rules as a result of public exhibition and targeted consultation

The Interagency Regional Panel reviewed all the submissions and the matters raised at the meetings and consequently made changes to the draft water sharing rules. During this review process, if updated data became available, it was incorporated into the plan. The following section documents the major changes to the proposed rules as a result of this consultative process.

9.3.1. Management of Instream Pools in the Mole River and the Beardy Rivers

Background

The IRP recommended setting a CtP rule of "no visible flow" at the pump site for all 13 surface water sources included in the draft plan. During public consultation, a small number of Mole River, Tenterfield Creek and Beardy River irrigators advised DPI Water that they had traditionally draw down their pools by 30cm and 50cm (respectively), and that a "no visible flow" CtP would make it difficult to continue to operate the way they had in the past. DPI Water advised stakeholders during public consultation a draw down provision would only be considered on a case by case basis. At the close of public exhibition eleven persons sought draw down provisions. Six of these were from the Mole River Water Source, four from Tenterfield Creek and one was from the Beardy River Water Source.

The Pools Policy provides the framework for setting rules that adequately protect pool values while not having a disproportionate impact on water available for extraction. The Pools Policy provides the IRP with the scope to tailor rules to local situations. The IRP was generally supportive of allowing draw on a limited scale down but sought additional information on the nature of the pools that may be drawn down, crops reliant on draw down and the risk to threatened species (e.g. risk to fish spawning activities) to inform their decision.

Considerations

DPI Water staff undertook a field survey of the key pools that Mole River, Tenterfield Creek and Beardy River irrigators wished to draw down. Prior to attending the pools the assessors conducted a

desk top assessment of the ecological values of the area and when on site measured the volume of each pool and conducted an assessment of the ecological condition (attributes considered included water turbidity, instream woody debris, bank edge condition, and presence of aquatic vegetation). DPI Water staff also interviewed each of the persons that wished to draw down their pools to determine the crops being produced and the critical months for irrigation. The IRP expressed concern that all persons that had traditionally drawn down their pools may not have been aware that under a no visible flow CtP, they would not be able to continue to draw down pools and that they should also be considered for draw down provisions.

Response

For the Mole River and for the six irrigators that applied, the IRP recommended to provide a 30 cm draw down (leaving between 50% and 80% of water in the pool for the environment) between March and August (inclusive) and 20 cm draw down (leaving between 70% and 90% of water in the pool for the environment) between September and February (inclusive).

For the Beardy River and for the one irrigator that applied, the IRP recommended to provide a 50 cm draw down (leaving 80% of water in the pool for the environment) between March and August (inclusive) and 35 cm draw down (leaving 90% of water in the pool for the environment) between September and February (inclusive).

For Tenterfield Creek and the four irrigators that applied, the IRP recommended to provide a 12 cm drawdown of the specific pools, with a first flush rule for all licence holders for a 24 hour period once water level rises above the 'No Visible Flow' height.

The IRP also recommended including a provision in the WSP that provides other irrigators in the Mole River and Beardy River water sources 12 months to apply for a draw down provision and that applications be subject to a case by case assessment to confirm historical participation and whether or not draw down would cause adverse impacts on environmental values, other users any other relevant factors.

9.3.2. Establishment of the Croppa Creek and Whalan Creek Extraction Management Unit.

Background

LTAELs are established at the EMU level. Prior to the commencement of the plan the whole of the NSW Border Rivers Catchment, including unregulated waters covered by the plan and the Water Sharing Plan for the Tenterfield Creek Water Source 2003 (the Tenterfield WSP (13 unregulated water sources) was unregulated waters covered by the Border Rivers Extraction Management Unit. This meant that in the event that an AWD response was triggered all usage across the EMU would be reduced to a level consistent with the LTAEL for the EMU.

Under the draft plan arrangements it was possible that the activities of persons in the far west of the EMU could impact on the activities of irrigators in the east of the EMU. During public exhibition, a number of irrigators advised DPI Water that they were concerned that the very large volume of entitlement in western parts of the WSP area combined with the opportunistic nature of irrigation in these lower catchment areas meant that a growth in use response may be triggered by activation of a relatively small proportion of lower valley irrigators.

Considerations

The IRP agreed that the risk of an AWD response being triggered by a combination of factors such as, more variable rainfall in the western part of the catchment, the associated opportunistic irrigation and the higher concentration of entitlement held in the area was sufficient to warrant separating the EMU into two components each with its own LTAEL (one for the upper NSW Border Rivers Catchment and the other for the lower NSW Border Rivers Catchment) to reflect the vastly different nature of the EMU.

Response

The IRP recommended splitting the EMU into two components, the Border Rivers Extraction Management Unit and the Croppa Creek and Whalan Creek Extraction Management Unit. The elements of each EMU are described in Table 12.

Table 12. NSW Border Rivers Catchment Extraction Management Units

Border Rivers Unregulated Extraction Management Unit	Croppa Creek and Whalan Creek Extraction Management Unit
Water source	Water source
Inverell	Croppa Creek and Whalan Creek
Glen Inness	-
Kings Plains	-
Mole River	-
Ottleys Creek	-
Beardy River	-
Reedy Creek	-
Bonshaw	-
Yetman	-
Camp Creek	-
Campbells Creek	-
Tenterfield Creek	

9.3.3. Aboriginal Cultural Assets

Background

In parallel with public exhibition and targeted consultation of the draft plan a process to identify and assess Aboriginal cultural assets (including cultural sites and flow dependent features) was being developed.

Considerations

During IRP meetings it was noted that a process was underway to identify and assess Aboriginal cultural assets and flow dependent features. Being mindful that a process was being developed the IRP agreed that once assets were identified and assessed they should be included in the plan and that water sharing rules would need to be developed to protect these assets or features. The IRP noted that whilst assets and features should be included in the plan as they were assessed that the community should be consulted over the rules that were required to protect the assets or features and that rules should be implemented on remake of the plan.

Response

Following the completion of community consultation, IRP discussions and consultation with the Aboriginal community DPI Water formulated a position on how Aboriginal cultural assets would be accommodated in the plan. It was determined that that Aboriginal cultural assets could be included in the plan after 5 years and that the rules required to protect the cultural assets would need to take into account the socio-economic impacts of the proposed change and the environmental water requirements of the water source. It was also determined that before any amendment to the plan was made that stakeholders, including the relevant Government agencies would need to be consulted.

9.3.4. Distance Rules

Background

A standard set of distance rules to minimise the interference between bores were developed by the State Groundwater Panel for inclusion in all relevant water sharing plans. The IRP considered the

standard rules and recommended to include them in the draft plan. It was intended that these rules would apply across all alluvial water sources in NSW but that these rules could be varied to accommodate local situations.

During public exhibition a number of irrigators from the NSW Upstream Keetah Bridge Alluvial groundwater source advised DPI Water that some of the distance for the water source should be increased so that they more closely align with the equivalent QLD interference rules and to promote groundwater sustainability.

Considerations

The IRP considered the irrigators suggestions and sought advice from DPI Water Hydrogeologist on the matter. DPI Water hydrogeologist advised that an amendment to the draft interference distance rules (for new and amended works) that related to bore distances from another landholding was justified due to potential synergies with the equivalent rules in Queensland and the potential for deep aquifer interference. DPI Water hydrogeologist also suggested a further amendment to distance rules related to DPI Water observation or monitoring bore distances.

Response

The IRP recommended increasing the distance a water supply work may be from another water supply work or DPI Water observation or monitoring water supply work for the NSW Upstream Keetah Bridge Alluvial Groundwater Source in line with irrigator and DPI Water Hydrogeologist advice as follows:

- from 200m to 400m (distance from another landholding) that is nominated by another licence holder
- from 200 to 400m (distance to another landholding) that is taking water under basic landholder rights
- from 100 to 200 (distance from another landholding) unless the other landholder consents
- from 100 to 400 (distance to a DPI Water observation monitoring bore).

10. 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 WMA 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.

10.1. Monitoring of plan performance

The DPI 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 plans and macro plans to enable the development of a specific MER plan.

10.2. 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.

10.3. Plan review

Under the WMA 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 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.

11. Implementation

11.1. Implementation programs

An implementation program may be established that 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.

An annual review of the implementation program will be conducted to determine whether the Implementation Program is being effective in implementing the water sharing provisions. The results of this review will be included in DPI Water's Annual Report.

11.2. Monitoring water extractions

Each water sharing plan establishes the relevant mandatory conditions for extraction, including that all licences undertake measurement of extraction. DPI 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, in order to provide water extraction estimates. 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.

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.

11.3. Compliance

DPI 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 DPI Water. Reports may be made by calling 1800 633 362 or emailing watercompliance@water.nsw.gov.au (refer to the DPI Water website).

12. Glossary

Many of the terms in this document are defined in the WMA 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.

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

Critical habitat: Areas of habitat (land or water) that are crucial to the survival of particular threatened species, populations or communities.

Cumulative impact: The combined impact of all surface water extraction.

Ecological values: The intrinsic or core attributes associated with naturalness, diversity, rarity and special features, but excluding representativeness used to classify water sources for apportioning water management rules.

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*.

Ephemeral: Temporary or intermittent; for instance, a creek or wetland which dries up periodically.

Extraction of water: Removal of water from a river for off-stream storage or consumptive use.

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

Flow classes: The range of daily flow rates in a river which provides the framework for sharing water on a daily basis.

Flow duration curve: A plot that shows the percentage of time that flow in a stream is likely to equal or exceed some specified value of interest.

Flow gauging station: A device used to measure the height of a river, from which the flow in the river can be calculated.

Flow reference point (FRP): The site from which the flow data is calculated to determine the rates associated with a flow class and then to implement the daily access rules during the life of the plan.

Full capacity: The volume of water that is impounded in the pool, lagoon or lake when the level of water in the pool, lagoon or lake is at the highest water level where there is no visible flow out of that pool.

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: 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 plans covering most of the remaining water sources in NSW.

Management zone (MZ): 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 (MZ) is more likely to be designated where local dealing restrictions are in place or where cease to pump rules for works approvals apply.

Pools: Lentic water bodies (standing water), including anything falling within the definition of a "lake" found in the Dictionary of the *Water Management Act 2000*, except for tidal pools and estuaries.

Riparian: Relating to or living or located on the bank of a natural watercourse, such as a river or stream.

Visible flow: The continuous downstream movement of water that is perceptible to the eye.

Water sharing plan (plan): A plan made under the WMA 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.

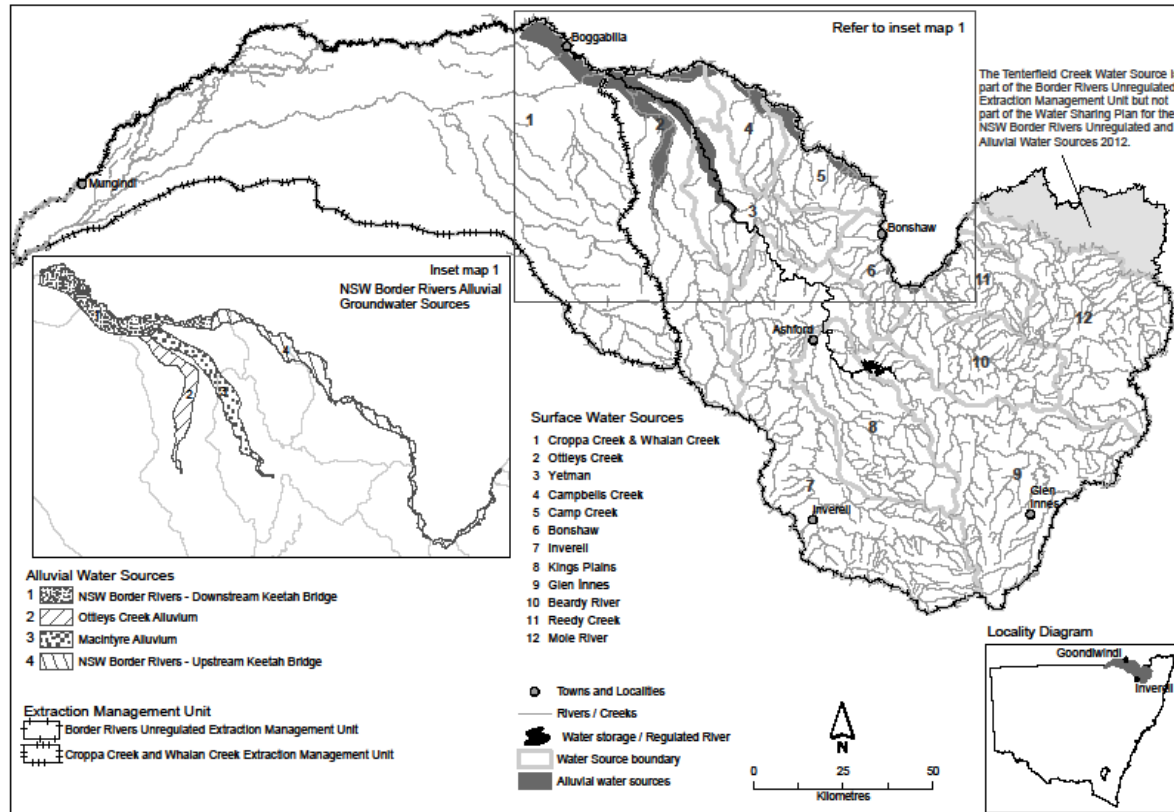
13. References

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14. Appendices

Appendix 1: Water sharing plan maps

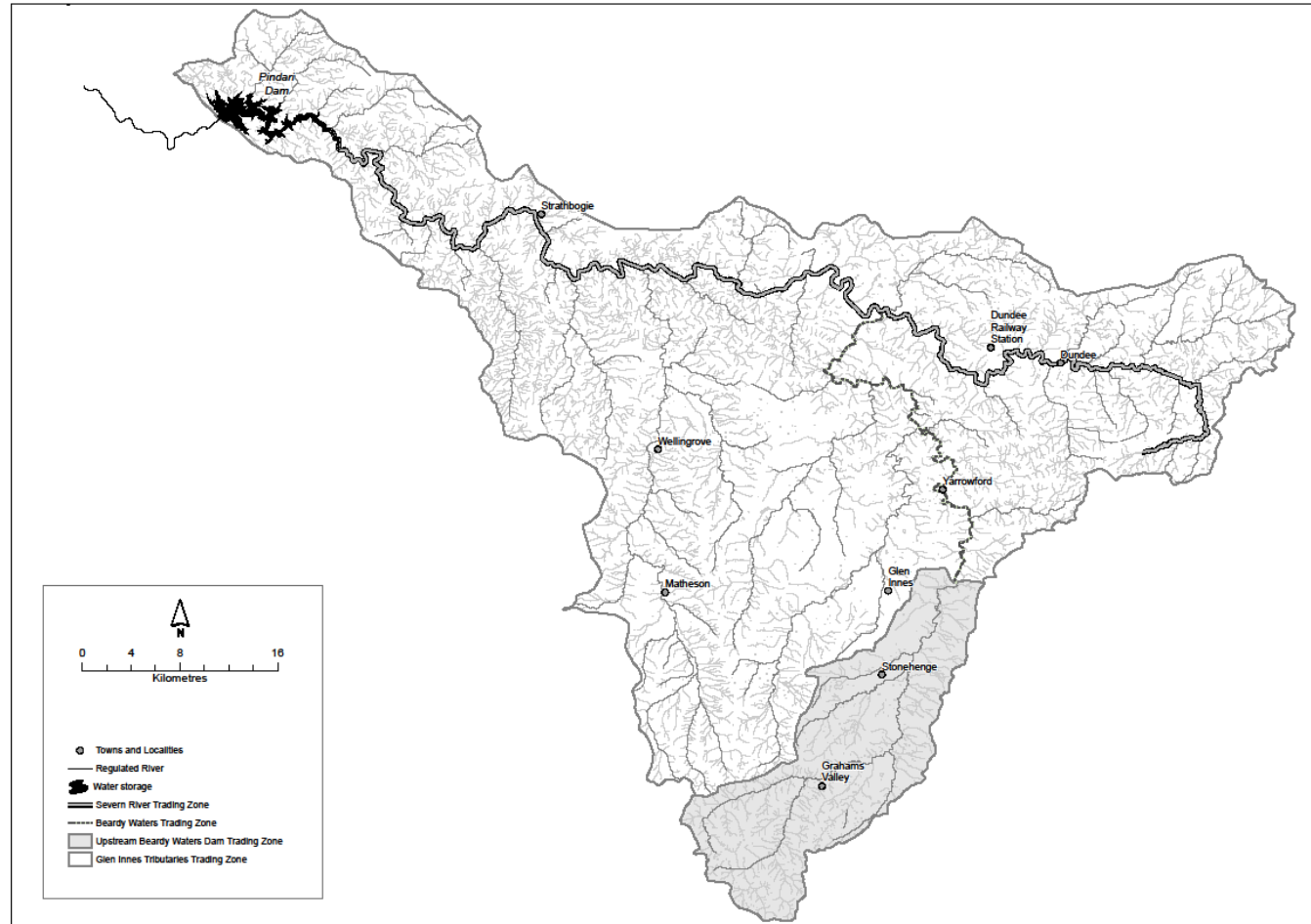
Map 1. Overview of Plan Area



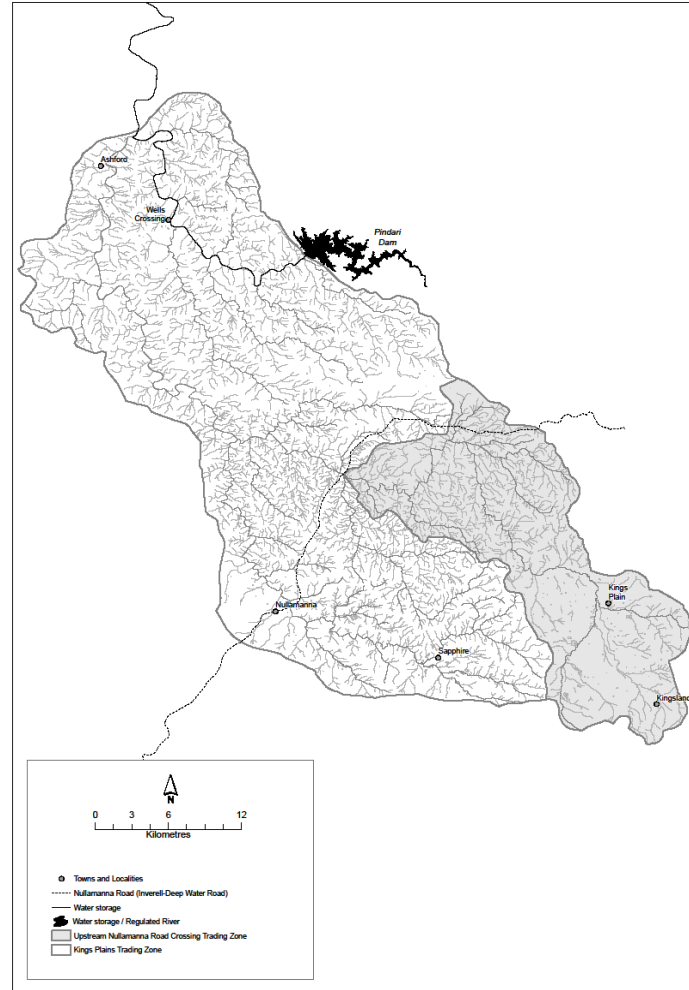
Map 2. Inverell Water Source Trading Zones.



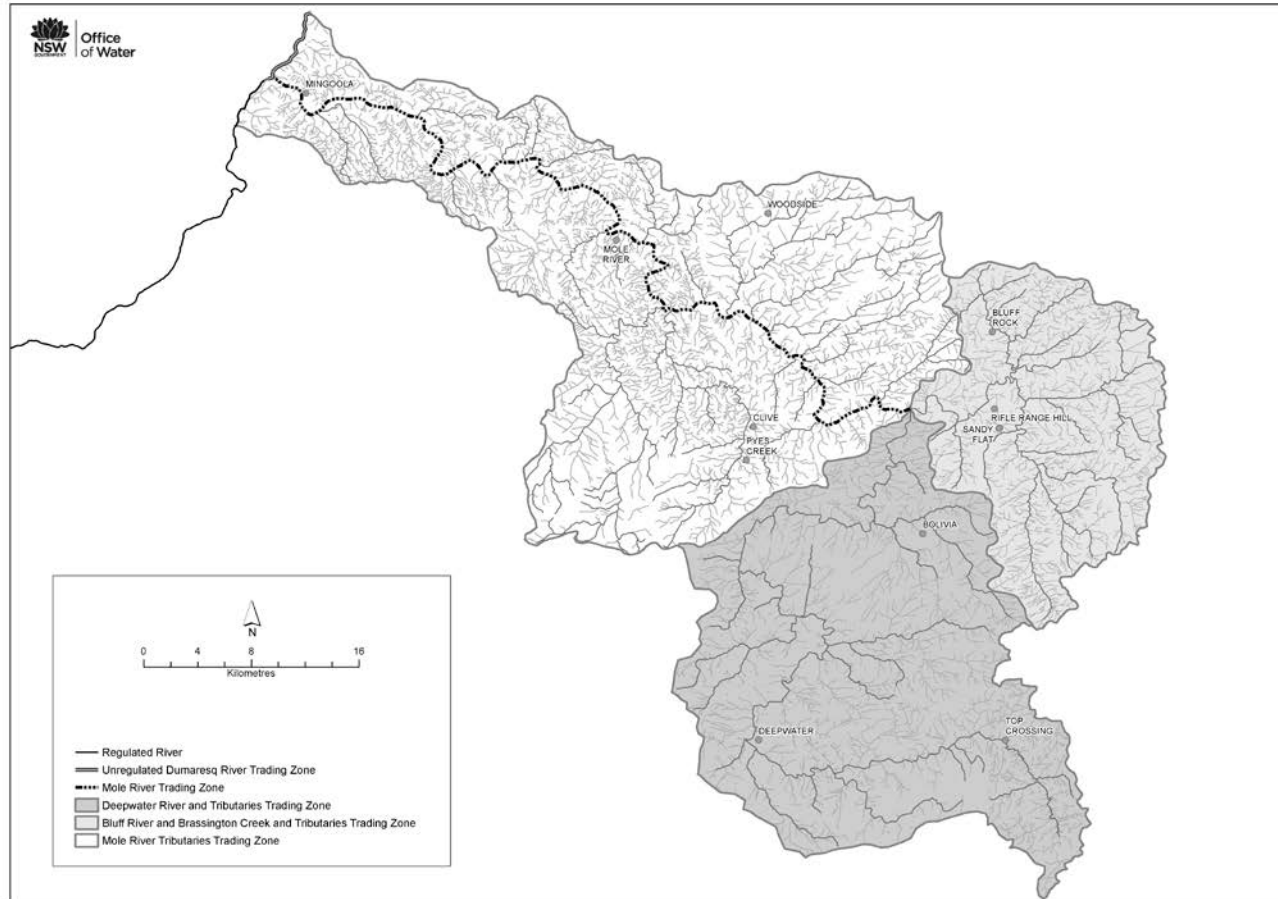
Map 3. Glen Innes water Source Trading Zones



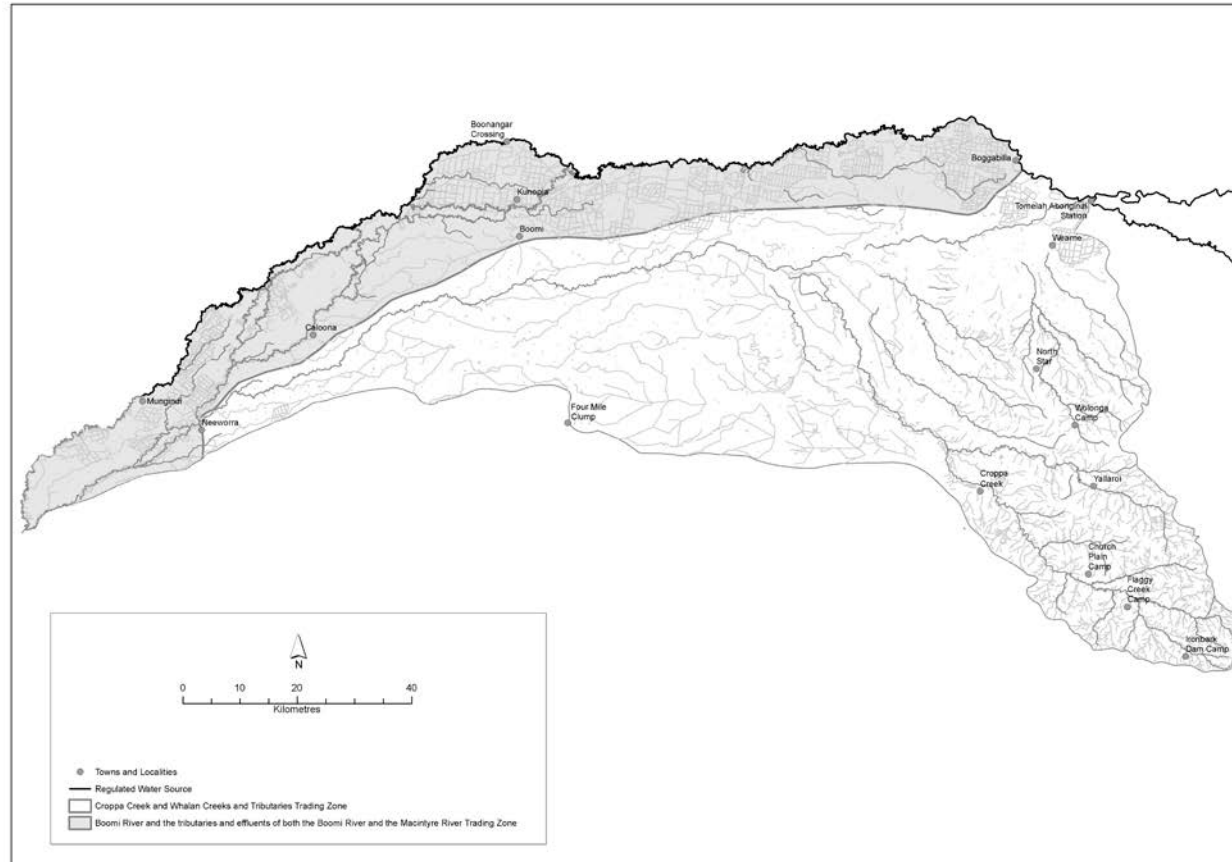
Map 4. Kings Plains Water Source Trading Zones



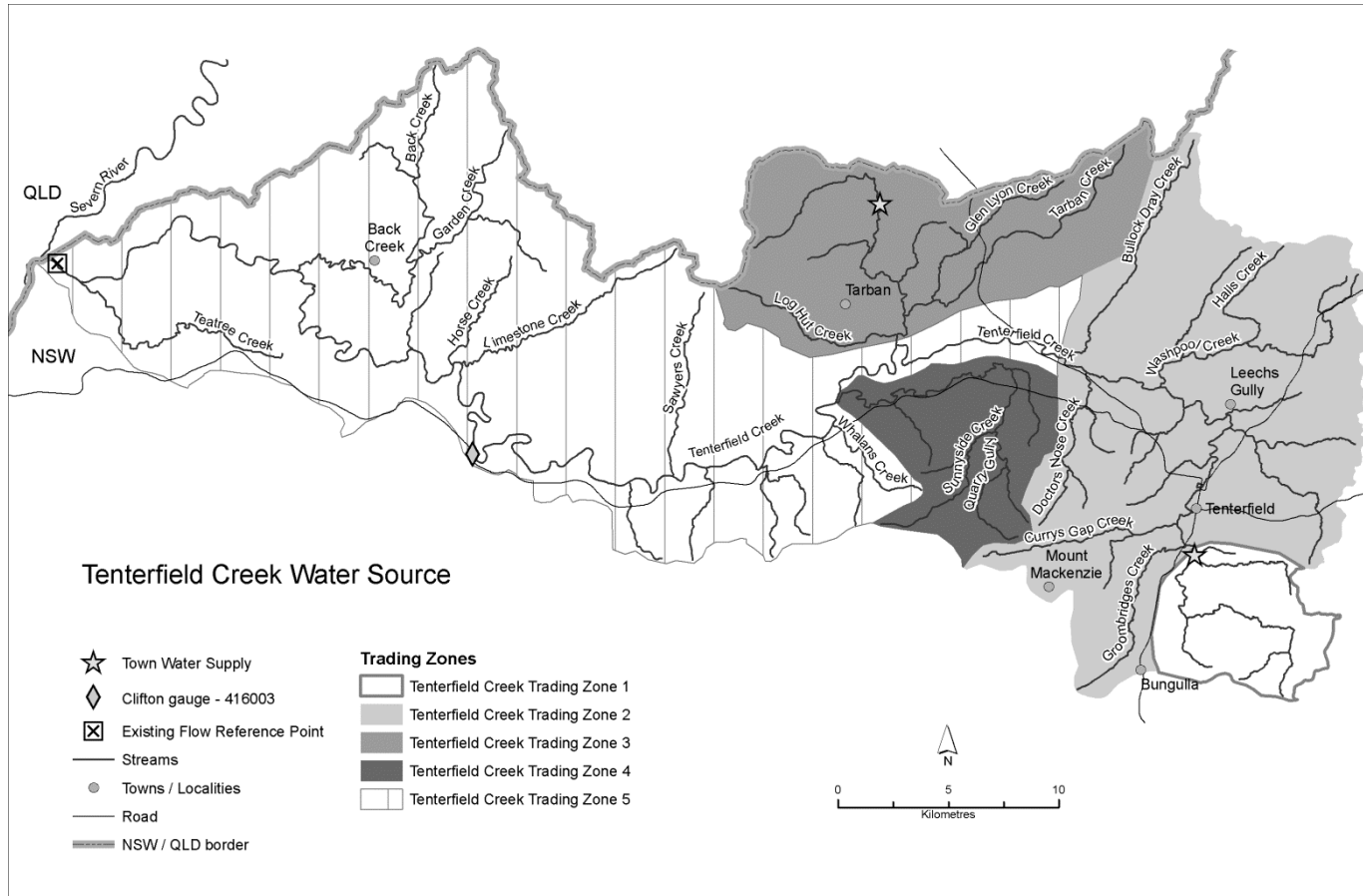
Map 5. Mole River Water Source Trading Zones



Map 6. Croppa Creek and Whalan Creek Water Source Trading Zones



Map 7. Tenterfield Creek Water Source Trading Zones



Appendix 2: Identified threatened species and ecological communities

It is important to note that the macro water sharing plan process is concerned with protecting in stream water values that relate to extraction. Therefore, only threatened species that are likely to be sensitive to extraction have been considered when assessing the water source values.

It should also be noted that some threatened species are highly sensitive to low flow extraction, whilst other threatened species, such as plants that occur in the riparian zone, are less sensitive. Accordingly, threatened species considered to be highly sensitive to low flows are given a highly priority for protection.

The table below shows threatened species that are known (K) or expected (E) to occur in each water source.

Water source	Instream Value Overall	Threatened Fish Species		Threatened frog species		Threatened macro-		Threatened bird species		Other threatened		Threatened wet flora		Endangered ecological	
		E	K	E	K	E	K	E	K	E	K	E	K	E	K
Inverell	Med	4	0	1	2	0	0	2	5	0	2	N/A	N/A	0	2
Glen Innes	High	3	0	1	6	0	1	2	5	0	2	N/A	N/A	0	1
Kings Plains	Med	3	0	1	2	0	0	2	5	0	2	N/A	N/A	0	2
Mole River	High	1	1	0	5	0	1	2	3	0	2	N/A	N/A	0	1
Ottleys Creek	High	3	1	0	0	0	0	0	8	0	0	N/A	N/A	0	2
Beardy Creek	High	1	1	0	1	0	0	2	2	0	1	N/A	N/A	1	0
Reedy Creek	High	0	2	0	0	0	0	1	2	0	2	N/A	N/A	0	1
Bonshaw	High	1	2	0	1	0	0	1	3	0	2	N/A	N/A	0	1
Yetman	Med	3	0	0	0	0	0	6	2	0	2	N/A	N/A	1	1
Croppa Creek	High	3	1	0	0	0	0	1	8	0	0	N/A	N/A	0	3
Camp Creek	High	2	1	0	0	0	0	6	2	0	2	N/A	N/A	1	1
Campbells Creek	High	0	0	0	0	0	0	6	1	0	2	N/A	N/A	1	1
Tenterfield Creek	Med	2	0	1	0	1	0	0	1	0	1	N/A	N/A	2	0

Disclaimer

The Office of Environment and Heritage (OEH) has provided assessments on the presence of threatened species and their sensitivity to extraction to inform the classification of water sources through the Macro Water Sharing Planning process. The assessments were undertaken for the specific purpose of developing an initial classification of water sources. They were based on the most accurate and relevant data/ information sourced and analysed at the time.

Initial classifications were a first step to inform panel deliberations. Panels considered a range of information and used local knowledge in determining a final classification. The assessments are not absolute – for example the absence of threatened species for an assessment does not necessarily mean the threatened species are not present.

These assessments should not be used for any purpose other than classification of catchment management units as part of the Macro Water Sharing Planning process.

Appendix 3: Interagency regional panel and support staff - membership and expertise

Name	Agency	Role	Expertise
Interagency Regional Panel			
Dave Miller	DPI Water	Agency Representative	Water planning/administration/policy. Geomorphology. Riparian management. Stream ecology/restoration.
Pam Welsh	DPI	Agency Representative	Resource management, farm systems and enterprises, farm management and economics, irrigation systems and management, extension and communications
Jane Humphries	OEH	Agency Representative	
Daryl Albertson*	OEH	Agency Representative - Alternate	
Liz Savage	CMA	CMA Observer	
Geoff Rayson	CMA	Agency Representative – from June 2011	
Support Staff			
Andrew Scott	DPI	Technical Support/ Alternate Representative	Resource management, farm systems and enterprises, farm management and economics, irrigation systems and management, extension and communications
Dale Gollan	DPI Water	Plan coordinator	Plan development and implementation, facilitation and project management. Plan coordination.
Jamie Foster	DPI Water	Plan coordinator (Tenterfield only)	Plan development and implementation, facilitation and project management. Plan coordination
Emily Turner	DPI Water	Plan support	Classification process, access and trading rules.
Karen Hearnden	DPI Water	Plan support	Classification process, access and trading rules. Plan coordination.
Anthony Colvin	DPI Water	Plan Technical Support (licensing)	Licensing officer, local knowledge of water users, WUAs, local access arrangements and reference points.
Martin O'Rourke	DPI Water	Plan Technical Support (Hydrogeology)	Hydrogeologist, expertise in Border Rivers Groundwater Sources.
Tim O'Connor	DPI Water	Plan Technical Support (GIS)	GIS expertise.

Appendix 4: Interagency regional panel reference materials

Office Data Sets

Licensing Administrator System (LAS) – the Office state wide database holding the licence details including volume of entitlement, location details and stream orders.

Hydsys – Hydsys is an Office state wide database that holds all flow record data. Flow records are available for most water sources in the Northern Rivers area.

Regional Groundwater Monitoring Network – the Office is developing a regional groundwater monitoring network to be used to monitor alluvial groundwater levels and assess stream / surface water connectivity.

Volumetric Conversion Database (VOLCON) – used to help determine the Peak Daily Demand (PDD) for each water source.

Regional Geographic Information Systems – the Office Land use and topographic information

Central Data Sets

Stressed rivers reports – used as the basis for identifying where there are instream barriers.

Threatened species (fish) – Data supplied by I&I NSW.

Threatened species (other) – Data supplied by DECCW.

Index of Social Disadvantage – Australian Bureau of Statistics.

Employment in Agriculture - Australian Bureau of Statistics

Roy PS et al. (2001) – Structure and Function of South-Eastern Australian estuaries.

Other Agency Data

National Parks and Wildlife (DECCW) state wide atlas – State wide flora and fauna database

NSW Fisheries (I&I NSW) modelled data sets (Fish Community Index, Fish Community Vulnerability).

NSW Fisheries (I&I NSW) freshwater and saltwater recreational fishing database.