



Department of  
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Water

# Water Sharing Plan for the Central Coast Unregulated Water Sources 2009

Background document for amended plan 2016

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*Water Sharing Plan for the Central Coast Unregulated Water Sources - Background Document for amended plan 2016*

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Updated in July 2016 to incorporate amendments to the plan following inclusion of the Ourimbah Creek and Jiliby Jiliby Creek Water Sources

## More information

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## Introduction

Water sharing plans are being progressively developed for rivers and groundwater systems across New South Wales following the introduction of the *Water Management Act 2000* (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 31 2004, 31 water sharing plans commenced in NSW, bringing these water sources and some 80% of water extracted in NSW under the management and licensing provisions of the WMA 2000.

In recent years, water sharing plans for unregulated<sup>1</sup> rivers and groundwater systems have been completed using a broad scale 'macro' approach based on whole river catchments or aquifer systems. Approximately 95 % of the water extracted in New South Wales is now covered by a water sharing plan and thus under the management and licensing provisions of the WMA 2000. Most water users on unregulated rivers rely on natural flows for their water supply.

This background document to *Water Sharing Plan for the Central Coast Unregulated Water Sources 2009* (the Plan) outlines:

- the purpose of the statutory Plan
- intended outcomes of the Plan
- a description of the Plan area
- the process of Plan development
- the use of adaptive management
- activities associated with implementation, monitoring and review of the Plan.

This document is part of a range of material available specifically on the Central Coast water sharing plan including:

- *The Water Sharing Plan for the Central Coast Unregulated Water Sources 2009*; the legal plan written in its required statutory format,
- *A guide to the Water Sharing Plan*; a plain English version explaining the key Plan sections and rules (this document was written prior to the amendment to include Ourimbah Creek and Jiliby Jiliby Creek water sources into the Plan in 2016),
- Report cards for each water source detailing background information on the water sources classification and the proposed management rules (there are no report cards for Ourimbah Creek and Jiliby Jiliby Creek water sources),
- Rule summary sheets for each water source detailing the management rules.

### An amended plan for the unregulated Central Coast water sharing plan

The Central Coast water sharing plan commenced on 1 August 2009. Until now, water sharing arrangements for the Ourimbah Creek and Jiliby Jiliby Creek water sources have been covered under separate water sharing plans that commenced in 2004. The *Water Sharing Plan for the Ourimbah Creek Water Source 2003* and the *Water Sharing Plan for the Jiliby Jiliby Creek Water Source 2003* (the water sharing plans for Ourimbah Creek and Jiliby Jiliby Creek water sources) were amongst the first in NSW and expired on 30 June 2016.

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

In 2013 the Minister approved the replacement of the water sharing plans for Ourimbah Creek and Jilliby Jilliby Creek water sources based on reports from the Natural Resources Commission and Department of Primary Industries, Water (DPI Water). As part of the replacement process, single catchment unregulated river water sources and groundwater aquifers have been merged into the larger “macro” water sharing plan for that area. The replacement water sharing plan for the Ourimbah Creek and Jilliby Jilliby Creek water sources has therefore been incorporated into the Central Coast water sharing plan.

The merging of these plans with the more recent Central Coast water sharing plan will bring them into line with the current legislative and policy framework for water sharing in NSW. All unregulated water sources on the Central Coast will now be governed by one plan. Once amended, the Plan will set the rules for water sharing arrangements until 30 June 2020 providing certainty to water dependant businesses and the environment.

Changes to the provisions of the two replacement plans (Ourimbah and Jilliby Jilliby) have occurred for a number of reasons including: changes to policy, updates to legislation, updated data, outcomes of audits, and stakeholder requests. As the provisions in these plan areas have been operating for over a decade, and the initial plans were developed in close consultation with stakeholder groups, DPI Water has aimed to avoid unnecessary changes and focus on improving provisions based on the information mentioned above.

## Purpose of the Plan

### Why are water sharing plans (WSPs) being prepared?

#### To provide certainty for the environment and water users

Continued expansion of water use across NSW has placed most catchments at the limit of their available water. This has seen increasing competition between water users (towns, farmers, industries and irrigators) for access to water. In addition, this has placed pressure on the health and biological diversity of our rivers and aquifers.

In December 2000, the NSW parliament passed the WMA 2000 which has the overall objective of “sustainable and integrated management of the State’s water for the benefit of both present and future generations” (DLWC 2001). Water sharing plans play a major role in achieving this objective by providing a legal basis for sharing water between the environment and consumptive water users.

Under the WMA 2000, water sharing plans must protect water sources and their dependent ecosystems, and must protect the basic rights of landholders to extract water. In this way, environmental water and basic landholder rights are afforded priority over licensed water extractions. Among licensed water users, priority is given to water utilities and licensed stock and domestic use, ahead of commercial purposes such as irrigation and other industries.

Water sharing plans also recognise the economic benefits that commercial users such as irrigation and industry can bring to a region. When a plan commences, access licences held under the *Water Act 1912* are converted to access licences under the WMA 2000 which separates the water licences from land tenure. This facilitates the trade of access licences and encourages 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 that permit commercial users to continue to operate productively. In general, commercial licences under the WMA 2000 are granted in perpetuity, providing greater certainty of water access entitlements. Water sharing plans also define the access rules for commercial users for 10 years providing all users with greater confidence regarding sharing arrangements.

## Why a macro approach to water planning?

The macro planning process was designed to develop broader-scale water sharing plans covering water sources not included in the initial round of planning. Each macro plan covers a large river basin rather than a single sub-catchment, or in the case of groundwater systems, covers a particular type of aquifer (for example fractured rock). Macro plans generally apply to catchments or aquifers where there is less intensive water use.

Macro plans were developed through a process involving technical assessments, classification and development of water sharing rules by regional panels and a state groundwater panel.

General information on the macro planning process is available in the water sharing plans section of the DPI Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au). This includes:

- *Macro water sharing plans – the approach for unregulated rivers. A 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. A report to assist community consultation* – explains the method used to classify and set water sharing rules for groundwater across the state,
- *Guidelines for Surface Water Sharing Plan Report Cards* – explains the information presented in report cards.

## Intended outcomes of the Plan

The objectives of the Plan are to:

- protect, preserve, maintain or enhance the important river flow dependent ecosystems of these water sources,
- protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources,
- protect basic landholder rights,
- manage local water utility/major utility water supply for the benefit of the community whilst recognising the environmental needs of the water sources,
- provide opportunities for market based trading of access licences and water allocations within sustainability and system constraints,
- provide water allocation account management rules which allow sufficient flexibility in water use,
- provide sufficient flexibility in water account management to encourage responsible use of available water, and
- allow for adaptive management, that is, to allow changes to be made when more information is available.

## Benefits for water users

With the introduction of the Plan, a number of benefits flow to water users:

- Greater certainty for water users – the Plan sets out the water sharing arrangements for a 10 year period.

- greater security with existing water licences converted to perpetual water access licences under the WMA 2000.
- The Plan will facilitate trading of licences (and water allocations) – clear trading and access rules will help foster trading on unregulated rivers and within alluvial aquifers.

The Plan recognises the economic benefits to the region that are generated by commercial users such as irrigators and industry. Four of the water sources covered by the Central Coast water sharing plan were classified as being of high economic significance to local communities due to their dependence on commercial extraction:

**Table 1 Water sources with high level of economic dependence**

<b>Water source</b>	<b>Description</b>
Wyong	Relatively high value of extraction due to regional urban water supply extractions in addition to irrigation for high value industries such as turf.
Ourimbah Creek	relatively high value of extraction due to regional urban water supply extractions in addition to irrigation.
Mangrove Creek	Relatively high value of extraction due to regional urban water supply extractions in addition to irrigation.
Mooney Mooney Creek	Relatively high value of extraction due to regional urban water supply extractions in addition to irrigation.

### Environmental outcomes

Water sharing plans are required to reserve water for the overall health of the river and aquifer. This is to protect specific ecosystems that depend on river flows and alluvial groundwater levels, such as instream aquatic ecosystems, wetlands, lakes, estuaries and floodplains and groundwater dependent ecosystems. The share of water reserved for the environment is intended to sustain the aquatic fauna and flora.

Rivers experience natural variation in flows which are necessary for different hydrologic, geomorphic, biological and chemical processes to occur. Flood flows are required to scour channels, rework sediments and inundate floodplains; medium flows oxygenate water and allow fish passage; low flows maintain connectivity and assist the survival of aquatic and riparian flora and fauna. To preserve a healthy river system this range of stream flow regimes must be maintained. There is evidence to suggest that low flows are essential for maintaining water quality, allowing fish and other fauna passage over riffles to pools used for drought refuge, and maintaining those parts of aquatic ecosystems that are most productive. 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 flows for the benefit of the environment, the Plan imposes access restrictions on days when stream flows are low. This is achieved by establishing cease-to-pump rules that require users to stop taking water when flows fall below a set level. In addition, ‘commence-to-pump’ rules applied in some water sources ensure that freshes are available to the environment by requiring users to only recommence taking water once flow has increased above a specified level.

Most of the flows in the Central Coast unregulated water sources are protected from extraction. However, prior to the commencement of the Plan, at least two water sources had no existing licence conditions requiring pumping to cease when flows are low. In others, only a small proportion of licenses were subject to flow rules. Surface water irrigation licences are now subject to cease-to-pump rules with limited exceptions for licensed stock, domestic and town water supply purposes, and licenses used for food safety and essential dairy care. The

Local Water Utility has been provided with large entitlements to provide flexibility in how they take water and fill their dams while they are limited on how much they can actually use.

The Central Coast supports a range of natural ecosystems, including significant wetland habitats, estuaries and riparian forests which are dependent on the rivers, creeks and aquifers. Six water sources within the Central Coast water sharing plan have been identified as having high instream values:

**Table 2 Water sources with high instream value (based on initial assessment)**

New water sources are shaded in grey

Water Source	Description
Wyong River	<ul style="list-style-type: none"> <li>• 4 threatened bird species.</li> <li>• 1 threatened aquatic invertebrate species.</li> <li>• 8 threatened amphibian species.</li> <li>• 1 threatened Herbs and Forbs species.</li> <li>• Platypus have been identified in this water source.</li> <li>• High species diversity.</li> </ul>
Ourimbah Creek	<ul style="list-style-type: none"> <li>• 2 threatened waterbird species</li> <li>• 1 threatened aquatic invertebrate species.</li> <li>• 5 threatened amphibian species</li> <li>• 2 threatened Herbs and Forbs species</li> <li>• Significant waterbird habitat</li> <li>• Platypus have been identified in this water source.</li> <li>• High species diversity.</li> </ul>
Jilliby Jilliby Creek	<ul style="list-style-type: none"> <li>• 1 threatened aquatic invertebrate species.</li> <li>• 1 threatened Herbs and Forbs species</li> <li>• 1 threatened waterbird species</li> <li>• 3 threatened amphibian species</li> <li>• Platypus have been identified in this water source.</li> <li>• High species diversity.</li> </ul>
Mangrove Creek	<ul style="list-style-type: none"> <li>• 1 threatened aquatic invertebrate species.</li> <li>• 7 threatened amphibian species.</li> <li>• 4 threatened bird species.</li> <li>• Platypus have been identified in this water source.</li> </ul>
Mooney Mooney Creek	<ul style="list-style-type: none"> <li>• 6 threatened amphibian species.</li> <li>• 3 threatened bird species.</li> <li>• 1 threatened aquatic invertebrate species.</li> <li>• High species diversity.</li> </ul>
Brisbane Water	<ul style="list-style-type: none"> <li>• 1 threatened aquatic invertebrate species.</li> <li>• 7 threatened amphibian species.</li> <li>• 3 threatened bird species.</li> <li>• 1 threatened Herbs and Forbs species.</li> <li>• Minimum disturbance to instream condition.</li> <li>• High recreation value.</li> </ul>

Water sources identified as having high instream value tend to be those water sources where threatened species are present. The identified threatened species are listed in Appendix 1.

## Scope of the Plan

Water sharing plans are developed using various 'extraction management units', 'water sources' and 'management zones'.

The Plan area is divided into two **extraction management units (EMUs)** for the purpose of establishing a geographic area over which a long-term average annual extraction limits (LTAAEL) apply. Each EMU consists of several water sources.

There are seven **water sources** in this Plan, coinciding with sub-catchment boundaries. It is at the water source level that water sharing rules are developed.

Four of the water sources have been subdivided into **management zones** where finer resolution of rules is required.

A map of the Plan area is provided in Appendix 2

**Table 3 Water management units in the amended Central Coast water sharing plan**

Extraction management unit	Water source	Management zone
<b>Surface Water</b>		
<b>Gosford Extraction Management Unit</b>	Brisbane Water Water Source	Brisbane Water Management Zone
		Brisbane Water Plateau Management Zone
	Mooney Mooney Creek Water Source	Mooney Mooney Plateau Management Zone
		Mooney Mooney Creek Management Zone
	Mangrove Creek Water Source	Mangrove Plateau Management Zone
		Mangrove Creek Management Zone
<b>Tuggerah Lakes Extraction Management Zone</b>	Wyong River Water Source	Wyong Plateau Management Zone
		Wyong River Management Zone
	Tuggerah Lakes Water Source	
	Ourimbah Creek Water Source	
	Jilliby Jilliby Creek Water Source	

## Description of the Plan area

The Central Coast Plan covers an area of more than 156,000 hectares. The Plan area is bordered in the east by the Pacific Ocean, in the west by the MacDonald River catchment (a Hawkesbury River tributary), in the north west by the Wollombi Brook catchment (a tributary of the Hunter River), in the north east by the Macquarie Lake catchment, while in the south it is Broken Bay and the Hawkesbury River which provides its boundary. Refer to map included in Appendix 2.

A high proportion of the fresh water in the Central Coast systems comes from the headwaters of the major streams situated along the Mangrove Mountain Kulnura ridge (which is often described as an indistinct plateau). The head-water streams coming off the plateau are steep relative to the low-land reaches which have much lower grades.

The Central Coast Water Sharing plan area is divided in two, separating those systems flowing into Tuggerah Lakes and those flowing into the Hawkesbury River. These major systems are:

- the Wyong River, Ourimbah Creek and Jilliby Jilliby Creeks, which are the major tributaries of Tuggerah Lake
- the Mangrove Creek and Mooney Mooney Creek systems, which drain to the Hawkesbury River.

The Wyong River and Ourimbah Creek catchments, above the tidal limit provide significant volumes of fresh water into the Tuggerah Lake system. The Wyong River catchment covers an area of 355 kilometres<sup>2</sup> (km) and runs 66 km down to Tuggerah Lakes, the last 9 km below the weir being estuarine. The Ourimbah Creek catchment covers an area of 155 km<sup>2</sup>, the last 8

km being estuarine before entering Tuggerah Lake at Chittaway Bay. The Jilliby Jilliby Creek Water Source is a major tributary of the Wyong River, and covers an area of 101 km<sup>2</sup>.

Tuggerah Lakes, formed from infilling of sediments, creates a shallow estuarine lake, with an ecosystem gradient from intermittent brackish waters to marine at the entrance.

The estuaries of the Hawkesbury River tributaries are significantly different from those that flow into Tuggerah Lakes. The larger north east Hawkesbury systems; Mangrove Creek, Mooney Mooney Creek and Popran Creek, flow southerly from the plateau into the Hawkesbury River estuary. The area of Mangrove Creek catchment, upstream of the tidal limit, covers 245 km<sup>2</sup> and runs 53 km before entering the Hawkesbury estuary, the last 18 km being estuarine. The proximity of these streams to the ocean means that flushing of the saline ocean water dominates the water quality of the estuary, except when large floods from the Nepean River and other upstream tributaries occur. The Hawkesbury River estuary formed as a sunken valley, creating a long deep estuary, with an almost marine ecosystem directly below the north east Hawkesbury tributaries.

The most significant topographical feature for the hydrology of the area is the north south orientated Hunter Range, because it creates the watershed which divides the Central Coast rivers between the Hawkesbury River and the Tuggerah Lakes, and because it contains a significant aquifer. This length of the ridge system from north of Mangrove Mountain south towards Gosford forms the Kulnura Mangrove Mountain Plateau. The Kulnura Mangrove Mountain Plateau is a network of ridges with undulating hills along the ridge system and an incised stream network.

### Stream flows

The estimated annual average flow of the Wyong River and Ourimbah Creek down to the tidal flow is 128,000 ML. The flows from Wyong River and Ourimbah Creek contribute up to 70 percent of flows within the Tuggerah Lakes EMU, with minor streams contributing the balance.

The estimated annual average flow of Mangrove Creek, Popran, Ironbark, Bedlam, Floods and Mooney Mooney creeks down to the tidal limit is 141,000 ML. The flows of these major creeks contribute 58 percent of the flows within the Gosford EMU, with minor streams such as Narara and Erina creeks contributing the balance.

### Alluvial aquifers

Aquifers are underground layers of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be extracted. Aquifers can store large volumes of water, often accumulated over thousands, or tens of thousands of years. Water enters (or recharges) aquifers from rainfall, surface flows from rivers and lakes, or flow from adjacent aquifers.

Some alluvial aquifers are highly connected to surface water, so that taking water from one source affects the other. In groundwater systems defined as 'highly connected' environmental water may also be protected from extraction through linked cease-to-pump rules to ensure taking groundwater does not adversely affect surface water flows.

The Central Coast water sharing plan as gazetted in 2009, and the Ourimbah Creek & Jilliby Jilliby Plans only covered surface waters. Because the alluvial aquifers within the Central Coast Plan area are considered highly connected to their overlying surface water sources, the Plan rules will now apply to these alluvial sediments, thus preventing over-extraction of the groundwater and resultant impacts on surface water. Surface water users that convert their access licence to an aquifer access licence, or those taking from alluvial aquifer without an aquifer access licence will abide by the same access rules as surface water users. Licence holders currently accessing alluvial water with an aquifer access licences in these water

sources will continue to access water under their current licence conditions. However, the Plan includes an amendment provision signalling that access rules for aquifer access licences may be established post 2022.

The Plan now includes rules that specify distance restrictions for the construction of new or replacement water supply works (bores) to protect high priority groundwater dependent ecosystems and groundwater dependent culturally significant site, to avoid interference between groundwater supply works and contamination sources. The Plan also includes rules on the volume of water than can be taken from works that are located within restricted distances.

### Aboriginal values

Aboriginal cultural values could be affected by water extraction from rivers. Most information about flow-related Aboriginal values resides in Indigenous communities, and is not widely available. These communities were targeted during the public exhibition period, to determine whether the proposed water sharing rules adequately protect Aboriginal cultural values. Preliminary consultation sessions were held with the Hunter Aboriginal Community and Environment Network who provided some insights into Aboriginal cultural values on the Central Coast.

Aboriginal communities have indicated that water sharing rules should protect natural instream values. Whilst Aboriginal groups acknowledge the rights of commercial water users, they believe that this should not be at the expense of the environment. In their view, the priority for water sharing plans should be to provide for natural flowing rivers with healthy aquatic biodiversity.

### Climate

The Central Coast catchments are relatively small hence the degree of climate variability is not dramatic, but it does vary, depending on aspect, elevation and proximity to the ocean. Coastal areas tend to receive the higher rainfall (over 1,250 millimetres) per year at Gosford). Rainfall decreases with distance inland with rainfall at Kulnura around 1,150 millimetres (mm) per year, making the Mangrove Creek catchment, the most western of the catchments, generally dryer than the other catchments. The wettest months away from the coast tend to be January to May. The sometimes erratic nature of the long-term climate in the Central Coast, in combination with the relatively small and steep catchments, has caused both serious droughts and floods.

### Geology

Along the majority of the streams within the Central Coast area quaternary alluvium dominates the bed material and consists of unconsolidated sands, silts, clays and gravels (DIPNR, 2004).

The ridges, that make up Kulnura Mangrove Mountain Plateau, are part of the Hawkesbury Sandstone (ref. 1:250,000 Geology Map). The ridges are underlain by harder sandstones of the Gosford Formation Sandstone, a sub division of the Narrabeen Group. The underlying sandstone is exposed in the valleys, while it is the Hawkesbury Sandstone on the plateau, which holds and transfers the groundwater that is used for irrigation on the plateau.

The soils formed from the Gosford Formation Sandstone are very coarse and permeable allowing infiltration of rainfall. Two soil landscapes occur, the Somersby and Sydney Town Soil Landscapes (Murphy C.L., 1992). The horticulture in the area is located mainly on the Somersby Soils Landscape, which has limitations such as waterlogging and high permeability. The Sydney Town Soils Landscape is much more limited and is probably only used for grazing.

The majority of the watercourses assessed in this report are situated within the Yarramalong and Wyong alluvial soil landscapes. The Yarramalong and Wyong alluvial soil landscapes cover the majority of the floodplains in the partly confined and unconfined valley settings of the Central Coast area and are both prone to stream bank erosion (if inadequately vegetated), suffer from seasonal water logging and flooding. Both are dominated by quaternary sediments as mentioned above and are dominated by meander cut offs, terraces, oxbows and backswamps (DIPNR, 2004).

### Land use history

There have been significant clearing of native vegetation in the area since European settlement. Agricultural development has occurred along the Wyong River Valley (or Yarramalong Valley), Jilliby Jilliby Creek (or Dooralong Valley), to a lesser extent along the Ourimbah Creek Valley, and on the Kulnura Mangrove Mountain Plateau. Along the spring fed streams of the Plateau an estimated 900 small dams have been constructed to help supplement stock, domestic and irrigation water demand.

Around Tuggerah Lake and Brisbane Water the streams and their catchments have been highly modified through urbanisation. Corresponding with the population growth, the need to supply urban water has seen dams and weirs constructed on the major streams.

### Industry

Significant primary industries on the Central Coast include turf growing, fruit (primarily citrus), vegetable production, poultry, and water bottling. The latter two industries tend to utilise groundwater, not water from the surface streams.

Major population centres include Gosford, and Wyong. Associated with Gosford and Wyong are a number of smaller towns close to the ocean and Tuggerah Lakes. Seasonal populations increase significantly from tourism due to the natural beauty of the area and the close proximity to major urban centres such as Sydney and Newcastle. Away from the coast there are a few small rural towns, such as Kulnura, Mangrove Mountain, Yarramalong, and Dooralong.

Stock and domestic (basic landholder right) access to water is estimated at 297 ML/year. Licensed water extraction in the Central Coast catchment totals approximately 235 ML/year for stock and domestic licences; 105,865 ML/year for local water utilities (e.g. Gosford City and Wyong Shire Councils) (Note; the maximum that can be extracted in a single year is 79,750 ML – only 36,750 ML can be supplied for urban use, while further water may be pumped into storage when there is adequate flow in the streams); and 14,012 ML/year for unregulated licences.

The Gosford Wyong Council's Water Authority is the largest extractor of water, owning and operating a number of on-river dams and weirs. These include:

- Mangrove Creek Dam which captures the headwater flows of Mangrove Creek
- Mangrove Creek Weir located at the tidal limit
- Upper Mooney Mooney Creek Dam which is mid-way along the creek's length
- Upper Ourimbah Creek Weir also mid-way along its length
- Wyong River Weir located at the tidal limit
- Mardi Dam located on a small watercourse half way between the Wyong and Ourimbah Weirs.

## Policy context and planning context

A number of national, state and regional plans and policies guide the development of water sharing plans in NSW, including:

- National Water Initiative
- *Water Management Act 2000*
- *Access Licence Dealing Principles Order 2004*
- Natural Resource Commission state-wide targets
- Catchment Action Plans
- NSW water planning policies and other considerations

The rules in the Plan were also guided by the River Flow Objectives which were developed as a whole of NSW Government initiative through a public process in 1997. Appendix 3 assesses by how much the water sharing plan rules in each water source contribute towards the river flow objectives.

### National Water Initiative

The National Water Initiative (NWI) was signed by the Council of Australian Governments (COAG) in June 2004. Through the NWI, governments across Australia, including NSW, have agreed on actions to achieve a more cohesive national approach to managing, measuring, planning, pricing and trading water. The NWI recognises the continuing need to increase the productivity and efficiency of Australia's water use, whilst servicing rural and urban communities, and ensuring the health of river and groundwater systems.

The NWI sets out guidelines, outcomes and timelines for water plans and planning processes. Until 2014 the NWI was implemented and monitored by the National Water Commission, an independent statutory body responsible for providing advice to COAG on national water issues. The Commission was responsible for undertaking a biennial assessment of each state's progress with implementing the NWI.

The role of the National Water Commission ceased in December 2014 and some of its water management functions were transferred to other agencies. Assessment of progress in the implementation of the NWI will be transferred to the Productivity Commission.

### Water Management Act 2000

The *Water Management Act 2000* (WMA 2000) is based on the concept of ecologically sustainable development i.e. managing current development so that it will not threaten the availability of resources for future generations. The WMA 2000 recognises the need to allocate water for the environmental health of our rivers and groundwater systems, while also providing licence holders with more secure access to water and greater opportunities to trade water through the separation of water access from land title.

Water sharing plans are the main tool through which the WMA 2000 achieves its objective. The major changes required to water management have meant that the WMA 2000 has been progressively implemented, and the *Water Act 1912* progressively phased out as water sharing plans commence.

The most recent version of the WMA 2000 is available from the NSW Government legislation website, <http://www.legislation.nsw.gov.au/>

### Access Licence Dealing Principles

The *Access Licence Dealing Principles Order 2004* (hereafter referred to as the Dealing Principles) draws on the objects and water management principles of the WMA 2000 and provides state-wide guidance and rules for applications to undertake water dealings including trade.

The Dealing Principles specify that dealings must consider:

- Impacts on other water users
- Impacts on the water source
- Impacts on indigenous, cultural, heritage and spiritual matters
- Maximising social and economic benefits

The Dealing Principles specify rules for different types of dealings such as; conversion to a new category, subdivision, consolidation, assignment of rights or allocation, changing water sources, amending extraction components and interstate dealings. They specify requirements that must be met for a dealing to be permitted and the conditions under which a dealing is prohibited.

Water sharing plans must be consistent with the Dealing Principles. Water sharing plans can also put additional restrictions in place such as restricting trade into a particular area due to environmental values or hydrologic stress.

### Natural Resource Commission targets

The Natural Resource Commission (NRC) was established in 2003 to provide the NSW Government with independent advice on natural resource management issues. To achieve this, the NRC developed a Standard for Quality Natural Resource Management, along with 13 state-wide targets for natural resource management which have been embedded in the NSW State Plan. The Standard is designed to apply to natural resource management at all scales including state, regional, catchment and local levels.

Appendix 4 provides information as to how the Central Coast water sharing plan contributes to the 13 state-wide targets.

The NRC Standard requires the use of the best available knowledge, 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 are progressing. The NRC reviews water sharing plan success against this standard and its associated targets. In 2013 the NRC reviewed 31 water sharing plans that were due to expire in 2014 and provided advice to the Minister for Primary Industries.

In 2012 the NRC reviewed state-wide standards and targets, including monitoring, evaluation and reporting arrangements in NSW. They recommended five new state-wide targets that provide a sharper focus on the key long-term issues of concern to the Government and community and revised the monitoring, evaluation and reporting strategy to support the implementation of the new targets.

### Catchment Action Plans

Catchment action plans are statutory, non-regulatory plans that were previously prepared by the state's catchment management authorities under the *Catchment Management Authorities Act 2003* (now repealed). The Central Coast water sharing plan was developed to be consistent with and contribute to the Hunter-Central Rivers Catchment Action Plan (January 2007, Catchment Action Plan, Hunter-Central Rivers CMA), and the Hawkesbury Nepean Catchment Action Plan (March 2008, Catchment Action Plan, Hawkesbury Nepean CMA).

In January 2014 the NSW Government established Local Land Services (LLS) and transferred the functions of catchment management authorities into this new organisation to provide agricultural support, natural resource management and emergency management to rural communities through a single organisation. Greater Sydney Local Land Services will be responsible for continuing the delivery of natural resource management programs on the Central Coast, including catchment management plans.

One of the LLS/CMA's responsibilities as observer on the Interagency Regional Panel, was to provide advice on the alignment of the proposed classification and extraction limits and water sharing rules with the priorities in their CAP.

### **Policies specific to water sharing plans**

A number of state policies and guidelines have been developed since commencement of the WMA 2000. These policies have arisen in response to specific water management issues that need to be considered during the development of water sharing plans. These policies directly influence the planning process and the formulation of water sharing rules.

### **Protecting Aboriginal values**

Aboriginal people have a spiritual, customary and economic relationship with land and water that provides an important insight into natural resource management. The NSW Government established the Aboriginal Water Initiative in 2012 to facilitate effective engagement with Aboriginal communities in the water sharing process and ensure that measurable Aboriginal water outcomes are achieved. The Initiative aims to build Aboriginal peoples' capacity to participate as water users, protect their rights to water, maintain a healthy environment, and take full advantage of economic opportunities.

Water sharing plans recognise the importance of rivers and groundwater to Aboriginal culture. The plans will allow Aboriginal communities to apply for water access licences for cultural purposes such as manufacturing traditional artefacts, hunting, fishing, gathering, recreation and for cultural and ceremonial purposes. Aboriginal cultural licences can also be used for drinking, food preparation, washing and watering domestic gardens. These cultural licences are limited to 10 ML/year per application. Opportunity for granting licences for Aboriginal cultural purposes throughout the Central Coast catchment is included in the water sharing plan.

For further information refer to *Our Water Our Country. An information manual for Aboriginal people and communities about the water reform process* which is available from the DPI Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au)

### **Aboriginal Community Development access licences**

Many of our rivers already have a high number of irrigation licences, and are generally judged to be 'stressed', particularly during dry times when, for example, river flows are low. This effectively prevents the issuing of any new water licences on these 'stressed' rivers. However in some of our coastal rivers, higher and more reliable flows are common and provide an opportunity for licences to be granted for Aboriginal Community Development activities, provided this additional extraction would not negatively impact on ecological values that are dependent on high flows. In these coastal catchments, Aboriginal Community Development licences<sup>2</sup> may be issued which allow water to be pumped from rivers during the higher flows, and stored in farm dams or tanks, to be used as needed. It is important to note that higher flows are not just peak or flood flows but also include flows that occur for 50 per cent of the time.

Since granting these Aboriginal Community Development licences would mean less water remains in the river to meet environmental needs, it will be necessary to limit the total volume that can be extracted for Aboriginal Community Development purposes. The limit would be a proportion of the river flow, and would never exceed 500 ML/year per water source. The government does not propose to limit the volume assigned to each individual Aboriginal Community Development licence, only the total volume per water source.

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<sup>2</sup> This new category of licences is not fully commercial. While they may be temporarily traded, they cannot be subject to permanent trade and as such will remain in the Aboriginal community for the life of the licence. Aboriginal communities, enterprises and individuals are encouraged to seek financial assistance from funding bodies to purchase fully commercial licences.

### High flow conversion

Many of our coastal unregulated rivers suffer severe competition for water during dry spells. These extended periods of low flow tend to be when water users compete most strongly for access to dwindling flows and pools. Instream values can also be stressed during these low flow periods as wildlife is concentrated and water quality can deteriorate. Therefore, there is merit in incentive schemes that attempt to move extraction out of the low flows and into the higher flows, as an attempt to improve environmental conditions.

None of the water sources within the Central Coast were considered suitable for high flow conversions because they have either been classified with high instream values, or high hydrological stress, and/or they are connected to highly sensitive estuaries; such as Intermittently Closed and Open Lakes and Lagoons.

### Protecting basic landholder rights

As defined under the WMA 2000, basic landholder rights (BLR) consist of domestic and stock rights, harvestable rights and native title rights. Water may be extracted under these rights without the need for a water access licence; although where groundwater is accessed under a domestic and stock right, the bore must still be approved by DPI Water.

The WMA 2000 requires water sharing plans to protect BLR. The Plan does this by identifying requirements for domestic, stock and native title rights at the start of the Plan and considers these requirements when designing the rules for licensed water extraction. The access rules for licensed extraction do not apply to water extracted under BLR, thus affording higher priority to BLR users.

The requirements of harvestable rights have been inherently considered in the water sharing process, as access rules are based on river flows that result after harvestable rights extractions have occurred.

There are currently no extractions for native title rights in the Central Coast water sharing plan, however the Plan allows for these rights should they be activated during the plan's ten year term.

The Plan provides an estimate of the water requirements for BLR within each water source, noting that these rights may increase during the life of the plan. The Plan cannot limit or restrict these rights, but the WMA 2000 provides for restrictions on BLR through the development of mandatory guidelines.

### Protecting town water supply access

Under the WMA 2000, extractions for town water supply are afforded a higher priority than extractions for commercial purposes such as irrigation. Water sharing plans recognise this priority by ensuring that a full share of water is allocated for annual town water supplies except where exceptional drought conditions prevent this. Local water utilities such as local councils are issued with local water utility access licences. The WMA 2000 allows for annual trade but not permanent trade of entitlement between local water utility access licences.

### Protecting pools, lagoons and lakes

Pools in NSW are 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.

The policy document *Macro water sharing plans – the approach for unregulated rivers. Access and trading rules for pools* can be found on the DPI Water website [www.water.nsw.gov.au](http://www.water.nsw.gov.au). This document provides guidance for Interagency Regional Panels in setting water access and trading rules for pools that are covered by unregulated river water sharing plans.

The general approach is to establish a default access rule where no draw down is allowed below full pool capacity for the majority of pools. This default rule may be reviewed where it is justifiable and feasible to do so, to allow limited access to pools based on local hydrological, environmental and socio-economic considerations.

Default rules vary depending on the pool type. Generally the default rule for artificial pools is to adopt the existing licence conditions; however in some circumstances where this may not be appropriate, alternate rules will need to be developed. For natural pools, the default rule requires users to stop pumping when the pool is less than its full capacity (approximated by the greatest pool volume at which there is no visible flow leaving the pool).

The Plan process allows for more lenient access rules to be set if the default rules would significantly impact on current irrigation operations.

### Protecting estuary health

Estuarine values can be threatened from water extraction. Some estuaries are highly sensitive to freshwater inflows, whilst others are quite resilient to changed inflows. The size and shape of estuaries vary and this, combined with the amount of freshwater inputs, determines the estuaries overall sensitivity to freshwater extraction. Where possible, extractions will be tightly capped in catchments found to be highly sensitive to freshwater inflows.

An analysis was undertaken by a group of estuary specialists to determine how sensitive each of the State's estuaries is to changes to freshwater inflows. The method was checked by staff from DPI (fisheries) and the Office of Environment and Heritage (OEH). It ranks the sensitivity of estuaries based on their physical attributes; size, shape and the ratio of catchment size to the surface area of the estuary. Small estuaries, such as coastal lagoons, tend to be highly sensitive to inflows. Barrier estuaries tend to be long and narrow and less sensitive to changes to inflows.

The tidal pool is a part of the upper estuary that is essentially fresh, despite being affected by daily tidal movements. The presence of tidal pools in the Central Coast streams is very limited, as the salinity below the tidal limits is high during low flow periods. The estuaries listed in Table 4 tend to have temporary tidal pools, generally immediately after high flow events. While there is provision for management of extractions in tidal pools, at this stage no water extractions in this reach of the streams estuaries have been identified. Those systems identified as being highly sensitive to inflows have very little extraction development within their catchments. To prevent extraction impacts from occurring in the future, the trading rules in the Central Coast water sharing plan prevent the trading of water into these areas, effectively capping entitlement at its current level.

The table below summarises the inflow sensitivities for the Central Coast estuaries.

**Table 4 Inflow sensitivities for the Central Coast estuaries**

Name	Groundwater sensitivity	Low flow inflow sensitivity	High flow inflow sensitivity
Tuggerah Lakes	Medium	Low	Low
Wamberal Lagoon	Medium	High	High
Terrigal Lagoon	Medium	Low	Low
Avoca Lagoon	Medium	High	High
Cockrane Lake	Medium	High	High
Brisbane Waters	Medium	Low	Low
Hawkesbury river	Medium	Low	Low

Estuary (Mangrove and Mooney Mooney Creeks)			
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The document *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation* provides further information about the principles used to determine estuary sensitivity to freshwater inflows.

### Water interception activities

Changed land-use activities can intercept significant quantities of water. Examples of this are an increased farm dam capacity in a catchment or significant areas of new forestry plantations. Under the National Water Initiative, significant interception activities will require a water access licence.

The Central Coast is considered an area in which there is no significant water interception activities anticipated within the life of the Central Coast water sharing plan. Large areas of the catchment are covered by National Parks and State Forests. State Forests are managed with selective logging technique, resulting in minimal change to catchment hydrology. Some plantation forests are anticipated but are not considered to have a significant impact on river flow at the water source or catchment level. Plantation developments are controlled in NSW under the *Plantations Afforestation Act 1999* and will be monitored in the Central Coast catchments, and assessed to determine if water access licences are required for new plantations.

### Instream dams

Farm dams currently require an access licence when:

- they are located on a third order (or greater) river, irrespective of capacity or purpose;
- they exceed the maximum harvestable right dam capacity for the property, which enables the capture of ten per cent of the mean annual run-off 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 may be permitted under "harvestable rights", a component of the basic landholder rights. The full activation of harvestable rights within the area of the Plan is considered highly unlikely.

Water sharing plans cannot restrict the volume of water collected under harvestable rights<sup>3</sup> but can place restrictions on instream dams – dams that are located on streams of third order or higher. Under state-wide policy the construction of new instream dams is prohibited in those water sources in which high instream values have been identified.

### Managing surface water and groundwater connectivity

Groundwater and surface waters are inextricably linked, and indeed, a key objective of the National Water Initiative is 'recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource'. The actual connections between surface and groundwater systems vary significantly between systems. For example, surface waters recharging alluvial aquifers may emerge again at a discharge point in the river within hours. In contrast water recharging aquifers of the Great Artesian Basin may not discharge for some tens of thousands of years. The connection characteristics need to be

<sup>3</sup> The maximum harvestable right dam capacity is calculated based on providing the ability to harvest 10% of the mean annual runoff from the landholder's property. It is determined using a calculator provided on the DPI Water website, with input parameters being property location and property size.

considered in linking surface water and groundwater planning, because in some cases, the same resource is being accessed.

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

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

The level of connectivity, the relative level of impact and the timing of connection have been considered in developing the Central Coast water sharing plan. One of the key factors in determining the extraction limits for various aquifers is the downstream values in associated streams.

The aquifer types and groundwater sources that occur within the Central Coast and their connectivity characteristics are given in Table 5. It is based on principles and recommendations in *Towards a National Framework for Managing the Impacts of Groundwater and Surface Water Interaction in Australia* by Sinclair Knight Merz (2006).

**Table 5 Connectivity between aquifer types and surface water sources**

<b>Aquifer type</b>	<b>Water sources</b>	<b>Level of connection between surface and groundwater</b>	<b>Level of impact on instream values</b>	<b>Estimated travel time between groundwater and unregulated river</b>
Coastal sands	Hawkesbury to Hunter Coast Coastal Sands	Significant (tidal section only)	Low as connection with saline water	Days to months
Up-river Alluvial	All unregulated rivers.	Significant	High due to impact on base flows	Day to months
Coastal Floodplain Alluvial	Central Coast Coastal Floodplain	Low – moderate (tidal section only)	Low as not major contributor and low level of connection	Season
Fractured rock	New England Fold Belt	Low – moderate	Low as not major contributor	Years to decades
Porous Rock	Sydney Basin Sandstones	Low – moderate	Low as not major contributor	Years to decades

The *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* provides management rules in relation to fractured and porous rock aquifers on the Central Coast and the *Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016* provides management rules in relation to coastal sands aquifers on the Central Coast.

## Developing the Plan

### Panels

DPI Water is responsible for implementing the WMA 2000, including developing water sharing plans for the State's water resources. DPI Water established several interagency panels to assist with the development of water planning policies and water sharing plans.

#### State Interagency Panel

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

The SIP is chaired by DPI Water and comprises representatives from DPI Water, OEH and Local Land Services (formerly Catchment Management Authorities) and agriculture, fisheries and aquaculture specialists from Department of Primary Industries. DPI Water is responsible for overall project management.

#### Interagency Regional Panels

Interagency Regional Panels (IRPs) were established to develop water sharing plans. IRPs consist of representatives from DPI (representing DPI Water, Fisheries and Agriculture) and one representative from Office of Environment and Heritage (OEH). A representative from Local Land Services attends meetings as an observer to provide advice on consultation issues and other matters within their area of expertise.

Appendix 5 lists the names of the Hunter IRP, their areas of expertise and agency staff who provided specific technical and scientific information.

The key responsibilities of the IRP are to:

- ensure water sharing rules are consistent with state policy
- review the water management units provided by DPI Water
- review 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 applicability
- make recommendations on water access and dealing rules for each water source
- assist with consultation on proposed rules
- review submissions from targeted consultation and public exhibition, and make changes where necessary to the water sharing rules.

The IRP uses local knowledge and expertise in developing and recommending water sharing rules through consensus decision-making approach.

An Independent Facilitator was initially engaged to chair the meetings and guide the decision-making process. An Independent Facilitator was not involved in the later IRP meetings which were focused on the clarification and finalisation of draft Plan provisions.

#### Classification method

In developing water sharing plans for unregulated rivers, DPI Water classified each water source based on the risks and values of water extraction. Two matrices were developed – the first being the 'value matrix' which rated a water source's instream value against its hydrologic stress. The second was the 'risk matrix' which rated the risk of extraction to instream values against community dependence on extraction. This classification method took into account:

- the amount of water extracted,
- the impact of extraction on rivers, estuaries and their ecosystems,
- the associated uses from this extraction,
- social and economic considerations of restricting extraction.

Specifically the classification process involves assessment of factors, including:

- instream values (such as threatened fish species) and the risk to these values posed by existing or increased extraction,
- the risk to instream values posed by extractions,
- hydrologic stress, which is the amount of water extracted in the peak demand month for extraction relative to low flows (i.e. flow that is exceeded 80 per cent of the time),
- extraction value, a qualitative assessment of the economic value of the agriculture which relies on the water licensed for extraction,
- the economic dependence of the local community on activities requiring licensed water extraction,
- the sensitivity of estuaries to the removal of freshwater inflows,
- amount of water extracted as basic landholder rights and for town water supplies,
- whether the existing water sharing rules are adequate to manage the risk to instream values and basic landholder rights,
- NSW Government policy.

A large range of reference material was used in addition to the knowledge of IRP members and technical support staff. The reference material is listed in Appendix 6.

The classification assisted in determining the optimal balance between extraction and protection of water for each water source. These broad-scale relative assessments showed where water sharing rules needed to strongly protect valuable natural assets by limiting extraction or to provide for extraction by water users where there is significant community dependence on extraction. Generic, indicative rules were developed for each classification for each matrix to expedite the development of the water sharing plans by the IRP. Where necessary, the IRPs refined these indicative rules to reflect local circumstances. The 'value' matrix was used to develop trading rules and the 'risk' matrix used to develop the water access rules. The final classifications determined by the IRP for all water sources (both value and risk matrices) have been summarised in Appendix 7.

It is important to note that the matrix approach was used as an 'indicative tool' to develop initial classifications. While these classifications guided the water sharing rules, a major role of the IRP was to use the local knowledge of IRP members to check whether the final classifications were realistic. Amendments to both the classifications and the management rules by the IRP were based on local and technical knowledge of the water sources. In addition, the approach did not include some information which was added by the IRP, such as extraction for town water supplies and the economic values of water extraction that were not considered in the classification process. Justification for changes the IRP made to the initial classification of water sources is provided in Appendix 8.

As a pilot region for the State, undertaking the classification process and in the development of macro plans, the IRP went through a number of iterations of the assessment process and classification of water sources. This was due to changes and improvements made to the guidance used to assist IRPs in the classification process.

Classifications for some water sources changed several times as a result of improvements to the classification process.

## Developing the access and dealings rules

Water sharing rules that the classification process focused on consist of:

- access rules – which determine at what flow levels extraction is allowed
- dealing rules – which control:
  - the trade of water, both transfer of access licence and assignment of water allocation between access licences
  - change of water sources
  - the location for extraction.

Other management rules are considered in the development of the Plan such as:

- extraction limits – which set the total volume of water that can be extracted annually from the water source or water management zone
- 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
- system operation rules – what types of rules are required for major storages (where relevant).

The key rules in the Plan specify when licence holders can access water and how water can be traded.

For details about the water sharing rules for each water source covered by the Plan, refer to the Water Source Rules Summary Sheets, available on the DPI Water website

[www.water.nsw.gov.au](http://www.water.nsw.gov.au)

## Developing the access and dealings rules

The IRP used local knowledge and expertise in applying the water sharing rules. For example:

- Existing local water sharing rules were examined to determine whether they achieved the required level of environmental protection and provided for basic rights.
- Local studies or information from regional staff in areas such as irrigation or aquatic ecology (DPI) were included.
- Extractions patterns by local water and major utilities were examined.
- Consideration was given to see if the estuary at the end of the system necessitated additional catchment-wide protection.

In some instances, indicative rules were further refined if site-specific information was available.

The IRP also considered the ability to manage and monitor flow in a water source. For example, where there was no flow gauging station they assessed the risks to the water source, and either:

- recommended new gauges be installed for high-risk or highly stressed water sources,
- looked at alternatives such as ‘staff’ gauges (which measure river height but not flow) or visible flow references where the risk to instream values was not regarded as high.

They also considered any known specific requirements of threatened species in relation to key reproductive needs, migration or other particular ecological process.

The IRP recommended a staged approach to change, so as to limit adverse social and economic impacts. In essence, this proposes that water users be given time to adapt to new rules. Where the existing rules were not consistent with the IRP’s recommended rules, the degree of immediate change (and hence the effect on extractors) was limited to the next higher level of rule in the first instance, unless a higher level of protection could be achieved

with minimal socio-economic impact. The IRP then determined a timeframe and the further steps required to achieve the recommended rules during the life of the Plan.

Once the proposed water sharing rules were determined, a check was done to ensure that the rules integrate well and are practical across the catchment.

### **Exceptions to the generic rule approach**

In reviewing the indicative rules proposed for each water source the IRP used their local knowledge to refine access and trading rules where appropriate. Amendments made were based on factors such as:

- available infrastructure (e.g. river gauges)
- available management systems (e.g. ability to manage the rules)
- existing management rules (e.g. existing licence conditions or Water Users' Association management rules)
- whether the highly variable nature of the water source required differing management rules.

It was recognised that local interpretation of the indicative water sharing rules was very important. For example, the rule of 'no pumping from pools when pool drops to a specified height' was regarded as inappropriate in coastal systems due to small pool sizes and the numerous numbers of pools, making it very difficult to implement and inconsistent with River Flow Objectives (pools need to be maintained for drought refuge). In these instances, the IRP recommended 'no pumping from pools where there is no visible inflow and outflow'.

In water sources where the existing access rule was more stringent than the indicative rule, generally the existing access rule was adopted, given that there should be no adverse social or economic impact as there would be no change to current operations. In these circumstances the IRP acknowledged that many of the rules had been negotiated by water users, had been in place for a long period of time and seemed to be adequately protecting values while providing security for water users.

For trading rules the IRP did not recommend 'no net gain' trade rules at the commencement of the Plan, proposing no trading into these water sources instead, due to the difficulty in effectively administering 'no net gain' type of transfer at the time. A 'no net gain trade' means that a trade cannot increase entitlement in a water source to a level above that at the start of the Plan. 'No net gain' types of trade are generally considered for water sources with low to medium instream values and high hydrologic stress/risk. The IRP did propose that any water source which was initially classified as 'no net gain trades' may move to this management approach during the term of the Plan when appropriate management systems were introduced. In the interim, no trading into these water sources was recommended.

Appendix 9 outlines the changes made to the initial access and trading rules by the IRP.

### **Granting Aboriginal Community Development access licences**

A detailed assessment was undertaken to determine where it may be appropriate to grant Aboriginal Community Development licences. It was decided that no new licences would be granted in water sources with high instream value or in areas that could not support any high flow licences. For the Central Coast, it was recommended that there was no provision for the granting of Aboriginal Community Development licences. This recommendation was based on level of current commitment of flows, both high and low flows are considered fully allocated to existing licences. Unlike some coastal unregulated rivers, the main streams in the Central Coast area have either dams or weirs with large pumps extracting/impounding water from the higher flows for urban water supply.

### **High flow conversions**

There was no water sources in Central Coast water sharing plan recommended for high flow conversions. This recommendation was made because the full range of flows, from high to low flows, are fully allocated to existing licences.

## Consultation

The classifications and the IRP's recommended rules underwent restricted targeted consultation with water users and specific interest groups<sup>4</sup> before the Plan was drafted. Formal public exhibition<sup>5</sup> of the draft Plan ensured wider public consultation.

While developing the macro plans, the participating agencies (DPI, OEH and the LLSs) identified areas where better data is needed for making future water planning decisions. Similarly, the community suggested areas where further analysis or data gathering was required. This local input was essential in the finalisation of the draft Plan.

The former Catchment Management Authorities assisted with the public consultation process, to ensure that all stakeholders and interested parties had an opportunity to examine and comment on the proposed water sharing rules. In particular, stakeholders were encouraged 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; and
- specific comments on the Minister's notes included in the draft Plan.

## Targeted consultation of the draft rules for the Central Coast

Targeted consultation for the draft Central Coast water sharing plan occurred in late 2005, these focused primarily on the Wyong River Water Source. 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.

Targeted consultation was initially undertaken on the draft management rules proposed for the Central Coast water sources when they were proposed to be part of the draft water sharing plan (WSP) for the Greater Metropolitan Region. The Central Coast water sources have since been excluded from the draft WSP for the Greater Metropolitan Region and included in a separate WSP for the Central Coast; recognising the significant planning issues in both areas.

Targeted consultation within the draft Central Coast water sharing plan area focused on the Wyong River Water Source. This was due to the fact that the Wyong River had significant management rules proposed which had the potential to impact on a range of water users while

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<sup>4</sup> Targeted consultation refers to informal consultation held with key stakeholders to test the suitability of the proposed water sharing rules and provide feedback on the rules potential impacts.

<sup>5</sup> Public exhibition is the formal exhibition of the draft Plan where the Minister invites submissions on the draft Plans and in particular will seek comment on a range of key issues.

in the remainder of the water sources the proposed rules were considered generally equivalent to existing management.

The IRP reviewed all matters raised at the targeted consultation meetings and consequently made changes to the initial water sharing rules. Appendix 10 outlines the changes to the proposed rules as a result of the consultation.

**Table 6 Key groups consulted for Central Coast water sharing plan targeted consultation**

Date	Group	Location
August 2005	Community Environment Network, Wyong turf growers, GWCWA	Ourimbah, Wyong
October	Hunter Aboriginal Community and Environment Network	Tocal
Ongoing	GWCWA	Wyong
June 2006	Hunter Aboriginal Community and Environment Network	Singleton

### Refining water sharing rules as a result of further studies

Following the initial targeted consultation a number of further studies have been undertaken which examined the ecological importance of flows from Wyong River to the Wyong River estuary and Tuggerah Lakes. The Interagency Regional Panel reviewed the results of the studies and the outcomes of negotiations with the Gosford Wyong Councils Water Authority and consequently made some changes to the revised rules. Appendix 11 outlines the changes to the proposed rules as a result of the study and discussions with the local water utilities.

### Public exhibition of draft rules for the Central Coast

Public exhibition of the draft Central Coast water sharing plan was held in late 2008 – early 2009. The objectives of this consultation were:

- to provide background to stakeholders as to why the water sharing plans were being developed, how they were developed, what rules were proposed in the various areas and how stakeholders could provide feedback
- to formally consult with a broad range of stakeholders to explain the proposed water sources rules and how they will be implemented
- to seek feedback in writing from stakeholders and the general community about the proposed water sharing rules.

Two public briefings were held at Mangrove Mountain and Wyong during the public exhibition period with two further meetings held with water users in the Wyong River water source on their specific rules. Seventeen submissions were received as a result of the public exhibition.

The IRP reviewed all submissions as well as matters raised at the meetings and consequently made changes to the proposed rules which are outlined in Appendix 12. The IRP provided a general response to all submissions so that individuals and groups could see the outcomes of the review of submissions in relation to amendments to the Plan.

### Consultation for amendment to Ourimbah and Jilliby Jilliby Creek access rules

Public submissions regarding replacement of the the Ourimbah and Jilliby Jilliby creek water sharing plans were called for in 2012. These submissions and additional information were collated and reviewed in 2013. A report was submitted to the Minister recommending these plans be replaced.

Key stakeholders were informed of the proposed changes to the rules and invited targeted information sessions to discuss how merging of these the plans into the Central Coast water sharing plan may affect them. None of the licence holders within the replacement Plan areas requested further information. Meetings were held with Wyong Shire Council in September –

October 2015 to discuss their extractions from Ourimbah Creek and changes to water sharing plan rules.

#### **Public exhibition for replacement plans**

No public exhibition period was held for the merging of the two replacement water sources into the Central Coast water sharing plan. This is because the plans had already been subject to public exhibition when they were first developed in 2002, and no major changes to water sharing rules were proposed. As discussed above, information regarding the proposed changes was provided to licence holders in 2015.

## Amendments to the Plan

### Addition of the Ourimbah Creek and Jilliby Jilliby Creek water sources

In 2016, the *Water Sharing Plan for the Central Coast Unregulated Water Sources 2009* was amended to incorporate the water sources previously regulated under the *Water Sharing Plan for the Ourimbah Creek Water Source 2003* and the *Water Sharing Plan for the Jilliby Jilliby Creek Water Source 2003*. Ourimbah and Jilliby Jilliby creeks form part of the Central Coast catchment and flow into Tuggerah Lake Water Source. The IRP provided advice to guide the amendments and changes were communicated with stakeholders to ensure that the amendments did not result in any unintended outcomes.

The amendments to the access rules in Ourimbah and Jilliby Jilliby creek water sources were limited as these water sources had been through their own process during the development of the 2004 water sharing plans. These changes were limited to:

- Standardising clauses to make them consistent with the latest water sharing plans and legislative framework
- Incorporating policy developments since 2004
- Reviewing flow reference points
- Reviewing daily flow sharing provisions

### Alluvial aquifer access licences

A change in approach since 2004 and consistent with the state-wide approach, extraction from highly connected aquifer access licences that relate closely to unregulated water sources will be managed via unregulated river cease-to-pump rules. These rules will be progressively introduced as access licences are converted to aquifer access licences or granted in these water sources.

For the water sources within the Plan, this change permits the opportunity to convert a surface water licence to an alluvial aquifer access licence, subject to assessment. Any new aquifer access licences granted as a result of such conversion will be subject to the surface water access rules from the date that the water access licence is granted.

### Rules for water supply work approvals

In accordance with the principles of the WMA 2000 the Central Coast water sharing plan sets rules to minimise the cumulative impacts resulting from groundwater extraction. To do this, the Plan specifies the distances that new bores may be permitted to be constructed from streams, other bores, contaminated sites, groundwater-dependent ecosystems (GDE) and groundwater dependent culturally significant sites. This is to prevent unacceptable or damaging levels of draw-down occurring in the local vicinity of these users and sites.

For new works there are rules to:

- minimise interference between neighbouring works
- locate works away from contaminated sites
- protect water levels in groundwater dependent ecosystems
- 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.

### 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 Endangered Ecological Communities.

With the inclusion of alluvial groundwater as part of this water sharing plan, high priority GDE have been identified through the Department's planning process and are listed in a schedule to the plan. The list of high priority GDEs compiled at this stage can be amended as further GDEs are identified during the life of the plan.

### Wetlands

Groundwater dependent wetland ecosystems are typically areas where the water table is at the surface, or periodically at the surface. While the degree of groundwater dependency is variable, groundwater plays a critical role in wetlands found on alluvial floodplains. Many wetlands are extremely species rich with a mixture of plants and animals and are often considered to have high conservation value. Three highly dependent coastal wetlands have initially been identified in the Brisbane Water and the Wyong River Water Sources. Further investigation may occur during the term of the Plan to identify any additional highly dependent wetlands.

### Aboriginal acknowledgement

A paragraph to acknowledge the traditional land owners will also be included in the Plan. This is being included in all new water sharing plans in NSW.

### Flow reference points and cease-to-pump rules

There have been some minor amendments to the very low flow classes and a change in the flow reference points for Ourimbah and Jiliby Jiliby creeks water sources. During the development of the earliest water sharing plans the policy was to set access rules based on the flow at the end of the water source. In many cases however, there was no gauge at the end of a water source. For the rules to be properly implemented, flows had to be correlated back to a functioning gauge or other reference point, so that licence holders would know when they were able to access water.

Replacement of the original plans has provided an opportunity to revise the flow reference points to better reflect licence holder's current conditions and make the access rules easier to implement and monitor. The new flow reference points and Cease To Pump (CTP) rules have been correlated to the existing conditions and there are no changes to the intent of the Plan or the level of access compared to the 2003 Plans.

#### Ourimbah Creek.

In Ourimbah Creek Water Source, the CTP has been revised from 4 ML/day at the end of the water source to 4 ML/day at the Ourimbah Creek at Bangalow gauge (211015). The Commence to pump rule of 6 ML/day on a rising river has been removed. The cease-to-pump levels in the Ourimbah Creek has been set at a gauge that is just upstream of the town water supply take off. However, the flow percentile have been estimated based on the 89th percentile of all days at gauge 211015 during period of 2003-2015 and should provide similar conditions as the rules in the 2003 water sharing plan.

#### Jiliby Jiliby Creek

In Jiliby Jiliby Creek Water Source, the CTP has been revised from 1 ML/day at the end of the water source to 1 ML/day at Jiliby Jiliby Creek at Upstream Wyong gauge (211010). The 1 ML/day has been retained because flows lower than this cannot be accurately measured at gauge 211010. The cease-to-pump levels set in the Jiliby Jiliby Creek is based on the 78th percentile of all days with flow based on data from gauge 211010 up to October 2014.

Table 7 Flow classes in replacement water sources (ML/d)

Flow class	Ourimbah Creek (ML/d) at gauging station 211015	Jiliby Jiliby Creek (ML/d) at gauging station 211010
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Very low flow class	4	I
Low flows or A class	4 - 7	1 – 3.3
Moderate flows or B class	7 - 25	3.3 - 8
High flows or C class	25 - 60	> 8
D Class	60 - 160	N/A
E Class	> 160	N/A

Limited volumes are available below this cease-to-pump threshold for basic landholder rights and for licence holders that require continued access to water for hygiene and health purposes, that is, those listed on Schedule 2 or 2A (for those taking from alluvial sediments) of the Plan. A standard amendment was made to all unregulated river water sharing plans allowing licence holders who historically required water for dairy washdown, fruit washing, poultry watering and animal hygiene to extract up to 20 kilolitres per day during very low flows periods. A provision exists for licence holders to be added to Schedule 2 or 2A if they are identified at a later stage. Only licence holders existing at the start of the original Plan can be added to Schedule 2 or 2A.

### Total Daily Extraction Limits

Total daily extraction limits (TDEL) set how much water can be taken from a particular flow class on a daily basis for water. This enables water to be shared fairly amongst all water users, plus a provision made for environmental needs. However, before these flow classes and daily extraction limits can be fully implemented, the establishment of additional gauging stations and the metering of extractions are required.

The TDELs that were established in the original plans for the unregulated river access licences in the Jilliby Jilliby Creek Water Source have not been carried forward into the Central Coast water sharing plan due to the current lack of infrastructure which limits the ability to effectively manage these daily limits.

TDELs for local water utility access licences in the Ourimbah Creek Water Source have been carried over in the Central Coast water sharing plan.

The Plan includes an amendment clause enabling establishment of, amendment, removal or reinstatement of TDELs if required at a later date.

### Long Term Average Annual Extraction Limit

The Ourimbah and Jilliby Jilliby creek water sources are part of the Tuggerah Lakes Extraction Management Unit. The entitlements for these water sources were included in the Long Term Average Annual Extraction Limit (LTAAEL) when the Central Coast water sharing plan commenced in 2009 and therefore no changes to the LTAAEL has been required.

### Requirements for water

The Plan provides for domestic and stock rights and native title rights, both forms of basic landholder rights (BLR) which extract water from the river and do not need to be licensed.

A new method for estimating water use for BLR has been developed since the Ourimbah Creek and Jilliby Creek water sharing plans commenced in 2004. The new method uses GIS layers, DPI Water land use data, population and housing census data, and reasonable take and use zones to estimate stock and domestic water use. The method reduces the possibility of double accounting and has reduced the BLR estimate in the Ourimbah Creek Water Source from 1.37 ML/day to 0.15 ML/day and in the Jilliby Jilliby Creek Water Source from 0.51 ML/day to 0.13 ML/day.

There are currently no known extractions for native title rights from these water sources. However, both forms of basic landholder right may increase during the Plan's ten-year term.

Licence entitlement volumes for all water sources have also been updated to reflect any changes to licenced entitlement since the plans were developed.

### **Access licence trading rules**

Recent assessment undertaken by DPI Water found that Ourimbah and Jiliby Jiliby creek water sources contain high instream value and trading rules have been amended to 'no net gain'. A 'no net gain trade' rule means that a trade cannot increase entitlement in a water source to a level above that at the start of the Plan. Trade within these water sources is permitted, subject to assessment. Trading rules for alluvial bores will be the same as for the surface water source that the bore is located within.

## Adaptive management

Adaptive management refers to the practice of change in response to new information such as monitoring or some other improvement in understanding obtained during the 10 year life of the Plan. In the case of water sharing plans, such information could include socio-economic studies, hydrological modelling, ecological studies and information about Aboriginal cultural values.

Adaptive management is a requirement of both the *Water Management Act 2000* and the National Water Initiative, and has been allowed for through amending provisions and establishment of 'limits of change' to the Plan. These provisions allow some aspects of the water sharing plan to be changed within defined limits. Specific amendment provisions are discussed below.

Monitoring, evaluation and reporting are key activities for the adaptive management of water sharing plans. Further information on these is provided below.

### Amendment provisions

Standard amendments that apply to all water sharing plans include:

- amending water sources, management zones or EMUs,
- establishing new or additional flow classes in any water source where management zones are added or amended,
- amending requirements for metering or record keeping in relation to licensed access works,
- updating information in Schedules or deleting them if no longer required.

### How the rules might change

In three of the Central Coast unregulated water sources, there was a lack of adequate information to develop the final water sharing rules which could fully manage the risk to instream values and/or protect community dependencies. In these cases, further analysis or data collection will be undertaken during the life of the Plan (see Table 9). These include additional monitoring or investigation in relation to surface water flows, water quality and estuarine water requirements.

There may be other general amendment provisions included in the Plan which are not mentioned in this document. Please refer to the Plan for a full list of amendment provisions.

Table 8 Water sources where adaptive management applies

Water Source	Adaptive Management
<b>Access rules</b>	
Wyong River, Mangrove Creek, Mooney Mooney Creek	Amendment of planned environment water provisions if it is determined that there is a need for a 'first flush' commence to pump rule to protect flushes to the estuary based on field verification and the outcome of monitoring and investigations.
Wyong river	Amendments during the term of the Plan based on outcomes of monitoring and investigations in relation to: flow classes, system operation, share components, daily extraction limits.

### Research opportunities

The planning process has identified a number of opportunities for research at a state and regional level. In order to better assess trade-offs, integrated hydrological/ecological studies and socio-economic models are required. An assessment of Aboriginal cultural values and an investigation into the Wyong River estuary including economic valuation and hydraulic behaviour are research opportunities in the Central Coast area.

It is intended that a statewide research prospectus be developed that reflects research needs and knowledge gaps across all macro plans once they have been drafted. Opportunities for a collaborative approach to research with organisations such as universities and co-operative research centres will be explored.

### **Monitoring, evaluation and reporting**

DPI Water has developed a Monitoring, Evaluation and Reporting Framework in collaboration with key stakeholders. The framework conforms to NSW and Commonwealth government guidelines for monitoring, evaluation and reporting, and demonstrates an adaptive management approach to water planning required under the principles of the WMA 2000.

The evaluation framework aims to inform the community of the outcomes of water sharing plans, and to collate the results of various legislatively required evaluations and relevant knowledge to inform the review of the water sharing plans. The framework will assess the inputs, outputs and outcomes of the water sharing plans and their operations. The assessment will consider:

- the process of plan development (appropriateness),
- the performance of the Plan during operation (efficiency), and
- the socio-economic, environmental and cultural outcomes of the Plan (effectiveness).

The main strategies in place to assist in evaluating water sharing plans include:

- assessment of performance indicators (using an Environmental Flows Monitoring and Modelling program),
- an audit of plans, and
- review of each plan at the end of its ten year term.

### **Performance indicators**

Part 2 of the water sharing plan includes a number of standard performance indicators that will be monitored over the life of the water sharing plan. It is not practical 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 water sharing plan as improved methods are developed.

In order to assess performance indicators, DPI Water has established an environmental flows monitoring and modelling program which is designed to make the results of environmental flow studies more transferable between water sources and to develop more generic relationships between flow, hydraulics and ecological responses. This will enable a more efficient and effective evidence based approach to support monitoring and evaluation of water sharing plans in NSW.

### **Audit**

The WMA 2000 requires that water sharing plans be audited regularly, at intervals of not more than five years, to determine whether the provisions of the Plan are being implemented. Under section 44 of the Act the Minister for Lands and Water must appoint an Audit Panel to undertake this review.

The Audit Panel reflects the membership of the State Interagency Panel for Water Sharing and comprises representatives from DPI Water, OEH, DPI and LLS. Representatives from the NSW Natural Resources Commission and NSW Fisheries are invited to participate in the audit process as observers.

Reflecting the requirements of the WMA 2000 the focus of the audit is on the extent to which the provisions in the Plan have been implemented. The audit does not attempt to assess the outcomes or effectiveness of the Plan in achieving its objectives (this is considered by DPI Water through its monitoring and evaluation process).

When conducting an audit the panel will review a range of analysis and material provided by DPI Water to:

- identify patterns of implementation activities across water source types, across plans and types of water sharing plan provisions,
- identify actions required to address instances of partial and non-implementation,
- develop broad recommendations for improving the implementation of existing plans and the robustness of new plans, and
- identify opportunities for linking the audit findings with other related processes, particularly the review of catchment action plan targets.

### Plan review

At the end of the water sharing plan's 10 year life the Minister may, under Section 43A of the WMA 2000 and on recommendation by the Natural Resources Commission, extend a water sharing plan for another 10 years or replace the plan. An extension does not allow for any changes to the water sharing plan. If any changes are proposed, then a replacement water sharing plan needs to be prepared.

The WMA 2000 requires that when deciding whether to extend or replace an existing plan, the Minister must consider:

- the most recent audit of water sharing plans conducted under section 44, and
- a report from the NRC prepared within the previous five years, on the extent to which the water sharing plan has contributed to relevant state-wide natural resource management standards and targets of the relevant LLS catchment action plan.

Under the WMA 2000 a water sharing plan may be extended for 12 months past the expiry date of the Plan to allow for a replacement plan to be prepared.

## Glossary

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

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

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

**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*.

**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 reference point:** 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.

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

**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.

**Individual daily extraction limit (IDEL):** The daily volume limit that may apply for a particular licence holder for each flow class. The IDEL will be specified as part of the extraction component on the access licence. It establishes a share of the TDEL for that flow class.

**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:** An area within a water source used for defining the location of applicability of water sharing rules, but secondary to the water source. A management zone is more likely to be designated where '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.

**Regulated river:** A river that is declared by the Minister, by order published in the Gazette, to be a regulated river. Typically rivers where state owned storages catch water during wetter periods and the river is used to supply stored water to meet downstream users' orders during dry times are regulated rivers.

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

**Total daily extraction limit (TDEL):** The total limit on the daily volume of water that access licence holders in a particular category can take from a flow class. It is the sum of all the IDELs in that flow class.

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

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

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

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# Appendices

## Appendix 1: Identified threatened species

The macro water sharing plan process is concerned with protecting instream 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. Threatened species considered to be highly sensitive to low flows are given a higher priority for protection.

The table below shows the threatened species known or expected to occur in the Central Coast water sources

Threatened Species	Tuggerah Lakes	Wyong River	Ourimbah Creek	Jilliby Jilliby	Mangrove Creek	Mooney Mooney Creek	Brisbane Water
Adams Emerald Dragonfly	✓	✓	✓	✓	✓	✓	✓
Giant Barred Frog		✓	✓		✓		✓
Giant Burrowing Frog	✓	✓	✓		✓	✓	✓
Green and Golden Bell Frog	✓	✓	✓	✓	✓	✓	✓
Green-thighed Frog	✓	✓	✓	✓	✓	✓	✓
Littlejohns Frog	✓	✓	✓		✓	✓	✓
Red-crowned Toadlet		✓	✓		✓	✓	✓
Stuttering Frog	✓	✓	✓	✓	✓	✓	✓
Wallum Froglet	✓	✓	✓				

Threatened Species	Tuggerah Lakes	Wyong River	Ourimbah Creek	Jilliby Jilliby	Mangrove Creek	Mooney Mooney Creek	Brisbane Water
Australasian Bittern	✓	✓	✓		✓	✓	
Black Bittern	✓	✓	✓		✓	✓	✓
Black-necked Stork	✓	✓	✓	✓	✓	✓	✓
Comb-crested Jacana		✓	✓				
Magpie Goose					✓		✓
<i>Maundia triglochoides</i>		✓					✓

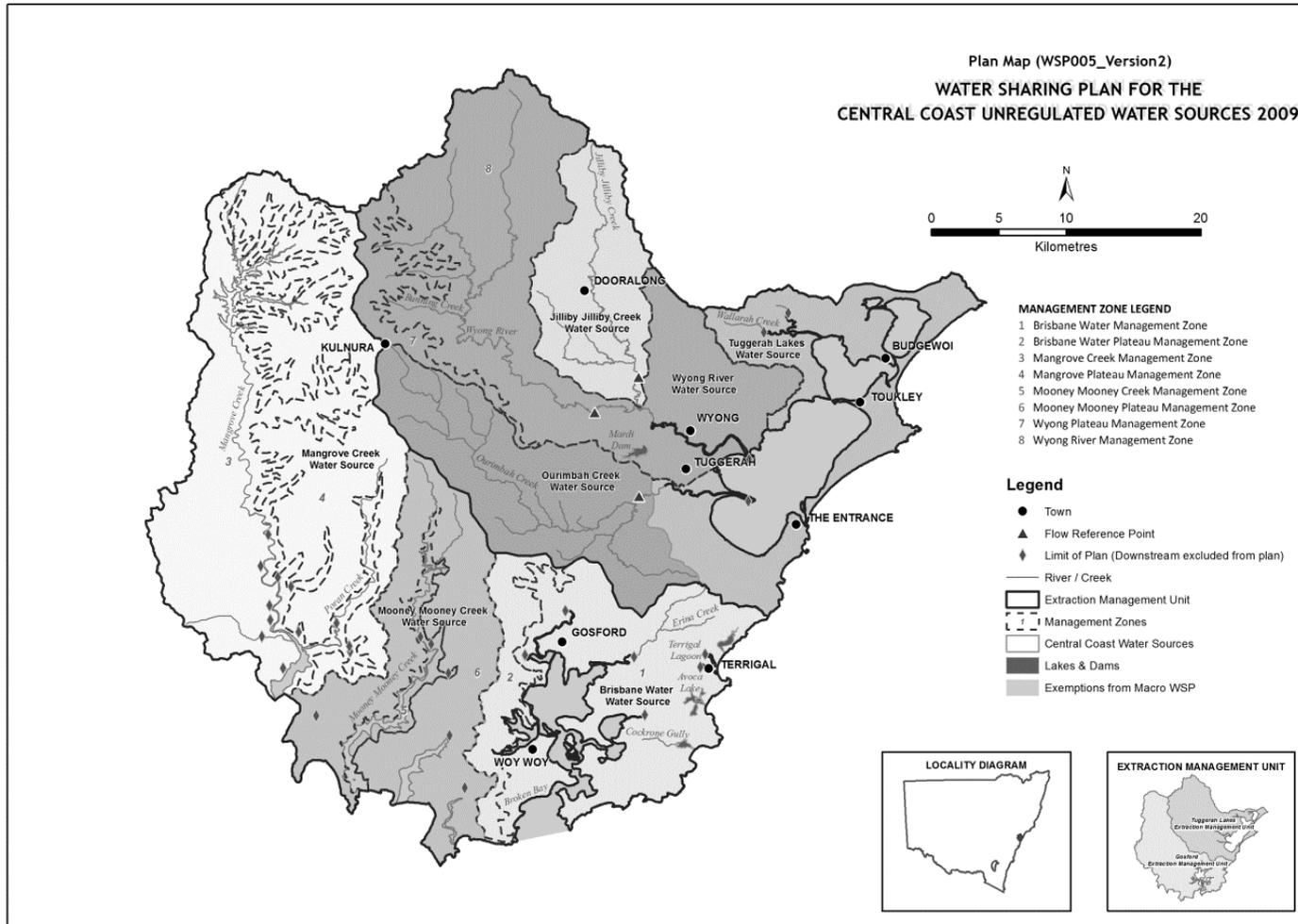
Disclaimer: The Office of Environment and Heritage (OEH) has provided assessments on the presence of threatened species and their sensitivity to extraction to inform the classification of water sources through the macro water sharing planning process. The assessments were undertaken for the specific 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. Regional 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 2: Central Coast water sharing plan map

Figure 1 Plan overview



### Appendix 3: Contribution to the river flow objectives

Levels of assessed contribution:

FULL – contributes to objective in full. HIGH – while not fully contributing to objective is considered a good level of contribution. PARTIAL – goes some way to contributing to the objective.

LOW – only small degree of contribution to the objective.

Note that for some systems while there may be no specific rule for each river flow objective the extent to which the rules, annual extraction limits and the risk to values contributed to the objectives was considered, and a specific rule developed only where necessary.

\* Note that for the tidal pool water source although rules have not yet been developed the following assessment is based on the intent of the rules. Tidal pool is assessed against the RFOs based on rules intended to maintain natural variability of salinity levels, and protect from significant salt water intrusion.

	Protect pools in dry times	Protect natural low flows	Protect important rises in water levels	Maintain wetland and floodplain inundation	Mimic natural drying in temporary waterways	Maintain natural flow variability	Maintain natural rates of change in water levels	Manage groundwater for ecosystems	Minimise effects of weirs and other structures	Minimise effects of dams on water quality	Make water available for unforeseen events	Maintain or rehabilitate estuarine processes and habitats
Tuggerah Lakes	FULL	LOW	LOW	LOW	HIGH	PARTIAL	LOW	LOW	HIGH	LOW	N/A	PARTIAL
Wyong River	FULL	HIGH	PARTIAL	PARTIAL	HIGH	HIGH	HIGH	LOW	HIGH	PARTIAL	N/A	HIGH
Mangrove Creek	FULL	LOW	LOW	LOW	HIGH	PARTIAL	LOW	LOW	HIGH	LOW	N/A	PARTIAL
Mooney Mooney Creek	FULL	LOW	LOW	LOW	HIGH	PARTIAL	LOW	LOW	HIGH	LOW	N/A	PARTIAL
Brisbane Water	FULL	LOW	LOW	LOW	HIGH	PARTIAL	LOW	LOW	HIGH	LOW	N/A	PARTIAL

## Appendix 4: Contribution to the NRC state-wide targets (2005)

Relevant state-wide target	Contribution by Central Coast WSP
By 2015 there is an improvement in the condition of riverine ecosystems.	<ul style="list-style-type: none"> <li>• Set a defined share of water for riverine ecosystems.</li> <li>• Protection of very low flows.</li> <li>• Trading rules to maintain or reduce entitlement in high value streams.</li> <li>• Adaptive management, giving the ability to adjust rules once information becomes available.</li> </ul>
By 2015 there is an improvement in the condition of important wetlands, and the extent of those wetlands is maintained.	<ul style="list-style-type: none"> <li>• Trading rules to maintain or reduce entitlement in high-value coastal water sources.</li> </ul>
By 2015 there is an improvement in the condition of estuaries and coastal lake ecosystems.	<ul style="list-style-type: none"> <li>• Rules to be developed to provide fish passage between the fresh water streams and Tuggerah Lake and possibly fresh protection into the Lake providing for environmental requirements of estuaries.</li> </ul>
Natural resource decisions contribute to improving or maintaining economic sustainability and social well-being.	<ul style="list-style-type: none"> <li>• Plans provide a defined share to water and defined security of access.</li> <li>• Water markets encourage movement of water licenses to high-value uses.</li> <li>• Rules developed which consider community dependence on water extraction.</li> </ul>
By 2015 there is an increase in threatened species populations and ecological communities.	<ul style="list-style-type: none"> <li>• Some access and trading rules were developed to protect water dependent threatened species where these were identified and the risk to these from extraction was high.</li> </ul>

## Appendix 5: Interagency Regional Panel and support staff

**Table 9 Hunter IRP membership and expertise for 2009 Plan development**

Name	Agency	Role	Expertise
Allan Raine (formerly Brian Gardoll and Mark Mignanelli)	DPI	Agency representative	Coastal riparian vegetation ecology, rapid assessment of stream health; fluvial geomorphology.
Bruce Reddan (formerly John Wilson and Glenda Briggs)	DPI	Agency representative	DPI regional input to water reforms, agriculture, catchment management and land use/strategic planning.
Richard Bath	Former DECC	Agency representative	DECC regional input to water reforms, catchment hydrology research, remote sensing, biodiversity.
Dean Chapman (formerly Cal Cotter, Garry Hunt and Sharon Vernon)	HCRCMA	CMA observer	Catchment management, riparian vegetation and wetland ecology, fluvial geomorphology.
Neville Pavan	HNCMA	CMA observer (Hawkesbury Nepean component)	Catchment management, project management and implementation of programs in soil and land management, and riparian restoration. Former HNCMA representative for water issue coordination.

**Table 10 Hunter IRP membership and expertise for 2016 Plan replacement**

Name	Agency	Role	Expertise
Peter Evans	OEH	Technical support	Regional experience in NRM management, floodplain planning and interagency coordination.
Glenda Briggs	DPI (Agriculture)	Technical support	Regional experience in NRM management, coastal agricultural industries, catchment management and interagency coordination.
Scott Carter	DPI (Fisheries)	Technical support	Fisheries management and conservation issues, threatened species, biological/environmental research, local knowledge of flow behaviour of catchments, WSP development and implementation.
Eddie Harris	DPI (Water)	Technical support	Water planning/administration/policy. Geomorphology. Riparian management. Stream ecology/restoration.

**Table 11 Support staff and expertise for 2009 plan development**

Name	Agency	Role	Expertise
Roland Bow	Former DEC	Technical support/ alternate representative	Technical and management expertise in research, aquaculture, commercial fisheries, compliance and conservation, fisheries management and aquaculture.
Gavin Doyle	Former DEC	Technical support/ alternate representative	Fluvial geomorphology, catchment management, fluvial/estuarine sedimentology, biogeography, plant ecology.
Scott Carter	DPI	Technical support/ alternate representative	Fisheries management and conservation issues, threatened species, biological/environmental research, local knowledge of flow behaviour of catchments, WSP development and implementation.
Danny Norris	DPI	Technical support/ alternate representative	Water policy implementation including water use, enterprise management and basic structural adjustment strategies for water users, water licensing, groundwater/surface water interactions, flow data analysis, local knowledge of flow behaviour of catchments, WSP development and implementation.
Sandra Mitchell	DPI	Technical support	Knowledge of flow and water quality relationships, WSP development and implementation, ecological habitat in relation to flow, monitoring.
Mark Simons	DPI	Technical support	Hydrologist – flow data analysis, hydrology, local knowledge of flow behaviour of catchments, WSP development and implementation, policy driver for connected systems, major utility licensing arrangements.
Jon Sayers	DPI	Technical support	Hydrologist – flow data analysis, hydrology, local knowledge of flow behaviour of catchments, WSP development and implementation, high flow policy development, water user background knowledge, local utility licensing arrangements.
John Williams	DPI	Technical support (groundwater)	Groundwater analysis and hydrology.
Brian McDougall	DPI	Technical support (licensing)	Licensing officer, local knowledge of water users, WUAs and local access arrangements.
Lyndal Betteridge	DPI	Macro coordinator	Water policy and planning, utility planning arrangements, WSP development and implementation, project management.
Neil Dufty	Independent facilitator	Qualified educator and earth scientist, experienced facilitator in NRM planning, former chair of water	Neil Dufty

management committees.

**Table 12 Support staff and expertise for 2016 plan development**

Name	Agency	Role	Expertise
Lyndal Betteridge	DPI Water	Macro coordinator	Water policy and planning, utility planning arrangements, WSP development and implementation, project management.
Sally Hunt	DPI Water	Plan Coordinator	Water sharing plan development and stakeholder liaison.
Brendan Mee	DPI Water	Technical support.	Licensing and compliance officer, local knowledge of water users, WUAs, local access arrangements and reference points.
Mark Simmons	DPI Water	Technical support.	Hydrologist – flow data analysis, hydrology, local knowledge of flow behaviour of catchments, WSP development and implementation, policy driver for connected systems, major utility licensing arrangements.
Jon Sayers	DPI Water	Technical support	Hydrologist – flow data analysis, hydrology, local knowledge of flow behaviour of catchments, WSP development and implementation, high flow policy development, water user background knowledge, local utility licensing arrangements.
Danny Norris	DPI (Agriculture)	Technical support/alternative representative	Water policy implementation including water use, enterprise management and basic structural adjustment strategies for water users, water licensing, groundwater/surface water interactions, flow data analysis, local knowledge of flow behaviour of catchments, WSP development and implementation.

## Appendix 6: Reference information used by Interagency Regional Panel

### DPI Water data sets:

- Licensing Administrator System – the DPI Water statewide database holding the licence details including volume of entitlement, location details and stream orders.
- Hydstra – Hydstra is an DPI Water statewide database that holds all flow record data.
- Regional Groundwater Monitoring Network – DPI Water has a regional groundwater monitoring network to be used to monitor alluvial groundwater levels and assess stream / surface water connectivity.
- Volumetric Conversion Database – used to help determine the Peak Daily Demand for each water source.
- Regional Geographic Information Systems – the DPI Water land use and topographic information.
- TRITON Water Quality database – DWE state wide database holding all corporate water quality data. Data was available for most basic parameters (i.e. EC, pH, temp, TP, TN) for the majority of water sources. DWE has an ongoing regional water quality monitoring network.
- Hydsys – Hydsys is a DWE statewide database that holds all flow record data. Flow records are available for most water sources in the Central Coast (CC) area.
- RiverStyles Mapping – Riverstyles mapping has been completed for the CC area. It is based on the nationally-adopted method developed by Macquarie University. Maps are produced of Riverstyle/ Geomorphic Condition / Recovery Potential. The information was used to assess issues such as drought refuge (pools), habitat heterogeneity, etc to inform the development of flow rules.
- AUSRIVAS – CC area has a number of AUSRIVAS sampling sites (macroinvertebrates). The data was used in the spreadsheet to help assess river health.
- Riparian vegetation mapping – riparian vegetation extent has been mapped across the Central Coast area. This was used to help determine other (non-extractive) influences on river health.

### Central data sets

- Stressed rivers reports – used as the basis for identifying where there are instream barriers.
- Threatened species (fish) – Data supplied by NSW DPI.
- Threatened species (other) – Data supplied by OEH.
- Index of Social Disadvantage – Australian Bureau of Statistics.
- Employment in Agriculture - Australian Bureau of Statistics
- Roy et al. 2001. Structure and Function of South-eastern Australian estuaries.

### Other agency data

- National Parks and Wildlife (OEH) Wildlife Atlas – statewide flora and fauna database
- NSW Fisheries (NSW DPI) modelled data sets (Fish Community Index, Fish Community Vulnerability).
- NSW Fisheries (NSW DPI) freshwater and saltwater recreational fishing database.

## Other Projects

- Internal PhD examining the distribution of freshwater mussels and the impacts of changes to their habitat on distribution and abundance. This work is largely occurring in the Hunter catchment, but it is likely the results can be used in the Central Coast.
- M. A. Alkhatib, M.A. & Merrick, N.P. (2006) *Groundwater Simulation and Optimisation Modelling of the Kulnura – Mangrove Mountain Aquifer Systems*. Report prepared for DNR and GWCWA. National Centre for Groundwater Management. Research Report NCGM 2006/1.
- *Wyong River Environmental Flows Report*, SKM, 2008 including:
  - a knowledge review of the aquatic ecology of the Wyong River, The Ecology Lab (2008)
  - a study of fish assemblages in the Wyong River upstream and downstream of the weir, Sainty and Associates (2007)
  - water quality data, Bio-Analysis Pty. Ltd
  - river estuary bed sediment analysis including an assessment of contamination (Bio-Analysis Pty. Ltd. prior to a major event storm event in June 2007)
  - hydrographic survey upstream and downstream of LWW, Barry Hunt Associates
  - assessment of riparian vegetation by SKM
  - assessment and mapping of macrophyte assemblages downstream of LWW, Bio-Analysis Pty. Ltd. (2008)
  - review of the effectiveness of the LWW fishway with recommendations for possible improvements, Fishway Consulting Services (2008).
- Mardi Project Water Treatment Process Review (in prep).

## Appendix 7: Summary of final classifications recommended by IRP

### Value matrix

High instream values	<b>A</b> Brisbane Water	<b>B</b>	<b>C</b> Wyong, Mangrove Creek, Mooney Mooney Creek
Medium instream values	<b>D</b> Tuggerah Lakes	<b>E</b>	<b>F</b>
Low instream values	<b>G</b>	<b>H</b>	<b>I</b>
	Low hydrologic stress of hydrologic risk	Medium hydrologic stress of hydrologic risk	High hydrologic stress of hydrologic risk

### Risk matrix

High risk to instream values	<b>A</b>	<b>B</b>	<b>C</b> Wyong River
Medium risk to instream values	<b>D</b> Brisbane Water	<b>E</b>	<b>F</b> Mangrove Creek, Mooney Mooney Creek
Low risk to instream values	<b>G</b> Tuggerah Lakes	<b>H</b>	<b>I</b>
	Low dependence on extraction	Medium dependence on extraction	High dependence on extraction

## Appendix 8: Justification of final classifications based on IRP knowledge

Water source	Change to classification	Justification
Brisbane Water	Risk classification changed from H-D	The Panel revised the risk to instream value from low to medium in recognition of urban development within the catchment.
Mangrove Creek	Value classification changed from F-C	The Panel revised the instream value from medium to high in recognition of the number of threatened species and other fauna species and the intact nature of the catchment.
Mooney Mooney Creek	Value classification changed from F-C	The Panel revised the instream value from medium to high in recognition of the number of threatened species and other fauna species and the intact nature of the catchment.

## Appendix 9: Water sharing rules based on IRP knowledge

Water source	Change to water sharing rules	Justification
Tuggerah Lakes	<p>Trading rules identified through the classification process (trades allowed in up to a specified percent of flow stress) were not adopted by the Panel.</p> <p>Access rules identified through the classification process (CtP to allow flows at or below 95 percentile to pass end of water source) were not adopted by the Panel.</p>	<p>No trading in to the water source was proposed due to the streams being very small and unreliable, with a limited number of existing licences. Impacts of extraction on the estuary unclear.</p> <p>No visible flow at the pump site was proposed due to the limited number of users and licensed entitlement in the water source. In addition a lack of infrastructure prevented the proposed end of system rule from implementation. Investment in infrastructure could not be justified due to the limited number of users.</p>
Mangrove Creek	<p>Access rules identified through the classification process (visible flow at end of water source) were not adopted by the Panel.</p>	<p>Visible flow at the pump site was proposed due to the difficulty in accessing the end of the system and a lack of infrastructure.</p>
Mooney Mooney Creek	<p>Access rules identified through the classification process (visible flow at end of water source) were not adopted by the Panel.</p>	<p>Visible flow at the pump site was proposed due to the difficulty in accessing the end of the system and a lack of infrastructure.</p>
Brisbane Water	<p>Access rules identified through the classification process (CtP to allow flows at or below 90 percentile to pass end of water source) were not adopted by the Panel.</p>	<p>No visible flow at the pump site was proposed due to the limited number of users and licensed entitlement. In addition a lack of infrastructure prevented the proposed end of system rule from implementation. Investment in infrastructure could not be justified due to the limited number of users.</p>

## Appendix 10: Refined water sharing rules based on targeted consultation

Water source	Change to water sharing rules	Justification
Wyong	Note: To provide improved explanation of how cease to pump/commence to pump works and other provisions where appropriate.	Licence holders were unsure what the term cease and commence to pump and other plan provisions meant and sought further explanation included in the Plan.
Wyong	Inclusion of additional high flow class.	Licence holders were concerned that the proposed access rules did not allow for filling of on farm storages to allow crop requirements to be met during dry periods.
Wyong	Inclusion of Plan amendment provisions based on estuary study to define flow requirements of Tuggerah Lakes estuary.	Consideration of how best to consider impacts of increased extraction on health of the estuary – study to help inform decision making. Study to be triggered by: <ul style="list-style-type: none"> <li>• application for refill licence</li> <li>• application for additional entitlement in Wyong River water source, Ourimbah Creek water source</li> <li>• application for transfer to Wyong (allow an additional volume and then if want to exceed that then trigger estuary study).</li> </ul>
Wyong , Mangrove, Mooney Mooney	Share components based on historic maximum extractions factored up for population growth for local water utilities in water sources, but still limited to long term average extraction limit figure, accompanied with refill share component for refilling storages.	Acknowledge need for flexibility for filling of storages to meet system security needs. Daily and annual limits allow for appropriate management of system.
Wyong	Include refill licence concept once augmentation undertaken and removal of three year rolling average accounting for local water utility.	The refill licences allowed the LWU to pump water into storage when water was available, separate to the normal LWU licence. This would allow the normal licences to reflect the average water use of the LWU as the refill licences would provide for intermittent refilling of storages. This would also allow water put into storage to be accounted for against the LTAEL when it was used, not when it was pumped to storage.  Proposal to remove three year rolling average for account management for LWU access licence given flexibility provided by refill licence and enhanced share components.
All	Provision of transfers between extraction management units (EMU) for local water utilities only.	Transfers between EMUs recognises that the water authority operates a system across the two EMUS and licences are held by two separate local water utilities.

## Appendix 11: Refined water sharing rules based on further studies

Water source	Change to water sharing rules	Justification
Wyong River	<p>CtP.</p> <p>Visible flow reduced from years one to five to one to three (or when new fishway installed, whichever is the sooner).</p> <p>First flush rules may be introduced to supplement existing rules.</p>	<p>CTP and A-Class at 4 ML/day commence once the new fishway and pump station are commissioned, or year three, whichever is the sooner.</p> <p>The current fishway does not allow adequate passage for fish at very low flows. Gosford Wyong Councils Water Authority intends to upgrade the existing fishway to improve its performance. Reducing the timeframe for introduction of the flow rules will ensure the new fishway can operate effectively as soon as it is completed.</p> <p>Freshwater flows during freshes and floods may be important for triggering fish migration from the estuary to the freshwater sections of the stream. The flows potentially necessary to trigger this migration, via changes to salinity downstream of the weir are not fully understood. Further work will be undertaken on this issue. The Plan allows for first flush rules to be introduced if it is deemed protection of the first a fresh is required to trigger fish migration, and that the magnitude of such flows have the potential to be influenced by water extraction.</p>
Wyong River	<p>Share components based on the local water utilities maximum modelled extractions possible with the limitations of the new infrastructure and daily sharing rules in each water sources – but still limited to long term average extraction limit figure which is smaller than the sum of the share components and is accounted for where water enters the distribution network.</p>	<p>While Share components are substantially bigger than historic extraction, these annual volumes are only able to be extracted if daily flow protection allows access to the water. The daily flow protection has been designed to optimise ecology benefits for the rivers and their estuaries while providing urban water demands for the year 2050.</p>
Wyong River	<p>Daily extraction limits for local water utilities.</p>	<p>Various TDEL thresholds established for LWU based on varying dam storage capacities and completion of upgrade works to infrastructure for GWCWA.</p> <p>Flow classes and TDELs established at year six or when infrastructure complete, whichever is the sooner.</p> <p>Restrictions for LWU customers come off at around 40 per cent (once system secured) so this was lowest storage capacity considered for introduction of TDELs.</p> <p>Staged approach to balance risk to LWU.</p>
Brisbane Water	<p>Removal of coastal lagoon management zone.</p>	<p>Coastal lagoon MZ removed as no licences within zone, reduce complexity for licence conversion, limited licences in water source so risk deemed minimal for impact in lagoon area.</p>

## Appendix 12: Refined water sharing rules based on public exhibition

Water source	Change to water sharing rules	Justification
Wyong River	<p>Amend the introduction of cease to pump at 4 ML/day to year three of the Plan (not sooner) for all access licences, excluding local water utility access licences.</p> <p>Inclusion of amendment provision that the upper limit of the very low flow class can be amended between 2-4 ML/day based on assessment of economic hardship caused by the access rules.</p>	<p>Submissions and public meeting participants raised concerns regarding the potential socio-economic impact of the proposed cease to pump level for the Wyong River.</p> <p>The Interagency Regional Panel (the Panel) is conscious that the Wyong River water source was classified with the highest risk from extractions in the whole of the Central Coast area. Given this relatively small system has significant extraction pressure from local water users and town water supply the Panel was not able to justify an increased delay (e.g. to five years before introduction) of implementation of the cease to pump @ 4ML/day however it did recommend that the introduction for all access licences other than the local water utility access licences was not linked to the works at the Weir (pumping station upgrade and fishway installation) and as a result would not be introduced any earlier than year three of the Plan.</p> <p>In addition the Panel recommended that if the flow reference point moves to the Wyong River Weir the top of the very low flow class could be amended if it was found that there was significant socio-economic impact on licence holders from the proposed rule. This would allow reduction of the cease to pump to a minimum of 2 ML/day. NB. 2 ML/day is the minimum flow at which the fishway can operate.</p>
Wyong River	<p>Inclusion of amendment provisions to require the daily extraction limits for the local water utility access licences to be updated prior to year six of the Plan, or following completion of works referred to in Schedule 3, whichever is the sooner, to:</p> <ul style="list-style-type: none"> <li>• amend the 'percentage of remaining flow in the river' to the 'percentage of flow remaining in the river in excess of the lower limit of the flow class', or</li> <li>• ii. amend the percentages for the flow classes to an equivalent volume of access as simulated in the modelling undertaken as part of the Wyong River Environmental Flow Study (3 March 2008) by the Gosford and Wyong Councils Water Authority.</li> </ul>	<p>The modelling undertaken by Gosford Wyong Councils Water Authority (GWCWA) used to determine percentage take, determines the percentages based on the flows above the lower limit of any flow class, rather than the total flow at the time.</p> <p>The basis for calculation was not known until public exhibition had been completed so the Panel recommended that prior to the commencement of the flow classes and daily flow sharing that the access conditions be amended to either:</p> <ul style="list-style-type: none"> <li>• reflect the modelling undertaken by amending the volume of flow that the percentage take pertains to, or</li> <li>• by allowing the percentage take to be amended to provide a similar level of access to that used in the modelling used to determine percentage take.</li> </ul>
Wyong River	<p>Inclusion of amendment provisions to allow the daily extraction limits for the local water utility access licences to be recalculated if the flow reference point is moved to Wyong River Weir to allow an equivalent daily extraction limit to that at the upstream flow reference points. Any amendment will not reduce the percentages specified by more than 7.6 per cent of that percentage.</p>	<p>Current modelling undertaken by the local water utilities to inform the Total Daily Extraction Limits (TDEL) volumes specified in the Plan is based on a percentage of a volume at a flow reference point which is upstream of the utilities pumping point and above the end of system. If the flow reference point is amended to a downstream location which coincides with the utilities extraction point and the end of system then the percentages will need to be recalculated to provide the same volume of daily extraction. It is not anticipated that this will change the total volume available for extraction by the local water utility access licences from that currently modelled.</p>

Mooney Mooney Creek	Inclusion of amendment provision to allow for further investigation of seepage quality and quantity from Lower Mooney Mooney Dam by the local water utilities to provide information to determination as to whether seepage from this Dam meets the requirements of release provisions specified in the system operation provisions of the Plan.	<p>In developing system operation rules for the draft water sharing plan (WSP), the Panel was guided by the Healthy Rivers Commission (HRC) recommendations which indicated that a 99th percentile flow be introduced for storages where trial releases were not being carried out in relation to recommendation 8.3.1 of the <i>HRC Report</i> (1998). To date the trial releases have not been carried out due to very dry climatic conditions and resource security issues for the local water utility.</p> <p>In relation to the Lower Mooney Mooney Dam, the local water utilities have indicated that this dam continually overtops, has a continued level of seepage from the Dam, and the ecology downstream is not significantly impacted by the reduced flows from upstream, hence no releases from this dam are required.</p> <p>The Panel maintains that costs outweigh any benefit of removing structure however further investigation is require to determine if the volume and quality of the seepage water is adequate to replace the proposed system operation rule or whether appropriate bypass conditions should be maintained.</p>
Mangrove Creek and Mooney Mooney Creek	Amendment of the proposed cease to pump level. No flow classes proposed for the first five years of the Plan with introduction of flow classes at year six of the Plan. These may be based on a number of options as detailed in the Plan.	<p>A large number of submissions argued that the proposed cease to pump provisions for Mooney Mooney and Mangrove Creeks (visible flow into and out of the pumping pool) were inequitable due to the specific characteristics of extractions in these water sources (mainly extractions from dams) and would have a socio-economic impact on licence holders. Management options initially considered by the Panel were limited due to available infrastructure however the Panel recommended to maintain current licence conditions for the first five years of the Plan while undertaking further work to identify appropriate access rules in these water sources for introduction at year six of the Plan. It is proposed that flow class rules may be based on, but not limited to, a cease to pump at a specified flow reference point (gauge(s) would need to be installed) in either Mangrove and/or Mooney Mooney water sources or cease to pumps at specified flow reference points throughout the water sources in specified reaches. A visible inflow/outflow rule may also be introduced. Consideration of the requirement for a bypass option for access licences holders extracting from in river dams will also be undertaken.</p>
Mangrove Creek and Mooney Mooney Creek	Inclusion of amendment provision to seek trial releases as specified in recommendation 8.3.1 of the Independent Inquiry into the Hawkesbury Nepean River (HRC, 1998) to be undertaken when the combined storage levels in local utility's storage dames is equal to or greater than 60 per cent capacity, if directed by the Minister.	<p>In 1998 the Health Rivers Commission undertook an Independent Inquiry into the Hawkesbury Nepean River System. The report published included a number of recommendations. The HRC recommended a trial of environment flows to inform the likely ecological improvements that would arise from introducing various levels of flow protection. Further detail on the studies is also provided in <i>Environmental Flows Expert Panel Report</i> (Quality Environmental Management Pty Ltd 2001).</p> <p>To date the trial releases have not been able to proceed due to very dry climatic conditions and resource security issues for the local water utility.</p> <p>A number of submissions raised concerns regarding the potential impact on downstream system health of proposed extractions and sought that completion of trials as recommended by the HRC would be of benefit. The Panel supported these comments.</p>

All water sources	Provision to all stormwater harvesting and environmental flow substitution to occur in all flow classes subject to meeting water quality criteria under relevant legislation and Plan provisions.	The draft Plan initially limited stormwater harvesting and environmental flow substitution to very low flows. To increase the variability of such activities which are currently being investigated by the local water utilities the Panel supported extending provision for these to occur in all flow classes, noting that water quality concerns would need to be managed for such activities in line with relevant legislation.
Wyong River	Inclusion of a 30 per cent carry over provision for the local utility access licences in the Wyong River water source.	Refined modelling undertaken by the local water utilities in conjunction with the proposed flow rules and system upgrades as per Schedule 3 indicated that in rare circumstances volumes in excess of those specified in the draft Plan could be extracted. The Panel recognised that in order to not affect the recovery rate following drought that amendment was required. Rather than change the share component specified during the public exhibition period it was recommended to include a carryover provision for the local water utility access licences. This provides for an additional maximum 10,400 ML/year extraction.
All water source	Clarification of long term average annual extraction limit (LTAAEL) Plan provisions and associated accounting for the LTAAEL for local water utility access licences.	Submissions indicated that there was some confusion regarding the draft provisions relating to the LTAAEL for local water utility access licences and how these were accounted for. The Panel supported review and amendment of these provisions to clarify the various components which combine to form the extraction limit for the local water utilities and how these components are accounted for.
Wyong River, Mangrove Creek, Mooney Creek, Mooney Creek	Rearrangement of provisions relating to further studies to clarify the review and amendment process and who is involved.	Submissions indicated that the provisions for amendment of the Plan were not structured clearly. The Panel recommended that the provisions were reordered to clarify the order of the process and notes included to specify the key stakeholders to be consulted as part of the process.