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Water Sharing Plan for the Clarence River Unregulated and Alluvial Water Sources

Background document

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Water Sharing Plan for the Clarence River Unregulated and Alluvial Water Sources Background Document

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More information

Rural Water Planning

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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 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 unregulated¹ 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 NSW is now covered by the WMA 2000. The macro planning process was designed to develop water sharing plans covering most of the remaining water sources across NSW. Each macro plan covers a large river basin rather than a single sub-catchment, or in the case of groundwater systems, cover a particular type of aquifer (for example fractured rock). These macro plans generally apply to catchments or aquifers where there is less intensive water use.

The *Water Sharing Plan for the Clarence River Unregulated and Alluvial Water Sources 2016* (hereafter referred to as the Clarence water sharing plan) covers 52 water sources that are grouped into three extraction management units (Appendix 1).

This document provides background to the development of the rules in the Clarence water sharing plan. It includes information on the purpose of the plan and the policy framework that supports it, a description of the Clarence catchment including land and water use, and the process of developing the various water sharing rules in the plan. This document is part of a range of material available specifically on the plan including:

- the *Water Sharing Plan for the Clarence River Unregulated and Alluvial Water Sources 2014* - a legal instrument written in its required statutory format
- *An overview of water sharing plans for unregulated and alluvial water sources in coastal NSW*
- Rule summary sheets for each water source detailing the management rules.

General information on the macro planning process is available in the water sharing plans section of the NSW DPI Water website 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
- *Setting rules for water sharing plans* – information outlining the key steps for developing the rules.

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

Purpose of the plan

Why are water sharing plans being prepared?

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

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, water sharing plans also set rules so that commercial users can continue to operate productively. In general, commercial licences under the WMA 2000 are granted in perpetuity, providing greater commercial security of water access entitlements. Water sharing plans define the access rules for commercial users for ten years providing all users with greater certainty regarding sharing arrangements.

Benefits for water users

The introduction of water sharing plans will benefit water users by providing:

- greater certainty by setting water sharing arrangements for a 10 year period
- clear trading and access rules which will help foster trading of water
- greater security with existing water licences converted to perpetual water access licences under the WMA 2000

Environmental considerations

Water sharing plans are required to reserve water for the overall health of the river and to protect specific ecosystems that depend on river flows, such as wetlands, lakes, estuaries and floodplains. This share of water reserved for the environment is also intended to sustain the river system’s aquatic fauna and flora. The Clarence River water sharing plan sets rules for unregulated streams and alluvial aquifers in the plan area. The scope of the plan is discussed later.

Unregulated streams

Rivers naturally experience a range of 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; and 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 flows must be maintained.

In order to protect a proportion of these flows for the benefit of the environment, water sharing plans impose new 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.

Each water source in the Clarence plan area has been classified as having high, medium or low instream values. Water sources with high instream value are protected through the plan by not allowing any water licences to be traded into the water source. Trades are allowed into some water sources with lower value in order to encourage the movement of extraction from higher to lower environmental value areas.

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 via rainfall, surface flows from rivers and lakes, or flow from adjacent aquifers. Water sharing plans aim to achieve sustainable groundwater extraction by limiting extractions to a proportion of the aquifer recharge. The remainder of the recharge is reserved for the environment.

The Clarence River water sharing plan defines access rules for alluvial aquifers in the plan area. Water sharing rules for fractured rock and porous rock aquifers are dealt with in the *Water Sharing Plan for the North Coast Porous and Fractured Rock Groundwater Sources*.

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

Objectives of the plan

The objectives of the Clarence River water sharing plan are to:

- a) protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources
- b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources
- c) protect basic landholder rights
- d) manage these water sources to ensure equitable sharing between users
- e) provide opportunities for enhanced market based trading of access licences and water allocations within environmental and system constraints
- f) provide water allocation account management rules which allow sufficient flexibility in water use
- g) contribute to the maintenance of water quality
- h) provide recognition of the connectivity between surface water and groundwater
- i) adaptively manage these water sources
- j) assist the passage of Eastern Freshwater Cod in these water sources, and
- k) contribute to the “environmental and other public benefit outcomes” identified under the “Water Access Entitlements and Planning Framework” in the *Intergovernmental Agreement on a National Water Initiative* (2004).

Scope of the plan

The Clarence River water sharing plan covers two discrete water resources: unregulated rivers and alluvial groundwater. Since there are no regulated rivers in the plan area, the water sharing plan applies to all rivers in the plan area.

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

In 2004, a water sharing plan was developed for the Dorrigo Plateau Surface water source, headwaters of the Nymboida River which is an important tributary of the Clarence River. The four surface water sources of the Dorrigo Plateau will be incorporated into the Clarence Unregulated and Alluvial water sharing plan.

Water sharing plans divide plan areas into several “water sources”, which usually coincide with sub-catchment boundaries. Access and trading rules are developed for each of these water sources. If water sharing rules need to be more refined, water sources may be divided into management zones. Conversely, rules about annual extractions are generally made at a broader scale within Extraction Management Units (EMUs), which is usually the entire catchment and consists of several water sources.

The Clarence water sharing plan defines 51 water sources and three EMUs: Clarence River Catchment EMU, Angourie/Redcliffe Catchment EMU and Woolli River Catchment EMU. The Clarence water sharing plan also defines the Clarence Floodplain alluvial water source that whilst overlain by surface water sources covered by the EMUs are excluded from the EMUs. The location and extent of these water sources and EMUs are shown on the map in Appendix 1 and listed in Appendix 2. The Clarence River water sharing plan has no management zones.

Policy framework

A number of national, state and regional plans and policies guided the development of water sharing plans for the NSW North Coast, including:

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

The Water Management Act 2000

The 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 [WMA 2000](#) can be obtained from the NSW government legislation website.

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:

- the impacts on other water users
- the impacts on the water source
- the 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 the 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 its environmental values or hydrologic stress.

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 its water management functions are in the process of being transferred to other agencies. Assessment of progress in the implementation of the NWI will be transferred to the Productivity Commission along with monitoring the effectiveness of the implementation of the Basin Plan and associated water resource plans.

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 has 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 at the state, regional, catchment and local level.

The NRC's 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 plans 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 the state-wide standard 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 Plan

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). 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. North Coast Local Land Services (North Coast LLS) will be responsible for continuing the delivery of natural resource management programs on the NSW North Coast, including catchment management plans.

The Northern Rivers Catchment Action Plan 2023 is a 10-year strategic plan that sets the direction for the sustainable use and care of the natural resources of the NSW North Coast. The Clarence River water sharing plan contributes to the goals and targets of this plan, in particular Goal 3, relating to the maintenance of diverse, healthy, connected and productive natural environments. The implementation of water sharing plans on the North Coast is one of the key strategies to be implemented in supporting land and water managers to maintain or improve the condition of priority freshwater, marine and estuarine assets (NRCMA 2013).

Water planning policies and considerations

A number of 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 pools, lagoons and lakes

Pools in NSW can provide an important source of water for licence holders, landholders and communities. Pools also have a key ecological function as a critical refuge and habitat for flora and fauna. For the purpose of this policy a pool refers to any lentic water bodies (standing water) within or associated with unregulated rivers in NSW, including water bodies that fall within the definition of a lake according to the Dictionary of the WMA 2000 (the exception is tidal pools and estuaries).

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. 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 does allow for more lenient access rules to be set if the default rules would significantly impact on current irrigation operations.

Managing surface water and groundwater connectivity

A key objective of the NWI is 'recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource'. Most alluvial aquifers have a relatively high degree of connectivity with their associated surface water sources. Accordingly, most alluvial water sources are included in a water sharing plan that covers both surface water and its connected alluvial groundwater. Conversely, most porous rock, fractured rock and coastal sands aquifers are considered to have a lesser degree of connectivity and are included in groundwater-specific plans.

The document *Macro water sharing plans – the approach for groundwater. A report to assist community consultation* provides further information about the principles used to develop water sharing rules for groundwater sources.

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 that water sharing must protect BLR. The plan does this by identifying the requirements for domestic, stock and native title rights at the start of the plan and considering these requirements when designing the rules for licensed water extraction. Because the access rules for licensed extraction do not apply to BLR, extractions taken under BLR are afforded higher priority than licensed extractions.

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, however the plan allows for these rights should they be activated during the plan's ten year term.

Domestic and stock rights can be restricted by the Minister to protect the environment or public health, or to preserve existing BLR. However, these restrictions are outside the framework of the water sharing plan.

The Clarence River water sharing 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 water sharing 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 (LWUs) 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 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 Clarence 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

Protecting estuary health

Streamflow and groundwater discharge have an influence on many ecological components of an estuary, and play a significant role in the health of these systems. Water extraction from surface water or groundwater sources may have an impact on the ecological health of estuaries. Some estuaries are highly sensitive to freshwater inflows, whilst others are more resilient to changed inflows. The size and shape of estuaries vary and this, combined with the amount of freshwater inputs and extractions, determines the estuary's overall sensitivity to freshwater extraction. Where possible, extractions will be limited in catchments found to be highly sensitive to freshwater inflows.

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

Changes in land use activities can potentially result in the interception of significant quantities of surface runoff and through flow. Activities that can impact on water quantity include increased farm dam capacity or the development of significant areas of new forestry plantations in a catchment. Under the National Water Initiative, significant interception activities should be accounted for within a plan's extraction limit.

Water sharing plans cannot restrict the volume of water collected under harvestable rights² 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.

Placing restrictions on forestry activities is beyond the scope of the water sharing plan. The NSW DPI Water recognises the potential impacts of forestry activities on catchment hydrology and is currently developing state-wide policy in relation to this issue.

² 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.

Description of the plan area

Catchment description

The area covered by the Clarence River water sharing plan (Appendix 1) comprises the Clarence River catchment, the Woolli River Catchment, the Angourie-Redcliffe-Sandon Catchment and the adjoining Dorrigo Plateau Water Sources. It contains a total of 52 water sources covering an area of around 22,654 km² on the north coast of NSW. The Clarence catchment consists of the Clarence River and associated rivers and creeks. It covers an area stretching from the coast to the east, to the New England Tablelands in the west. The catchment is defined by high tableland areas in its western extremities, falling away to a large and relatively flat coastal floodplain. The major towns of Grafton, Maclean, Iluka and Yamba are all located on the coastal plain, with Bonalbo and Dorrigo in the western extremities of the catchment, to the north and south respectively.

The Clarence River catchment is bounded to the north by the New South Wales-Queensland border, north-east by the Brunswick & Richmond catchments, south-west by the Bellingen River catchment, south-east by the Coffs Harbour WSP area and to the west by the Northern Tablelands which forms part of the Great Dividing Range. The major tributaries that enter the Clarence River include the Mann, Nymboida and Orara Rivers.

The Clarence River is one of the largest rivers in NSW, beginning from the slopes of the Great Dividing Range and flowing east, where it joins the Pacific Ocean. It is joined by numerous smaller tributaries, with the water typically fresh through the upper reaches, brackish near the township of Maclean, and salty where the estuary opens up to the ocean.

The Nymboida River begins west of Dorrigo, in the southern reaches of the Plan area, flowing north-east to join the Mann River. A number of smaller tributaries flow into the Nymboida River, including Bielsdown River, Blicks Creek, Little Nymboida River and Boyd River. Many of those tributaries are part of the Dorrigo Plateau Water Source.

The Orara River rises up from the south of the catchment, beginning on the Dorrigo Plateau, to meet the Clarence River south of Copmanhurst.

The Mann River begins on the slopes of the Great Dividing Range, travelling in a generally north-east direction until it joins the main arm of the Clarence River. Tributaries flowing into the Mann River include Henry River and Yarrow River.

Water management structures

All of the rivers and creeks in the Clarence River water sharing plan area are unregulated; having no major dams for water supply or instream structures. Most water users rely on natural flows for their water supply, although small dams and weirs may be present.

The only significant water management structure present in the catchment is the Nymboida Hydro-electric Power Station. Construction for the power substation and associated infrastructure began in 1923, with work completed in 1924 (OEH, 2015). The main structures on the river are the powerhouse building, which contains seven turbines coupled to three alternators, and a 120 m high overshoot weir. Storing water from the Orara River, the weir was constructed across the Nymboida River near the township of Nymboida, with surge tanks at Goolang Creek.

The power station was automated in 1973, but is in-operable at the time of writing.

Aboriginal history

Prior to European settlement, the Bundjalung Nation, were the traditional owners and custodians of the region. For years they occupied an area stretching from below Dorrigo in the south to up into south-east Queensland in the north. The wider Bundjalung Nation

extends from the Clarence River in the south to the Nerang River in south-east Queensland to the north, reaching westwards to the Great Dividing Range (Arakwal People of Byron Bay, 2011).

The Yaegl people have been the traditional custodians of the country around the modern-day locations of Yamba, Iluka and Maclean. Though this area is relatively small, abundant resources from the ocean and the Clarence River catchment enabled them remain in the area whilst maintaining a less nomadic lifestyle than other groups, only moving between a few main camps for the most part. Other groups also visited the region from time to time.

When white settlement in the area began in the late 1830s, the Yaegl people initially co-existed with them and continued to practice their traditional way of life. As land started to get locked up in small farms by selectors, the original owners were unintentionally displaced, and their values were further eroded as they took up work. In 1904, the Aboriginal Protection Board formalised the segregation of Aboriginal people from the later settlers with the creation of an Aboriginal Reserve on Ulgundahi Island, near Maclean. By the mid-1940s, Aboriginal people began to move off the Reserve and back into other communities, such as Yamba.

Despite these events, the Yaegl people have remained proud of their heritage and strive to preserve their culture. Two of the many Local Aboriginal Land Councils (LALCs) operating to achieve this outcome are the Yaegl LALC at Maclean and Birrigan Gargle LALC at Yamba. Their initiatives include the protection of sites under Native Title and the publication of the Yaygirr Dictionary and Grammar book in 2012 to preserve their language (Yamba Museum, 2013).

The Githabul people are the custodians of the land covering the northern reaches of the Clarence catchment, including the town of Woodenbong, Koreelah National Park, Tooloom National Park and areas around Tenterfield (OEH, 2011). Many of their sacred lands are now protected under Native Title. The Indigenous Land Use Agreement was signed in February 2007 by the Githabul People, the Githabul Nation Aboriginal Corporation and the NSW Government.

Early European settlement and land use

The first European to explore the Clarence catchment was the escaped convict Richard Craig, who had fled south from the Moreton Bay Penal Settlement in 1830. It was settled by loggers in search of timbers such as cedar in 1838. It was in the same year that the “Big River” was mapped by Captain Butcher. This was soon followed with the construction of a ship building yard in 1839 and further infrastructure from the early 1840s in the areas lying immediately adjacent to the main arm of the Clarence River.

The township of Grafton was first officially surveyed in 1847, and later was proclaimed a city in 1885. The township of Copmanhurst was gazetted in 1860. The Nymboida Water Supply dates back to 1911 (CRHS, 2006).

Cedar loggers were also the first to settle the Dorrigo Plateau, who quickly established themselves, harvesting the valuable hardwood. As these supplies dwindled, they turned their attention on to other valuable varieties, such as rosewood and coachwood. In 1894, small dairy blocks were released in the area, with selectors opting to clear the native scrub for pasture. Despite early challenges such as decreasing soil fertility and long distances to markets, logging, dairying and beef cattle production remain major industries in the region today (DCC, 2015).

The prawn trawling industry was established in the 1940s in the Clarence estuary, and as well as other commercial fishing interests, continues to thrive today (DPI Fisheries, 2008).

Current land use

Agriculture remains a key industry within the Clarence catchment, with flourishing beef cattle, timber and sugar cane industries. Beef cattle production is the catchment's dominant land and water user, present across much of the coastal floodplain and in the fertile tablelands. Sugar cane is grown intensively on the lower Clarence River, especially in areas such as Maclean, Harwood Island and Palmers Island. As a result of the extensive rural settlement, only a small fraction of the catchment area has been urbanised, with much of this towards the coast.

In towns such as Grafton and Yamba, the commercial fishing and tourism industries continue to thrive, with the latter growing steadily in importance and attracting many thousands of visitors to the region annually. Indeed, the Clarence supports the largest estuary-based fishery in NSW (Creighton, 2013). Historically, the commercial fishing industry accounted for the bulk of the seafood produced in the Clarence catchment, but aquaculture activities are increasingly contributing to the catch. Oyster farming in the Sandon River, Woolli River and Clarence River is the predominant aquaculture activity in the catchment; with hatcheries producing fingerlings also present (RDA Northern Rivers, 2014). The tourism industry in the Clarence catchment is predominantly focussed around water activities, such as recreational fishing, boating, swimming, canoeing and surfing (Clarence Landcare, 2011). The plethora of National Parks, such as Dorrigo National Park at the southern border of the catchment, provides popular destinations for tourists in the Clarence catchment.

Climate

The Clarence catchment is characterised by a temperate climate in the higher country to the west, with a subtropical climate on the coast. Average annual rainfall varies from less than 1,000 mm on the western edge of the plan boundary to 1,400 mm in the coastal catchments and more than 2,000 mm on the tablelands around Dorrigo (Figure 1). The mean annual rainfall on the coast is 1461.5 mm at Yamba and 1606.4 mm at Coramba (BOM 2015). Rainfall is highest in summer and autumn with August, September and October being the driest months (Figure 2). Mean monthly rainfall varies from 59 mm in September to 182.9 mm in March.

January and February are the hottest months with the mean maximum temperature being 23.3°C at Yamba. Winter temperatures rarely fall below 10°C on the coast, with the mean minimum temperature for July falling below this mark at 9.7°C. In the mountainous regions in the western reaches of the catchment, mean minimum temperatures can be significantly lower, e.g. 1°C recorded for Tenterfield in July (BOM 2015).

Figure 1: Average annual rainfall in the Clarence catchment (1961-1990)

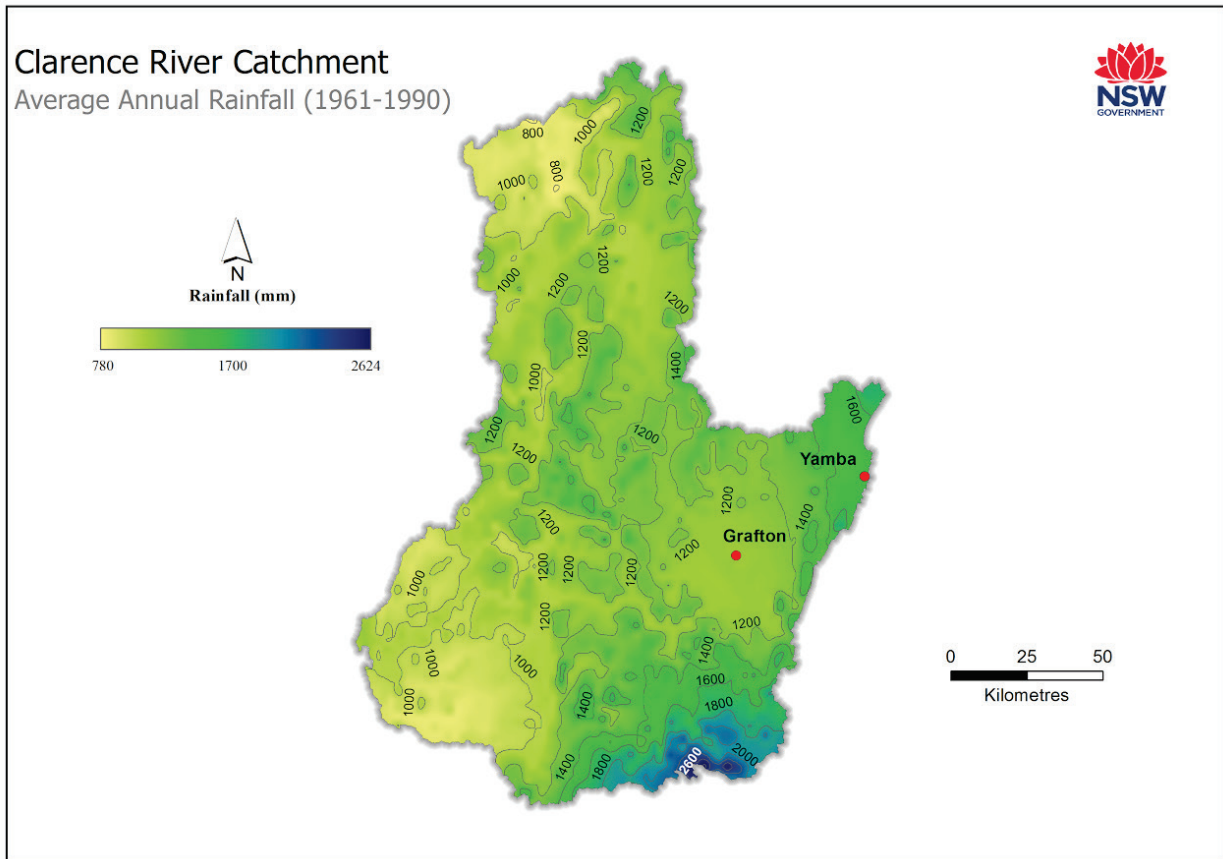
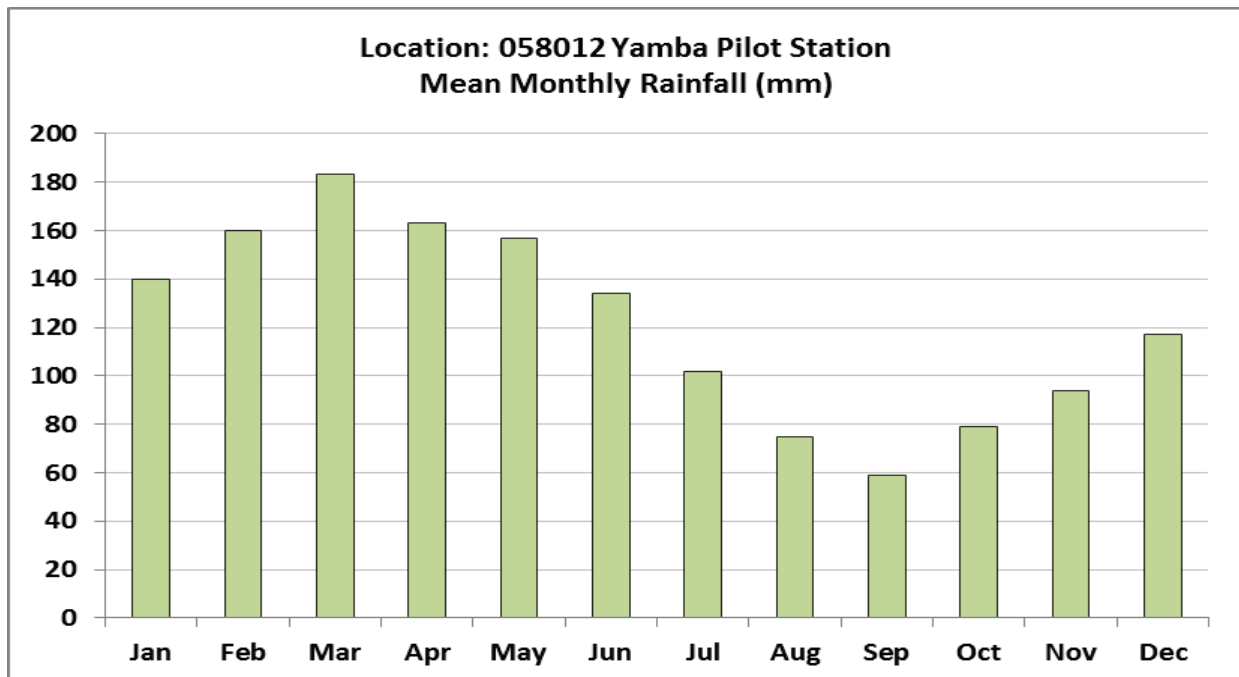


Figure 2: Mean monthly rainfall at Yamba (1878 -2015)



Ecological values

Wetlands and estuarine habitats such as mangroves and seagrass are very sensitive ecosystems, vital to the maintenance of inshore fisheries and the provision of habitat for many birds, especially waterfowl.

The Clarence catchment contains numerous wetland areas associated with the estuaries and other water sources within the catchment. Some areas of these wetlands along the coastal floodplain of the Clarence catchment are protected under State Environmental Planning Policy 14. The catchment area also contains some communities of ecological significance, often adjacent to the streams within the saltmarshes and mangrove forests.

Over many years the coastal flood-plain of the Clarence catchment has been extensively cleared and drained for grazing and sugar cane cropping.

Some areas of the Clarence catchment are protected within national parks and nature reserves (approximately 20%). The Bundjalung National Park is on the coastal floodplain, extending north of the mouth of the main Clarence River estuary, and includes the Esk River water source. Other national parks and nature reserves that lie within the catchment's borders include Tooloom National Park, Nymboida National Park, Yuraygir National Park and the Yaegl Nature Reserve.

Threatened species

The Clarence catchment provides habitat for a number of significant species and ecological communities that are protected under the *Threatened Species Conservation Act 1995*. Varying numbers of threatened fish, frog, bird and wet flora species have been found to occur in all the water sources with the plan area, along with endangered ecological communities.

The ecological values and threatened species known or expected to occur in each of the Clarence River water sources are identified in Appendix 3. These species have been considered as part of the “macro” classification approach in determining water sources with high environmental values.

The Clarence catchment supports a known population of Eastern Freshwater Cod, an endangered fish species that is listed as vulnerable under the TSCA 1995.

Estuary sensitivity

Estuary specialists from the DPI Water and Office of Environment and Heritage (OEH) have assessed each of the state's estuaries to determine how sensitive they are to changes in freshwater inflows (DWE 2009).

The assessment 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 the coastal lagoons within the Clarence catchment, tend to be highly sensitive to inflow variations, with most being only intermittently connected to the ocean. Barrier estuaries such as the Clarence River estuary are generally less sensitive to inflow variations. As they mature and infill with sediment they tend to be long and narrow ‘river’ estuaries.

Table 1 lists the sensitivity of each of the estuaries in the Plan area. The method used for assessing estuary sensitivity is detailed in ‘*Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation*’.

Table 1 Inflow sensitivities for the estuaries within the plan area

Name of estuary	Inflow sensitivity - low flows	Inflow sensitivity - high flows
Clarence River, Lower Clarence	Medium	Medium
Esk River	Medium	Medium
Sandon River	Medium	Medium
Wooli River	Medium	Medium
Wooloweyah Lagoon	High	High

Groundwater

Groundwater aquifers in the Clarence catchment are primarily found in fractured rock, unconsolidated alluvial sediments and coastal sands. Alluvial sediments can be categorised as “upriver alluvium” or “coastal floodplain alluvium”. Upriver alluvium nominally occurs upstream of the tidal limit and tends to be sand or gravel materials, compared to the silt/clay of the coastal floodplain alluvium.

Both classifications of alluvial aquifers are included in the Clarence water sharing plan. The Clarence water sharing plan does not differentiate between upriver and coastal floodplain alluvium; both types of alluvium are subject to the same rules.

Water sharing rules for the Clarence River Coastal Floodplain Alluvial groundwater source are included in the Clarence water sharing plan.

The Clarence River Coastal Floodplain Alluvial groundwater source covers an area of approximately 471 km², overlying rocks of the Clarence Moreton Basin Formation. Its alluvial deposits generally consist of fine grained sand, silts and clays, with typically low groundwater yields as a consequence. Water quality across the aquifer is quite variable, ranging from fresh in some areas to saline in others that are significantly impacted by estuarine influences. Acid sulphate soils also negatively impact on the water quality in significant expanses of the floodplain.

The Upriver Alluvial groundwater source consists of medium to coarse grained sand, silts and gravel deposits. It typically features high connectivity with the surface water systems, with generally quite good yields and water quality expected.

River flows

There are currently 37 active gauges within the Clarence catchment that monitor daily stream-flows (Table 2). These gauges are the flow reference points which are used to define the water sharing rules within the plan. Historical records are also available for some discontinued gauges throughout the catchment.

Average annual flow in the Clarence River varies from 7,865 ML at Peacock Creek to 3,449,053 ML at Clarence - Lilydale (Table 2).

Significant flood events have occurred in the Clarence catchment in 1962, 1967, 2001, 2009 and 2013. In each of these events peak daily flows were in excess of 1,400,000 ML/d at Nymboida.

Table 2: Current river gauges in the Clarence catchment

Gauge	Location	Catchment area	Mean Annual Flow	Commenced
204001	Nymboida @ Nymboida	1,660 km ²	733,118 ML	1908
204002	Clarence @ Tabulam	4,550 km ²	787,220 ML	1909
204004	Mann @ Jackadgery	7,800 km ²	1,687,906 ML	1919
204006	Bookookoorara River @ Undercliffe	127 km ²	27,228 ML	1921
204007	Clarence @ Lilydale	16,690 km ²	3,449,053 ML	1922
204008	Guy Fawkes @ Ebor	31 km ²	35,038 ML	1923
204014	Mann @ Mitchell	881 km ²	112,816 ML	1945
204015	Little Murray @ North Dorrigo	2,670 km ²	368,272 ML	1945
204017	Dorrigo No.2 & AMP; No.3 (Bielsdown)	76 km ²	106,952 ML	1947
204025	Orara @ Karangi	135 km ²	128,492 ML	1925
204030	Aberfoyle @ Aberfoyle	200 km ²	19,482 ML	1951
204031	Mann @ Shannon	348 km ²	38,680 ML	1951
204033	Timbarra Billgrimbah	985 km ²	177,099 ML	1951
204034	Henry @ Newton	389 km ²	47,297 ML	1951
204036	Cataract Sandy Hill	236 km ²	54,429 ML	1952
204037	Clouds Creek @ Clouds	62 km ²	14,849 ML	1952
204039	Maryland d/s Wylie Creek	373 km ²	37,834 ML	1953
204041	Orara @ Bawden Bridge	1,790 km ²	730,798 ML	1955
204043	Peacock Creek @ Bonalbo	47 km ²	7,865 ML	1960
204046	Timbarra @ Drake	1,720 km ²	318,202 ML	1969
204051	Clarence Paddys Flat	2,230 km ²	373,072 ML	1970
204055	Sportsmans Gurrang	202 km ²	49,077 ML	1972
204056	Dandahra Gibraltar R	104 km ²	71,484 ML	1972
204060	Bucca Creek @ Central Bucca	22 km ²	N/A	1975
204067	Gordon Bk @ Fineflower	315 km ²	79,107 ML	1983
204068	Orara @ Orange	126 km ²	108,193 ML	1995
204069	Nymboida d/s weir	1,732 km ²	823,402 ML	1997

Gauge	Location	Catchment area	Mean Annual Flow	Commenced
204071	Bielsdown @ Charlstead	131 km ²	132,219 ML	2003
204072	Nymboida Powerstation Right Bk	N/A	N/A	1999
204073	Nymboida Powerstation Left Bk	N/A	N/A	1999
204078	Acacia Creek @ Legume	N/A	N/A	2006
204400	Grafton	N/A	N/A	2009
204403	Coldstream @ Tucabi	N/A	N/A	2001
204413	Rogan's Bridge	N/A	N/A	2009
204460	Clarence @ Mylneford	N/A	N/A	2010
204900	Clarence @ Baryulgil	7,490 km ²	1,526,613 ML	1971
204906	Orara @ Glenreagh	446 km ²	218,346 ML	1972

Entitlement and water use

At the commencement of the water sharing plan, there were approximately 2,189 water licences in the Clarence River water sharing plan area, totalling 78,154 ML/yr of entitlement (Table 3). This entitlement is divided between unregulated surface water (76,135 ML/yr) and alluvial groundwater (2,019 ML/yr).

The Clarence River water sharing plan assumes full development of all entitlement in setting the extraction limits and access rules that form part of the water sharing rules.

Table 3: Total entitlement* and number of licences for each water source at plan commencement

Water source	Unregulated river entitlement^ (ML/yr)	Aquifer access entitlement (ML/yr)	Number of licences
Aberfoyle River	119	0	3
Acacia Creek	600	0	23
Alumy Creek	1,245	31	51
Angourie-Redcliffe and Sandon Rivers	NIL	NIL	NIL
Bielsdown River	7,555	NIL	78
Blicks River	439	NIL	12
Bookookoorara Creek	597	0	11
Boonoo Boonoo Creek	142	0	5
Bottle Creek	NIL	0	3
Boyd River	17	NIL	4

Water source	Unregulated river entitlement^ (ML/yr)	Aquifer access entitlement (ML/yr)	Number of licences
Bucca Bucca Creek	443	229	112
Cataract River	18	0	21
Clarence Coastal	330	135	268
Clarence River Coastal Floodplain Alluvial	NIL	901	209
Clarence Tidal Pool	2,435	30	99
Coldstream Creek	325	NIL	23
Coombadjha Creek	NIL	NIL	NIL
Copmanhurst – Lower Mid Clarence	731	0	30
Dandahra Creek	NIL	NIL	NIL
Deep - Tunglebung Creek	206	0	28
Demon Creek	NIL	0	1
Duck Creek	686	0	43
Esk River	NIL	0	7
Guy Fawkes River	14	0	29
Henry River	74	0	3
Kooreelah Creek	554	0	19
Little Nymboida River	339	0	41
Lower Mann River	514	0	8
Lower Nymboida River	49	0	4
Lower Orara River	674	30	48
Lower Timbarra River	8	0	5
Maryland River	995	0	28
Mid Mann River	745	0	38
Mid Nymboida River	29,910	0	18
Mid Orara River	8,756	449	483
Paddys Flat – Upper Clarence	925	0	28
Peacock Creek	243	0	14
Plumbago Creek	1	0	9
Sara-Oban Rivers	258	0	5

Water source	Unregulated river entitlement [^] (ML/yr)	Aquifer access entitlement (ML/yr)	Number of licences
Sportsman and Stockyard Creeks	104	0	53
Swan Creek	915	5	26
The Gorges – Upper Mid Clarence	3,281	0	51
Toooloom Creek	870	0	60
Upper Mann River	36	0	25
Upper Nymboida River	1,545	NIL	26
Upper Orara	8,693	209	102
Upper Timbarra River	8	0	5
Washpool Creek	108	NIL	1
Wild Cattle Creek	336	NIL	5
Wooli River	243	0	9
Wooloweyah Lake	9	0	7
Yarrow River	40	0	8
TOTAL	76,135	2,019	2,189

* Under the WMA 2000, licences are granted “share component” rather than “entitlement”. The term “entitlement” has been retained in this document due to its common usage. Share component is granted as unit shares for unregulated river access licences, and as ML/yr for local water utility and domestic & stock access licences. For ease of reporting, the total share component has been recorded as ML/yr.

[^] Includes unregulated river access licences and domestic & stock access licences. Clarence Valley Council’s local water utility access licence is included in the aquifer access licence total as all town water is extracted from the alluvial bores rather than from the river pump.

The majority of the unregulated surface water licences are located in the Mid Orara water source.

The Mid Nymboida water source shows the greatest annual unregulated river entitlement, with 99% of the volume being allocated for local town water supplies.

Of the total surface water entitlement throughout the WSP area, 47% is for irrigation, 51% for town water supply, and the rest for stock, domestic and farming purposes.

Long-term records of water use are not available in the Clarence catchment as there is not yet broad scale metering in unregulated catchments on the north coast.

Water extraction in the alluvium

Most of the alluvial groundwater licences are located in the alluvium along the main trunk of the Orara River in the Mid Orara River water source, in the alluvium along the main trunk of the Clarence Coastal water source and in the Clarence River Coastal Floodplain Alluvial Groundwater Source. Although domestic and stock bores need to be licensed, water access licences are not issued for groundwater extracted for domestic and stock purposes.

Detailed water use is not available in the alluvial groundwater sources because there is not yet broad scale metering in these water sources. The NSW government is exploring this issue through the Water Use Monitoring Program.

Local water utility requirements

Town water within the plan area is provided by Clarence Valley Council and Coffs Harbour City Council. The Clarence Valley Council provides water services to a number of towns, villages and rural areas within its boundary via three separate supply systems: Orara River, Nymboida River and Shannon Creek Dam.

The Shannon Creek Dam located south of Grafton and west of Coutts Crossing, is a 30,000 ML off-river storage reservoir completed in 2009 with the aim to provide water supply security during dry times. The dam has been at capacity since 2010 and sources its water from the Nymboida River near Nymboida (CVC, 2015b). The dam was constructed as a bypass dam which allows translucent flows (i.e. water entering the dam to be passed downstream). The dam has the ability to replenish the Clarence Valley Council reservoir and if required pump water south to Karangi Dam; which is the main town water supply reservoir for Coffs Harbour. Shannon Creek Dam accesses water from the Nymboida River when the flows in the river are at or above 225 ML/day at the Nymboida Gauge at Nymboida.

The Coffs Harbour City Council sources its water from the Nymboida River for the town of Coramba, and the Orara River for the town of Nana Glen. When the water quality of the Nymboida River deteriorates, such as after heavy rain, water is back-fed from the main storage reservoir in the Coffs Harbour LGA, Karangi Dam instead (CHCC, 2014).

The process of developing the Clarence water sharing plan

The DPI Water is responsible for implementing the WMA 2000, including developing water sharing plans for the state's water resources. The DPI Water established several interagency panels to assist with the development of water planning policies and water sharing plans. The preparation of the Clarence River water sharing plan was guided by three panels:

- the State Interagency Panel
- the DPI Water North Coast Working Group
- the North Coast Interagency Regional Panel (IRP).

The role of each of these panels is discussed below.

In summary, the draft Clarence River water sharing plan was prepared based on:

- the indicative rules generated by a risk and values assessment (explained later in this section),
- the deliberations of the Working Group and the IRP, and
- feedback from stakeholders during targeted consultation and public exhibition.

The draft plan was publicly exhibited throughout the plan area. Comments and feedback received during the public exhibition period were considered by the Working Group and the IRP in finalising the water sharing plan.

This section describes the panels and briefly discusses the process of developing the Clarence water sharing plan including the risks and values classification, refining the indicative rules, and the specific outcomes of panel deliberations, targeted consultation and public exhibition.

Full details of the macro-planning approach and the classification method is available in the document *Macro water sharing plans – the approach for unregulated rivers. A report to assist community consultation*. This document is available on the DPI Water website www.water.nsw.gov.au.

DPI Water - North Coast Working Group

The North Coast Working Group (the Working Group) comprises a range of officers representing the various functions of the NSW DPI Water such as plan and policy development, licensing and compliance, hydrometrics and environmental protection. The Working Group was responsible for collating information and developing recommendations to be considered by the Interagency Regional Panel.

Interagency Regional Panel

The North Coast Interagency Regional Panel (IRP) comprises representatives from the DPI Water, OEH, DPI Agriculture and the North Coast LSS (formerly Northern Rivers Catchment Management Authority) as an observer. Appendix 4 lists the names of panel representatives and their areas of expertise, and also lists relevant colleagues who the panel had access to for specific technical and scientific information.

The key responsibilities of the IRP were to:

- ensure water sharing rules are consistent with state policy
- review the water management units provided by the 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 the proposed rules
- review submissions from targeted consultation and public exhibition, and make changes where necessary to the water sharing rules.

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

Water source assessment method

In developing water sharing plans for unregulated rivers, the DPI Water classifies each water source based on the risks and values of water extraction.

Specifically the classification process involves assessing:

- instream values (such as threatened fish species) and the risk to these values posed by existing or increased extraction
- hydrologic stress, based on the demands for licensed extraction relative to river flows
- the risk to instream values posed by extractions
- 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.

For the Clarence water sharing plan, each water source was classified according to these values and risks. The Regional Panel then reviewed these classifications against a range of reference material and data including irrigation data, hydrologic data, aquatic ecology information, fisheries data, and threatened species data. Extraction patterns by local water utilities were also examined. A list of data and reference material that was used by the panel can be found in Appendix 5.

The finalised water source classifications (Appendix 6) were used to generate indicative access and trade rules which provided the basis for deliberations and the development of draft water sharing rules.

Refining the indicative rules

Guided by the indicative access and trade rules, the IRP used local knowledge and expertise to develop the access and trade rules for the draft water sharing plan. Indicative rules were revised based on site specific considerations such as:

- the availability of infrastructure (for example river gauges)
- the availability of management systems (for example ability to manage the rules)
- any existing access rules (for example existing licence conditions or Water Users Association rostering rules which distribute low flow access amongst licensed users)
- whether flow regimes within different areas of a water source required differing management rules for those sub-areas.

For example, water users in the Clarence catchment have long recognised the need for a cease-to-pump and have willingly participated in water sharing arrangements since 2005. These existing water sharing arrangements, plus any licence restrictions in place as a result of Land Board hearings, were examined by the IRP to determine whether they achieved the required level of environmental protection and provided for BLR.

Consideration was also given to each of the estuaries in the plan area to see if any additional catchment-wide protection was required. The specific requirements of threatened species in relation to reproductive needs, migration or other particular ecological activities were considered where information was available.

Consultation

The draft rules formulated by the IRP underwent targeted consultation with specific interest groups³ and water users who had the opportunity to provide input to proposed water management rules before the plan was drafted.

Targeted consultation on the proposed rules for the Clarence River draft water sharing plan began in 2006 and continued through the development of the water sharing plan until public exhibition in February 2015. The consultation process was facilitated by the Northern Rivers CMA whose role was 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:

- feedback on the potential economic and social impacts of proposed rules
- local knowledge and expertise, for example, other natural or socio-economic values that have not yet been considered by the panel
- feedback on the practical elements of the proposed water sharing rules to ensure they are easily implemented by the licence holders. This included 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.
- confirmation that there were no unintended outcomes from the plan
- specific comments on the Minister's notes included in the draft water sharing plan.

Public exhibition

Public exhibition is the formal exhibition of a draft water sharing plan where the Minister invites submissions on the draft plan and in particular seeks comment on a range of key issues. Public exhibition of the draft Clarence River water sharing plan was held from 9 February 2015 to 20 March 2015 with the plan documents available for viewing at three locations on the North Coast (Grafton, Coffs Harbour and Dorrigo). Licence holders were sent letters advising of the public exhibition period. DPI Water staff were available at Dorrigo

³ 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.

on the 17th February, Bonalbo on the 18th February and Grafton on the 19th February, to answer questions from stakeholders and explain the process for making a submission.

12 written submissions were received from stakeholders including landholders, water users, environmental groups and Clarence Valley Council. The main issues raised in the submissions related to the cease-to-pump rules, environmental concerns, town water supply and the suitability of flow reference points. The IRP considered all of the issues raised in written submissions and those voiced at public consultation meetings.

Water sharing rules

The Clarence River water sharing plan establishes a framework for water sharing that defines:

- planned environmental water to protect instream environmental values
- water that is required to meet BLR
- water that is required to meet licensed water extraction (including domestic and stock, local water utilities, unregulated river access licences and aquifer access licences)
- long-term extraction limits and available water determinations (AWDs) for each water source
- rules for granting access licences
- rules for water allocation account
- flow classes and daily access rules for managing licensed extraction from unregulated rivers and alluvial aquifers
- rules for water supply work approvals
- access licence dealing rules, which control the trade of water within or into other water sources.

The following section provides further background on each of these components, and outlines the information and methods used in developing the specific water sharing rules.

Planned environmental water

The water sharing plan identifies and protects water for environmental purposes in each water source. This is defined as ‘planned environmental water’ and consists of water that is remaining within the stream or aquifer after water has been taken for BLR and access licences in accordance with the rules of the plan.

In unregulated streams planned environmental water is generally delivered through two mechanisms:

- On a daily basis environmental water is protected through the implementation of cease-to-pump rules and total daily extraction limits which are applied to water access licences.
- On an annual basis environmental water is protected through the establishment of long term average annual extraction limits.

The Regional Panel set cease-to-pump rules for each water source in the Clarence catchment which are discussed in the section on daily flow rules. For water sources where cease-to-pump rules could not be practically linked to a gauging station, the plan applies simple visual rules to protect environmental water such as a ‘no visible flow’ rule, and no pumping from instream or off-river pools when the pool is less than full capacity.

Requirements for water

The water sharing plan defines all of the licensed and unlicensed requirements for water within the Clarence catchment.

Basic landholder rights (comprising domestic and stock, and native title rights) must be provided for and protected within a water sharing plan. The water sharing plan provides an estimate of the water requirements for domestic and stock rights within each water source. BLR requirements were estimated using the number of properties with river frontage in each water source, and estimated water usage based on property size, climatic region and land use.

At the start of the Clarence River water sharing plan:

- BLR were estimated at 5,633 ML per year
- domestic and stock access licences accounted for 541 ML of entitlement per year
- local water utility access licences accounted for 41,213 ML of entitlement per year
- unregulated river access licences accounted for 36,863 unit shares (a unit share is equivalent to 1 ML in years where 100% of entitlement is allowed to be extracted)
- aquifer access licences accounted for 2,019 unit shares.

Managing extractions

The Clarence water sharing plan establishes long term average annual extraction limits (LTAAELs) to manage extractions from surface water resources and alluvial groundwater in each of the EMUs.

The LTAAEL for the Clarence River Catchment EMU comprises:

- the number of share components in the Aberfoyle River, Acacia Creek, Alummy Creek, Bielsdown River, Blicks River, Bookookoorara Creek, Boonoo Boonoo River, Bottle Creek, Boyd River, Bucca Bucca Creek, Cataract River, Clarence Coastal, Clarence Tidal Pool, Coldstream Creek, Coombadjha Creek, Copmanhurst-Lower Mid Clarence, Dandahra Creek, Deep-Tunglebung Creek, Demon Creek, Duck Creek, Esk River, Guy Fawkes River, Henry River, Koreelah Creek, Little Nymboida River, Lower Mann River, Lower Nymboida River, Lower Orara River, Lower Timbarra River, Maryland River, Mid Mann River, Mid Nymboida River, Mid Orara River, Paddys Flat-Upper Clarence, Peacock Creek, Sara-Oban Rivers, Sportsman Creek and Stockyard Creek, Swan Creek, The Gorges-Upper Mid Clarence, Tooloom Creek, Upper Mann River, Upper Nymboida River, Upper Orara River, Upper Timbarra River, Washpool Creek, Wild Cattle Creek, Wooloweyah Lake and Yarrow River water sources at plan commencement (80,393 ML/yr), plus
- an estimate of BLR in these water sources (5,631 ML/yr), plus
- any share components granted in the water sources over the life of the plan under the *Water Management (General) Regulation 2011*.

The LTAAEL for the Angourie/Redcliffe Catchment EMU comprises:

- the number of share components in the Angourie-Redcliffe and Sandon Rivers water source at plan commencement (0 ML/yr), plus
- an estimate of BLR in these water sources (0 ML/yr), plus
- any share components granted in the water sources over the life of the plan under the *Water Management (General) Regulation 2011*.

The LTAAEL for the Wooli River Catchment EMU comprises:

- the number of share components in the Wooli River Catchment water source at plan commencement (243 ML/yr), plus
- an estimate of BLR in these water sources (2 ML/yr), plus
- any share components granted in the water sources over the life of the plan under the *Water Management (General) Regulation 2011*.

The LTAAEL for the Clarence River Coastal Floodplain alluvial comprises:

- the number of share components in the floodplain alluvial, plus
- an estimate of future water requirements in the floodplain alluvial.

At plan commencement, the LTAAELs for the Clarence River Catchment EMU, the Angourie/Redcliffe Catchment EMU, the Woolli River Catchment EMU, and the Clarence River Coastal Floodplain alluvial were 86,024 ML/yr, 0 ML/yr, 243 ML/yr, and 4,466 ML/yr respectively.

The LTAAELs for all EMUs incorporate an allowance to increase entitlement following conversion of low flow entitlement to high flow entitlement.

To protect water for the environment and the supply to existing users, it is important to control any growth in water use that is above the LTAAEL. For the Clarence River Catchment EMU, the Angourie/Redcliffe Catchment EMU, the Woolli River Catchment EMU, and the Clarence River Coastal Floodplain alluvial groundwater source a reduction in allocated water may be triggered if the average annual usage over any three year period exceeds the LTAAEL by more than five per cent. Reductions in allocation will be implemented by reducing the available water determination (AWD) which is the basis of crediting water into the water allocation account of each water access licence. The AWD for unregulated river access licences is set at 1 ML per unit share unless a reduction in allocation is required. If a reduction in allocation is required, the AWD for unregulated river access licences will be reduced to less than 1 ML per unit share in order to manage extractions.

Specific purpose access licences such as domestic and stock or local water utility access licences, will be permitted to extract 100% of their share component, except in years of exceptional drought. During periods of extremely low stream flow, daily access rules may limit extraction so that the full annual entitlement cannot be realised.

This approach to managing long term extractions in the Clarence water sharing plan is the default position adopted for all unregulated rivers across the state.

Granting new access licences

Consistent with the WMA 2000, the Clarence water sharing plan does not permit the granting of new unregulated river access licences. Any new commercial development must purchase entitlement from existing access licences consistent with the dealing rules defined in the water sharing plan. The water sharing plan does however permit the granting of several other categories of access licence: Aboriginal community development, Aboriginal cultural, domestic licences and high flow only access licences.

Aboriginal community development access licences

Many of the rivers in NSW already have a high number of irrigation licences and are generally judged to be stressed, particularly during dry times when river flows are low. This effectively prevents the issuing of any new irrigation licences. However in some 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.

In coastal catchments, Aboriginal community development licences⁴ (ACDLs) may be granted which allow water to be pumped from rivers during the high flows and stored in farm dams or tanks, to be used as needed. For the purpose of issuing these licences, high flows are defined as those that are exceeded 50% of the time (the top half of the flow regime).

The North Coast Regional Panel recommended that no new licences be granted in water sources with high conservation value, or in areas that could not support high flow licences. On this basis, the Clarence River water sharing plan has made provision for the granting of

⁴ These are a sub-category of unregulated river and aquifer access licences called "Aboriginal community development." This new category of licences is not fully commercial. While they may be temporarily traded, they cannot be permanently traded and as such will remain in the Aboriginal community for the life of the licence. These arrangements are currently being reviewed by the DPI Water.

ACDLs in the following water sources: Blicks River, Maryland River, Peacock River and Upper Orara River.

Since granting ACDLs would mean less water remains in the river at these higher flows to meet other users' and environmental needs, it is necessary to limit the total volume that can be extracted for Aboriginal community development purposes. The water sharing plan allows for a total of 34 ML/year to be granted for the Maryland River Water Source and 1 ML/year for the Peacock Creek Water Source.

The restriction of ACDLs to high flows has been raised as a general issue across all water sharing plans. The DPI Water is currently working with the Aboriginal community through the Aboriginal Water Initiative to address these concerns and look at options for allowing limited access to lower flows.

Aboriginal cultural access licences

Aboriginal cultural access licences of up to 10 ML per year may be granted to Aboriginal persons or Aboriginal communities for any personal, domestic or communal purpose such as drinking, washing, gardening, making traditional artefacts, or for recreation or ceremonial purposes. The water sharing plan allows for the granting of these licences in any water source.

Domestic and stock access licences

Domestic and stock access licences may be granted where applicants can demonstrate a history of extraction within the tidal pool.

This provision recognises that under the *Water Act 1912* no licence was required to extract water from a tidal pool and therefore there are a number of existing users that will need to obtain a licence under the WMA 2000.

High-flow-only access licences

Many of the coastal unregulated rivers within NSW have significant competition for water during dry periods. Therefore, there is merit in developing incentives that aim to move extraction out of the low flows and into the higher flows, to improve environmental conditions and reduce competition. To utilise higher flows, it is generally necessary to construct on-farm water storage. Water can then be pumped during periods of higher flow and stored for use at a later time, therefore enhancing security of supply.

The Clarence water sharing plan includes an incentive to allow those licences that are converted to high-flow-only access to be granted additional volumes of water. The plan states that for every unit of unregulated river access licence entitlement surrendered, 5 units of unregulated river (high flow) access licence entitlement will be granted. The high flow access commences at the 50th percentile (i.e. the flow that is exceeded on 50% of days).

Statewide guidelines recommend that high flow conversions only be adopted in specified water sources if:

- the water source is classified as having important instream values at high risk from extraction or in water sources having high hydrological stress
- there are adequate mechanisms in place to ensure the surrendered low flow is reserved for the environment
- there is a no highly sensitive estuary or other identified high flow sensitive feature such as a wetland within the EMU
- there is no significant extraction already occurring in high flow periods
- the conversion would not significantly impact on tidal pool users or town water supplies.

The Regional Panel considered these factors in relation to the Clarence River plan area and recommended that high flow conversions be made available in the following water sources: Copmanhurst-Lower Mid Clarence, Lower Mann River, Lower Orara River, Mid Orara River, Paddys Flat-Upper Clarence, Peacock Creek and Tooloom Creek.

Water allocation accounts

Water usage by individual licence holders is managed through water allocation accounts. Water is credited to the account when an AWD is made (at the start of the water year), and debited as water is extracted throughout the water year. A licence holder's account is not permitted to go into debit.

Unregulated rivers have enormous variation in annual flow volumes between years. It is important to allow this variability to be reflected in water accounting practices. Unused water allocation may be carried over from one water year to the next. The maximum amount that may be carried over in unregulated river access licence accounts is 100% of the share component, where share component is expressed in megalitres; or 1 ML per unit share, where share component is expressed in unit shares.

Unregulated river access licence accounts are managed under three-year accounting rules, subject to compliance with the daily access rules. AWDs combined with any carryover allowance will enable licence holders to use up to twice their water allocation in a year provided that over a consecutive three year period they do not exceed the sum of their water allocations for those three years.

An example of three year accounting for an unregulated river access licence holder with a share component of 50 shares is shown in Table 4.

Table 4: Example of unregulated river access licence accounting rules for a licence with 50 unit shares

Year	Balance brought forward (ML)	AWD (ML/unit share)	Account balance after AWD credited (ML)	Usage (ML)	Account balance at end of year (ML)	Water Carried Over to next year (ML)
1	0	2	100 ML	0	100	*50
2	50	1	100 ML	50	50	50
3	50	1	100 ML	**100	0	0
4	0	1	50 ML	***0	50	50

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

** 100 ML is the maximum that can be extracted in this year, that is, twice the unit shares for the year

*** Although with the AWD there is 50 ML in the account, no water is available for extraction as the maximum extraction over three years is the sum of AWDs in those 3 years which in this example is 150 ML and this was extracted in year 2 and 3 so no extraction can occur in year 4

Final water access rules

Following public exhibition and consideration of the issues raised during public exhibition, the water sharing rules were finalised. The final water access rules including flow classes, cease-to-pump rules adopted by the Regional Panel are summarised in

Table 5.

For some water sources, the Regional Panel recommended that cease-to-pump rules be implemented incrementally to provide water users time to adapt to the new rules.

In water sources where the existing cease-to-pump rule under the *Water Act 1912* was more stringent than the proposed rule, the existing access rule was generally adopted. This was based on the premise that with no change to current operations there should be no adverse social or economic impact. In these circumstances the Regional Panel acknowledged that many of the existing cease-to-pump rules had been negotiated by water users or stipulated

as outcomes of Rural Land Board hearings, had been in place for a period of time; and seemed to be adequately protecting values while providing certainty for water users.

This information may also be found on individual rule summary sheets for the Clarence catchment that are available on the DPI Water's website www.water.nsw.gov.au. These rules were developed using the risk and value assessment, a wide range of resources, targeted consultation and public exhibition.

Table 5: Summary of access rules for the Clarence River water sharing plan

Water source	Flow classes	Access rules	Flow reference point
Aberfoyle River	Very low flow = No visible flow A Class = Visible flow	CtP when there is no visible flow at the gauge	204030
Acacia Creek	Very low flow \leq 1 ML/d A Class > 1 ML/d	Pumping is restricted to a maximum of six hours per day at 3 ML/d at the reference point. CtP at 1 ML/d at the reference point	Upper Acacia Creek at the staff gauge at Killarney Road
Alumy Creek	Very low flow \leq 0.1 m AHD A Class > 0.1 m AHD	CtP at 0.1 AHD when floodgates are open. Pumping is not permitted if floodgates are closed. Daily flow sharing of 10 hours/day at 0.2 AHD	Staff gauge at Experimental Farms Lane
Bielsdown River	Very low flow \leq 23 ML/d A Class > 23 ML/d	CtP at 98 th %ile at the reference point In the Dorrigo Plateau Surface Water Sources there are various restrictions on when you can take water. These include: • Visible flow at the work site, this means you cannot take water if: 1. There is no visible flow within 10 m downstream of the work; 2. There is no visible flow at the upstream and downstream riffle of the pool where the work is located.	204071
Blicks River	Very low flow \leq 32 ML/d A Class = 32-114 ML/d B Class >114 ML/d	CtP at 95 th %ile at the reference point In the Dorrigo Plateau Surface Water Sources there are various restrictions on when you can take water. These include: • Visible flow at the work site, this means you cannot take water if: 1. There is no visible flow within 10 m downstream of the work; 2. There is no visible flow at the upstream and downstream riffle of the pool where the work is located.	204071

Water source	Flow classes	Access rules	Flow reference point
Bookookoorara Creek	Very low flow ≤ 0.281 m AHD A Class > 0.281 m AHD	Pumping is restricted to a maximum of eight hours/day when flows are ≤ 0.281 m at the reference point CtP when flows are ≤ 0.281 m at the reference point	Staff gauge at Wallaroo Ridge Road
Boyd River	Yr 1-5: Very low flow ≤ 5 ML/d A Class > 5 ML/d	CtP at 98 th %ile (5.23 ML/d) at the end of the water source (calibrated back to the gauge)	204015
	Yr 6-10: Very low flow ≤ 16 ML/d A Class > 16 ML/d	CtP at 95 th %ile (15.7 ML/d) at the end of the water source (calibrated back to the gauge)	
Cataract River	Very low flow ≤ 1 ML/d A Class > 1 ML/d	CtP at 95 th %ile (1.4 ML/d) at the gauge	204036
Clarence Tidal Pool	Very low flow ≤ 86 ML/d A Class > 86 ML/d	CtP at 86 ML/d, equivalent to 97 th %ile at the reference point	204007
Copmanhurst-Lower Mid Clarence	Yr 1-5: Very low flow ≤ 86 ML/d A Class = 86-2,891 ML/d C Class $> 2,891$	CtP at 97 th %ile (86 ML/d) at the reference point	204007
	Yr 6-10: Very low flow ≤ 125 ML/d A Class = 125-2,891 ML/d C Class $> 2,891$	CtP at 95 th %ile (125 ML/d) at the reference point Pumping is restricted to 10 hours/day at the 90 th %ile (225 ML/d). First flush rule: No pumping for 24 hours when the Clarence River gauge at Lilydale reads at or above the 80 th %ile (509 ML/d) after reading at or below the 95 th %ile (125 ML/d) level after 48 hours.	
Guy Fawkes River	Very low flow ≤ 7 ML/d A Class > 7 ML/d	CtP at 95 th %ile (7 ML/d) at the reference point	204008
Henry River	Very low flow ≤ 1 ML/d A Class > 1 ML/d	CtP at 1 ML/d at the reference point	204034
Lower Mann River	Yr 1-5: Very low flow ≤ 44 ML/d A Class = 44-1,461 ML/d C Class $> 1,461$ ML/d	CtP at 98 th %ile (44 ML/d) at the gauge	204004

Water source	Flow classes	Access rules	Flow reference point
	<p>Yr 6-10: Very low flow \leq 64 ML/d</p> <p>A Class = 64-1,461 ML/d</p> <p>C Class > 1,461 ML/d</p>	<p>CtP at 95th %ile (64 ML/d) at the gauge</p> <p>First flush rule: No pumping for 24 hours when the Mann River gauge at Jackadgery reads at or above the 80th %ile (181.44 ML/d) after reading at or below the 95th %ile (64 ML/d) level after 48 hours.</p>	
Lower Nymboida River	<p>Yr 1-5: Very low flow \leq 44 ML/d</p> <p>A Class > 44 ML/d</p>	<p>CtP at 98th %ile (44 ML/d) at the gauge</p>	204004
	<p>Yr 6-10: Very low flow \leq 64 ML/d</p> <p>A Class > 64 ML/d</p>	<p>CtP at 95th %ile (64 ML/d) at the gauge</p> <p>First flush rule: No pumping for 24 hours when the Mann River gauge at Jackadgery reads at or above the 80th %ile (181.44 ML/d) after reading at or below the 95th %ile (64 ML/d) level after 48 hours.</p>	
Lower Orara River	<p>Very low flow \leq 10 ML/d</p> <p>A Class = 10-189 ML/d</p> <p>C Class > 189 ML/d</p>	<p>CtP at the 93rd %ile (10 ML/d) at the reference point.</p> <p>If either of the gauges at the Nymboida Power Station are equal to or greater than 40ML/d, pumping is permitted.</p> <p>First flush rule: No pumping for 24 hours when the Orara River gauge at Bawden Bridge reads at or above the 80th %ile (229 ML/d) after reading at or below the 95th %ile (38 ML/d) level after 48 hours.</p>	204906
Lower Timbarra River	<p>Very low flow \leq 31 ML/d</p> <p>A Class > 31 ML/d</p>	<p>CtP at the 95th %ile (31 ML/d) at the reference point</p>	204046
Maryland River	<p>Very low flow = Visible flow</p> <p>A Class = More than visible flow and less than 6 ML/d</p> <p>B Class > 6 ML/d</p>	<p>CtP when there is no visible flow at the pump site</p>	204039
Mid Mann River	<p>Yr 1-6: Very low flow \leq 5 ML/d</p> <p>A Class > 5 ML/d</p>	<p>CtP at the 98th %ile (4.7 ML/d) at the end of the water source (calibrated back to the gauge)</p>	204014
	<p>Yr 7-10: Very low flow \leq 11 ML/d</p> <p>A Class > 11 ML/d</p>	<p>CtP at the 90th %ile (10.7 ML/d) at the end of the water source (calibrated back to the gauge)</p>	

Water source	Flow classes	Access rules	Flow reference point
Mid Nymboida River	Yr 1-5: Very low flow \leq 142 ML/d A Class > 142 ML/d	CtP at the 98 th %ile (142 ML/d)	204001
	Yr 6-10: Very low flow \leq 185 ML/d A Class > 185 ML/d	CtP at the 95 th %ile (185 ML/d*) *225 ML/d for Regional Water Supply (approx. 92 nd %ile). Pumping is restricted to 10 hours/day at the 92 nd %ile (225 ML/d). First flush rule: No pumping for 24 hours when the Nymboida River gauge at Nymboida reads at or above the 80 th %ile (337.2 ML/d) after reading at or below the 95 th %ile (184.7 ML/d) level after 48 hours.	
Mid Orara River	Very low flow \leq 10 ML/d A Class = 10-189 ML/d C Class > 189 ML/d	CtP at the 93 rd %ile (10 ML/d) Pumping is restricted to 10 hours/day at the 85 th %ile (18 ML/d). First flush rule: No pumping for 24 hours when the Orara River gauge at Bawden Bridge reads at or above the 80 th %ile (229 ML/d) after reading at or below the 95 th %ile (38 ML/d) level after 48 hours.	204906
Paddys Flat-Upper Clarence	Yr 1-5: Very low flow \leq 1 ML/d A Class = 1-527 ML/d C Class > 527 ML/d	CtP at 95 th %ile (1 ML/d) at the reference point	204002
	Yr 6-10: Very low flow \leq 4 ML/d A Class = 4-527 ML/d C Class > 527 ML/d	CtP at 94 th %ile (4 ML/d) at the reference point Daily flow sharing of eight hours/day at 10 ML/d (approx. 92 nd %ile)	
Peacock Creek	Very low flow = No visible flow A Class = More than visible flow and less than or equal to 1 ML/d B Class > 1 ML/d	CtP when there is no visible flow at the gauge	204043
Swan Creek	Very low flow \leq 0.0 m A Class > 0.0 m	CtP at 0.0 m at the reference point	The Avenue staff gauge
The Gorges-Upper Mid Clarence	Yr 1-5: Very low flow \leq 41 ML/d A Class > 41 m	CtP at the 97 th %ile (41 ML/d) at the reference point	204900

Water source	Flow classes	Access rules	Flow reference point
	<p>Yr 6-10: Very low flow \leq 83 ML/d A Class > 83 m</p>	<p>CtP at the 95th %ile (83 ML/d) Pumping is restricted to 10 hours/day at the 90th %ile (137 ML/d). First flush rule: No pumping for 24 hours when the Clarence River gauge at Baryugil reads at or above the 80th %ile (249 ML/d) after reading at or below the 95th %ile (83 ML/d) level after 48 hours.</p>	
Tooloom Creek	<p>Yr 1-5: Very low flow \leq 1 ML/d A Class = 1-527 ML/d C Class > 527 ML/d</p>	CtP at the 95 th %ile at the gauge	204002
	<p>Yr 6-10: Very low flow \leq 17.8 ML/d A Class = 17.8-527 ML/d C Class > 527 ML/d</p>	CtP at the 90 th %ile at the gauge	
Upper Mann River	<p>Very low flow \leq 3 ML/d A Class > 3 ML/d</p>	CtP at the 95 th %ile (3 ML/d) at the gauge	204031
Upper Nymboida River	<p>Very low flow \leq 32 ML/d A Class > 32 ML/d</p>	<p>CtP at the 95th %ile (32 ML/d) at the reference point. In the Dorrigo Plateau Surface Water Sources there are various restrictions on when you can take water. These include:</p> <ul style="list-style-type: none"> • Visible flow at the work site, this means you cannot take water if: <ol style="list-style-type: none"> 1. There is no visible flow within 10 m downstream of the work; 2. There is no visible flow at the upstream and downstream riffle of the pool where the work is located. <p>First flush rule: No pumping for 24 hours when the Nymboida River gauge at Nymboida reads at or above the 80th %ile (337 ML/d) after reading at or below the 95th %ile (185 ML/d) level after 48 hours.</p>	204071

Water source	Flow classes	Access rules	Flow reference point
Upper Orara River	Very low flow \leq 8 ML/d A Class = 8-77 ML/d B Class > 77 ML/d	CtP at the 95 th %ile (8 ML/d) at the Non TWS reference point (Orara River gauge @ Orange Grove). Coffs Harbour City Council River Extraction Conditions: 1. The authorised pumps shall not be used to divert water from the Orara River unless the discharge of the Orara River at the Karangi gauge exceeds 5 ML/day (82 nd %ile); 2. Subject to condition 1, when the volume of water stored in Karangi Dam exceeds 3,650 ML, the authorised pumps shall not be used to divert water from the Orara River unless the discharge of the Orara River at Karangi gauge exceeds 15 ML/day (67 th %ile); 3. Subject to condition 2, when the volume of water stored in Karangi Dam exceeds 4,750 ML, the authorised pumps shall not be used to divert water from the Orara River unless the discharge of the Orara River at Karangi gauge exceeds 25 ML/day (57 th %ile). Pumping is restricted to 10 hours/day at the 90 th %ile (12 ML/d). First flush rule: No pumping for 24 hours when the Orara River gauge at Orange Grove reads at or above the 80 th %ile (31 ML/d) after reading at or below the 95 th %ile (12.47 ML/d) level after 48 hours.	204068
Upper Timbarra River	Very low flow \leq 13 ML/d A Class > 13 ML/d	CtP at the 95 th %ile (16.5 ML/d) at the gauge	204033
Washpool Creek	Yr 1-5: Very low flow = No visible flow A Class > Visible flow	CtP when there is no visible flow at the reference point	Lionsville Road crossing
	Yr 6-10: Very low flow \leq 4 ML/d A Class > 4 ML/d	CtP at the 96 th %ile (4 ML/d)	

Water source	Flow classes	Access rules	Flow reference point
Wild Cattle Creek	Very low flow \leq 45 ML/d A Class > 45 ML/d	CtP at the 90 th %ile (45 ML/d) at the reference point In the Dorrigo Plateau Surface Water Sources there are various restrictions on when you can take water. These include: • Visible flow at the work site, this means you cannot take water if: 1. There is no visible flow within 10 m downstream of the work; 2. There is no visible flow at the upstream and downstream riffle of the pool where the work is located.	204071
Angourie-Redcliffe and Sandon Rivers Boonoo Boonoo Creek Bottle Creek Bucca Bucca Creek Clarence Coastal Coldstream Creek Coombadjha Creek Dandahra Creek* Deep-Tunglebung Creek Demon Creek Duck Creek Esk River Koreelah Creek Little Nymboida River Plumbago Creek Sara-Oban Rivers Sportsman Creek and Stockyard Creek Wooli River Wooloweyah Lake Yarrow River	No flow classes defined	Licence holders are not permitted to take water when there is no visible flow at the pump site, or where water is being taken from a pool, when the volume of water in that pool is less than the full capacity of the pool. *CtP at 95 th %ile (9.65 ML/d) for Dandahra Creek.	Pump site or the outflow of the pool from which water is taken

Access to very low flow

Those activities that are considered critical human needs or animal health requirements are permitted to access very low streamflows, that is, flows below the cease-to-pump. Licences with access to very low flows are listed in Schedule 2 of the plan. They include the taking of water for:

- domestic supply
- town water supply, until major augmentation of the scheme infrastructure occurs
- fruit washing

- cleaning of dairy plant and processing equipment for the purpose of hygiene
- poultry washing and misting
- cleaning of enclosures used for intensive animal production for the purposes of hygiene.

Total daily extraction limits

One of the plan's main objectives is to share water between users during low flows, particularly so on the Clarence River where there are potentially competing demands for water from irrigators, the local water utility, the environment and other water users. This objective is achieved through the use of total daily extraction limits (TDELs). A TDEL is the total volume of water that may be extracted daily under access licences from an unregulated river in a particular flow class. TDELs are used where peak daily demands exceed supply and a cease-to-pump rule alone is not sufficient to ensure an adequate environmental share of the water within that flow class.

Daily extraction limits are calculated based on a policy method developed by the DPI Water that assigns a proportion of extraction from the upper limit of each flow class. Full details of this policy can be found in the document *Advice to Water Management Committees. No. 6 Daily extraction management in unregulated rivers* which is available on the DPI Water website www.water.nsw.gov.au

Under this policy, daily extraction limits should generally be set at less than 30% of the flow threshold. However where demands for extraction are already very high and the economic impact of a significant reduction in access would be high, the volumes may be set at up to a maximum of 60 per cent of the upper limit of the flow class.

After considering peak daily demands in the Clarence River water sources, the North Coast IRP agreed that it was not necessary to introduce TDELs in the Clarence Catchment water sources at the commencement of the Plan. The plan allows for TDELs to be established in these water sources at a later date, if required.

Alluvial licences

For management purposes, the Clarence River water sharing plan will establish a 40 metre wide buffer zone along the river from the high bank. This recognises the strong connectivity between groundwater and surface water at the boundary between the two. Existing bores located within the 40 metre buffer zone will be managed according to the same daily access rules that apply to surface water licences in the water source. The exceptions are access licences for stock and domestic, local water utility, food safety or essential dairy care purposes which are exempt from these constraints. These access rules will apply to alluvial water users from Year 6 of the plan to allow them to become familiar with the cease-to-pump concept and adjust their management practices.

In addition to the plan rules, alluvial bores may be subject to local impact rules, which are developed to address local groundwater issues, and are implemented through Ministerial Orders.

Water supply works approvals

Construction of dams

Consistent with state-wide policy, the Clarence River water sharing plan prohibits the construction of instream dams in the following water sources which have been assessed to have high instream values: Aberfoyle River, Boonoo Boonoo River, Bielsdown River, Boyd River, Cataract River, Clarence Coastal, Coldstream Creek, Coombadjha Creek, Copmanhurst-Lower Mid Clarence, Dandahra Creek, Esk River, Guy Fawkes River, Henry River, Koreelah Creek, Little Nymboida River, Lower Mann River, Lower Nymboida River, Lower Orara River, Lower Timbarra River, Mid Mann River, Mid Nymboida River, Mid Orara

River, Paddys Flat-Upper Clarence, Plumbago Creek, Sara-Oban Rivers, Sportsman Creek and Stockyard Creek, The Gorges-Upper Mid Clarence, Tooloom Creek, Upper Mann River, Upper Nymboida River, Upper Timbarra River, Washpool Creek, Wild Cattle Creek, Wooli River and Wooloweyah Lake.

Construction of bores in alluvial aquifers

The Clarence River water sharing plan sets the distances that new bores may be permitted to be constructed from streams, other bores, GDEs and cultural sites. These distance rules were set based on state-wide recommendations.

The plan prohibits new bores within 40 metres of a third order stream or higher, except for bores that:

- are the result of a conversion from an unregulated river access licence, or
- are drilled into the underlying non-alluvial material, and the slotted intervals of the production bore commence deeper than 30 metres, or
- the applicant can demonstrate that the bore will have minimal impact on base flows in the stream.

In relation to distances from other bores, new groundwater bores are not permitted within:

- 100 metres of an approved water supply bore nominated by another access licence
- 100 metres of an approved water supply bore from which BLR is being extracted
- 50 metres from the property boundary unless the owner of the adjacent property consents in writing
- 500 metres from an approved water supply bore that is used by a local water utility or major water utility
- 100 metres from a Department observation or monitoring bore

These restrictions do not apply if the new bore is solely for accessing BLR, or is replacing an existing groundwater bore or is for the purpose of monitoring or environmental management. The Regional Panel recommended that new bores may be permitted closer than the minimum distances if a hydrologic assessment is undertaken and can demonstrate that the impacts of extraction will be minimal.

The water sharing plan specifies rules for new bores located near high priority GDEs and culturally significant groundwater dependent sites. At the start of the plan there were no specified high priority GDEs or cultural sites. Should these be identified during the life of the plan, the plan rules state that no new works will be approved within 100 metres of either type of site for bores that supply BLR, and within 200 metres for any new water access licences.

Dealing rules

The objective of dealing rules (trading rules) is to allow the development of a water market whilst recognising and protecting the needs of the environment and third party interests. The NWI has established guidelines for water trading. Trading of water entitlement within the water sharing plan area needs to maximise the flexibility for users to be able to use water to its highest value without having an adverse impact on water sources or existing water users.

The water sharing plan details the trading rules for the Clarence as shown in Table 6 below.

Table 6: Summary of water dealing rules

Water source	Dealing rule
Aberfoyle River	Trade into water source not permitted
Acacia Creek	Trade into water source permitted, as long as it results in no net gain
Alumy Creek	Trade into water source permitted, as long as it results in no net gain
Angourie-Redcliffe and Sandon Rivers	Trade into water source not permitted
Bielsdown River	Trade into water source not permitted
Blicks River	Trade into water source permitted, subject to assessment; from the Little Nymboida, Lower Nymboida, Mid Nymboida, Upper Nymboida, Bielsdown and Wild Cattle Creek water sources
Bookookoorara Creek	Trade into water source permitted, as long as it results in no net gain
Boonoo Boonoo Creek	Trade into water source permitted only from the Bookookoorara Creek Water Source
Bottle Creek	Trade into water source permitted from any water source in the Clarence Plan, but only up to a maximum of 33% hydrologic stress at the 80 th %ile
Boyd River	Trade into water source permitted only from the Sara-Oban Rivers, Guy Fawkes River or Aberfoyle River water sources
Bucca Bucca Creek	Trade into water source permitted, as long as it results in no net gain
Cataract River	Trade into water source not permitted
Clarence Coastal	Trade into water source permitted, as long as it results in no net gain
Clarence River Coastal Floodplain Alluvial	Trade into water source not permitted
Clarence Tidal Pool	Trade into water source permitted, up to a total of 5,000 ML
Coldstream Creek	Trade into water source not permitted
Coombadjha Creek	Trade into water source not permitted
Copmanhurst-Lower Mid Clarence	Trade into water source permitted only from the Sara-Oban Rivers, Guy Fawkes River, Aberfoyle River, Dorrigo Plateau Surface Water, Little Nymboida River, Henry River, Yarrow River, Upper Mann River, Mid Mann River, Dandahra Creek, Coombadjha Creek, Demon Creek, Upper Timbarra River, Plumbago River, Lower Timbarra River, Washpool Creek, Bookookoorara Creek, Boonoo Boonoo River, Duck Creek, Bottle Creek, Koreelah Creek, Cataract River, Acacia Creek, Maryland River, Tooloom Creek, Peacock Creek, Deep Creek, Tunglebung Creek, Paddys Flat-Upper Clarence or The Gorges-Upper Mid Clarence water sources
Dandahra Creek	Trade into water source not permitted
Deep-Tunglebung Creek	Trade into water source permitted, as long as it results in no net gain
Demon Creek	Trade into water source permitted from Lower Timbarra River, Upper Timbarra River and Plumbago River water sources
Duck Creek	Trade into water source permitted, as long as it results in no net gain

Water source	Dealing rule
Esk River	Trade into water source not permitted
Guy Fawkes River	Trade into water source not permitted
Henry River	Trade into water source not permitted
Koreelah Creek	Trade into water source not permitted
Little Nymboida River	Trade into water source not permitted
Lower Mann River	Trade into the water source permitted from all upstream water sources: the Sara-Oban Rivers, Guy Fawkes River, Aberfoyle River, Dorrigo Plateau Surface, Little Nymboida River, Mid Nymboida River, Boyd River, Lower Nymboida River, Henry River, Yarrow River, Upper Mann River, Mid Mann River, Dandahra Creek, or Coombajha Creek water sources
Lower Nymboida River	Trade into water source permitted only from the Sara-Oban Rivers, Guy Fawkes River, Aberfoyle River, Bielsdown River, Blicks River, Upper Nymboida River, Wild Cattle Creek, Little Nymboida River, Mid Nymboida River or Boyd River water sources
Lower Orara River	Trade into water source not permitted
Lower Timbarra River	Trade into water source permitted only from Plumbago River, Upper Timbarra River or Demon Creek water sources
Maryland River	Trade into water source permitted, as long as it results in no net gain
Mid Mann River	Trade into water source permitted only from the Upper Mann River, Henry River or Yarrow River water sources
Mid Nymboida River	Trade into water source permitted only from the Bielsdown River, Blicks River, Little Nymboida River, Upper Nymboida River, and Wild Cattle Creek water sources
Mid Orara River	Trade into water source not permitted
Paddys Flat-Upper Clarence	Trade into water source permitted only from the Bookookoorara Creek, Boonoo Boonoo River, Duck Creek, Bottle Creek, Koreelah Creek, Cataract River, Acacia Creek, Maryland River, Tooloom Creek, Peacock Creek, or Deep-Tunglebung Creek water sources
Peacock Creek	Trade into water source permitted, as long as it results in no net gain
Plumbago Creek	Trade into water source not permitted
Sara-Oban Rivers	Trade into water source not permitted
Sportsman Creek and Stockyard Creek	Trade into water source not permitted
Swan Creek	Trade into water source not permitted
The Gorges-Upper Mid Clarence	Trade into water source permitted only from the Demon Creek, Upper Timbarra River, Plumbago River, Lower Timbarra River, Washpool Creek, Bookookoorara Creek, Boonoo Boonoo River, Duck Creek, Bottle Creek, Koreelah Creek, Cataract River, Acacia Creek, Maryland River, Tooloom Creek, Peacock Creek, Deep-Tunglebung Creek, or Paddys Flat-Upper Clarence water sources
Tooloom Creek	Trade into water source not permitted
Upper Mann River	Trade into water source not permitted

Water source	Dealing rule
Upper Nymboida River	Trade into water source permitted, subject to assessment; from the Little Nymboida River, Lower Nymboida River, Mid Nymboida River, Bielsdown River and Wild Cattle Creek water sources
Upper Orara River	Trade into water source permitted, as long as it results in no net gain
Upper Timbarra River	Trade into water source not permitted
Washpool Creek	Trade into water source not permitted
Wild Cattle Creek	Trade into water source permitted, subject to assessment; from the Little Nymboida River, Lower Nymboida River, Mid Nymboida River, Upper Nymboida River, Bielsdown River and Wild Cattle Creek water sources
Wooli River	Trade into water source not permitted
Wooloweyah Lake	Trade into water source not permitted
Yarrow River	Trade into water source permitted, as long as it results in no net gain

Alluvial groundwater licences:

- are subject to the same dealing rules as surface water licences, i.e. not permitted to be traded into areas with high instream values or high hydrological stress
- may be traded between alluvial aquifers, subject to assessment
- are not permitted to be converted to surface water licences

Surface water licences are permitted to be converted to alluvial groundwater licences, subject to assessment.

Adaptive management

Adaptive management refers to the practice of change in response to new information such as monitoring or some other improvement in understanding. 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 WMA 2000 and the NWI, and has been allowed for during the life of the Clarence water sharing plan through the inclusion of amendment provisions. These provisions allow some aspects of the water sharing plan to be changed within defined limits. Specific amendment provisions in the Clarence water sharing plan are discussed below. Following this is a discussion about monitoring, evaluation and reporting which are key activities for the adaptive management of water sharing plans.

Amendment provisions

The Clarence water sharing plan includes a number of specified amendments that may be made to the plan during its 10 year period of operation. 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 water sources for which dams on third order streams or higher will not be granted

- amending requirements for metering or record keeping in relation to licensed access works
- updating information in Schedules or deleting them if no longer required.

The Clarence plan also includes the following amendments that are specific to the Clarence catchment.

Eastern Freshwater Cod passage

Division 2 of Part 8 of the Clarence water sharing plan provides for an additional access rule to assist with the passage of the Eastern Freshwater Cod in the following water sources: Copmanhurst-Lower Mid Clarence, Lower Mann River, Lower Nymboida River, Lower Orara River, Mid Nymboida River, Mid Orara River and The Gorges-Upper Mid Clarence Water Sources.

Amendments will be subject to:

- the availability of new information that identifies the flow requirements of the Eastern Freshwater Cod, the hydrology of the respective water source, levels of water extraction, geomorphological characteristics of the rivers within the respective water source, instream barriers, and
- consideration of the socio-economic impacts of any proposed change to licence holder access.

Monitoring, evaluation and reporting

The 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)
- 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, the 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 Natural Resources, 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 the 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 the DPI Water through its monitoring and evaluation process).

When conducting an audit the panel will review a range of analysis and material provided by the 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
- 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, on recommendation by the NRC (under Section 43A of the WMA 2000), 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
- 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 WMA 2000 and are therefore not redefined here. However, there are some terms not included in the legislation that are defined below to assist with understanding the water sharing plan.

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

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

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.

Conversion factor: The adjustment factor that is to be applied to share components when they are cancelled and reissued in a different water source and vice versa, or as a different category. It is designed to allow movement of water from one water source to another or from one licence category to another whilst minimising the impacts on third parties of such movements. These impacts result in that the value of a unit of share component (in terms of the average water allocations) that result from it may vary from one water source to another or from one licence category to another.

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

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

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

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

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

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

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

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

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

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

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.

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: 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.

Instream refuge habitat: Stream habitat containing pools that retain water for longer periods of time during drought and low flow. Instream biota will migrate to these more permanent habitats to survive.

Long-term average annual extraction limit (LTAAEL): The target for total extractions (under all water access licences plus an estimate of BLR 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 local dealing restrictions are in place or where 'cease-to-pump' rules for works approvals apply.

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

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

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 WMA 2000, which sets out the rules for sharing water between the environment and water users within whole or part of a water management area or water source

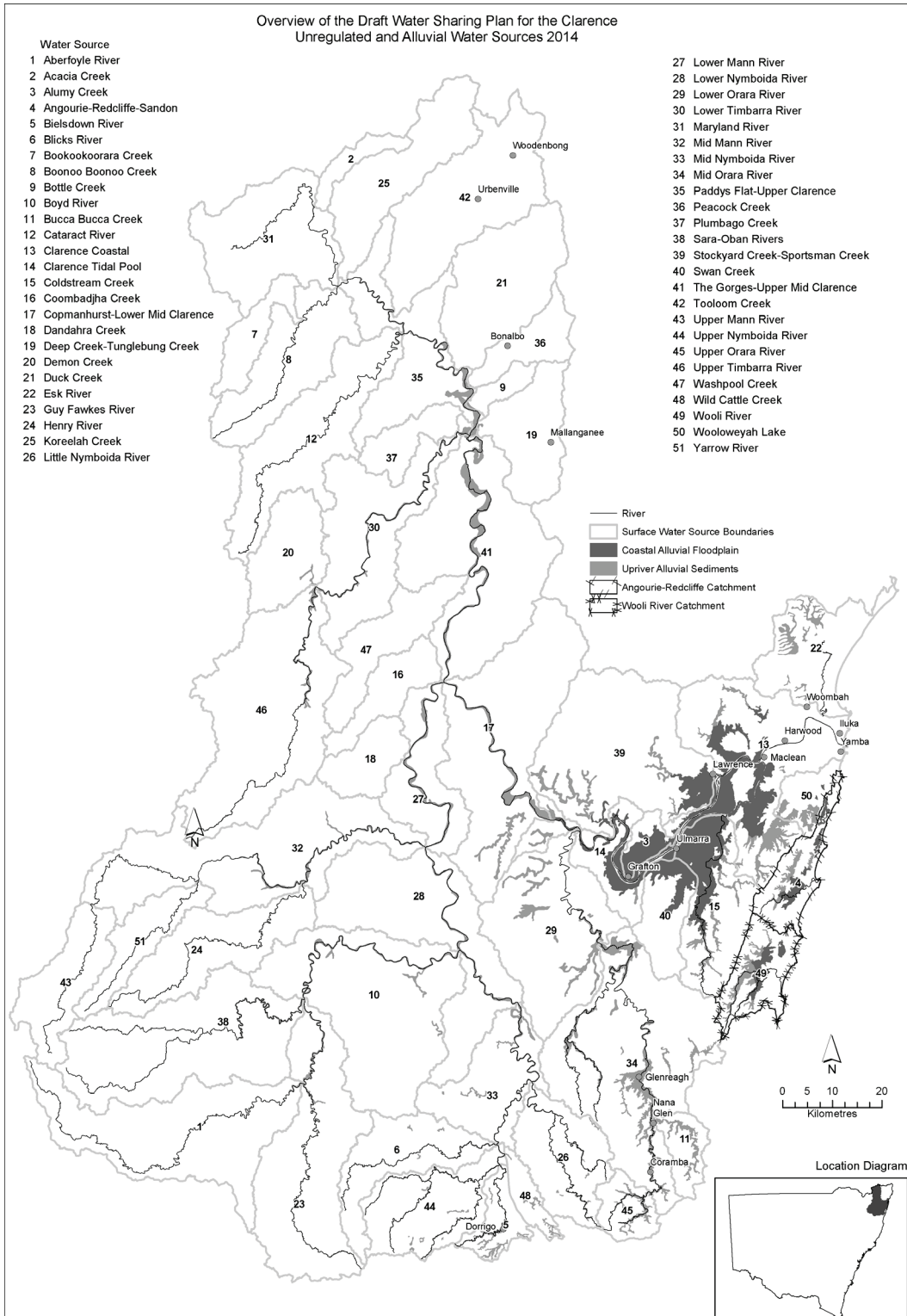
Water year: The 12 months running from 1 July to 30 June.

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Appendix 1

Water sharing plan map



Appendix 2

Water management units established by the Clarence water sharing plan

Clarence River Catchment Extraction Management Unit	Angourie/Redcliffe Catchment Extraction Management Unit	Wooli River Catchment Extraction Management Unit
Aberfoyle River Water Source Acacia Creek Water Source Alummy Creek Water Source Bielsdown River Water Source Blicks River Water Source Bookookoorara Creek Water Source Boonoo Boonoo River Water Source Bottle Creek Water Source Boyd River Water Source Bucca Bucca Creek Water Source Cataract River Water Source Clarence Coastal Water Source Clarence Tidal Pool Water Source Coldstream Creek Water Source Coombadjha Creek Water Source Copmanhurst-Lower Mid Clarence Dandahra Creek Water Source Deep – Tunglebung Creek Water Source Demon Creek Water Source Duck Creek Water Source Esk River Water Source Guy Fawkes River Water Source Henry River Water Source Koreelah Creek Water Source Little Nymboida River Water Source Lower Mann River Water Source Lower Nymboida River Water Source Lower Orara River Water Source Lower Timbarra River Water Source Maryland River Water Source Mid Mann River Water Source Mid Nymboida River Water Source Mid Orara River Water Source Paddys Flat-Upper Clarence Water Source Peacock Creek Water Source Plumbago Creek Water Source Sara-Oban Rivers Water Source Sportsman Creek and Stockyard Creek Water Source Swan Creek Water Source The Gorges-Upper Mid Clarence Water Source Tooloom Creek Water Source Upper Mann River Water Source Upper Nymboida River Water Source Upper Orara River Water Source Upper Timbarra River Water Source Washpool Creek Water Source Wild Cattle Creek Water Source Wooloweyah Lake Water Source Yarrow River Water Source	Angourie-Redcliffe and Sandon Rivers Water Source	Wooli River Water Source

Appendix 3

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.

Table 7 shows threatened species that are known (K) or expected (E) to occur in each water source.

Table 7: Threatened species and other environmental values known or expected to occur in the Clarence water sources

	Aberfoyle River	Acacia Creek	Alumy Creek	Angourie-Redcliffe and Sandon Rivers	Bielsdown River	Blicks River	Bookookoorara Creek	Boonoo Boonoo River	Bottle Creek	Boyd River	Bucca Bucca Creek	Cataract River	Clarence Coastal	Clarence Tidal Pool	Coldstream Creek	Coombadjha Creek	Copmanhurst-Lower Mid Clarence	Dandahra Creek	Deep-Tunglebung Creek	Demon Creek	Duck Creek	Esk River	Guy Fawkes River	Henry River	Koreelah Creek	Little Nymboida River	
Threatened fish species																											
Oxleyan Pygmy Perch				K									E										K				
Eastern Cod	E	K	E			E	E	E	E	E	E	E	E	E	E	E	K	E	E	E	E		K	E	K	K	
Threatened frog species																											
Booroolong Frog	K					K				K						E		E		E			K	K		E	
Fleay's Barred Frog																					K				K		

	Aberfoyle River	Acacia Creek	Alumy Creek	Angourie-Redcliffe and Sandon Rivers	Bielsdown River	Blicks River	Bookookoorara Creek	Boonoo Boonoo River	Bottle Creek	Boyd River	Bucca Bucca Creek	Cataract River	Clarence Coastal	Clarence Tidal Pool	Coldstream Creek	Coombadjha Creek	Copmanhurst-Lower Mid Clarence	Dandahra Creek	Deep-Tunglebung Creek	Demon Creek	Duck Creek	Esk River	Guy Fawkes River	Henry River	Koreelah Creek	Little Nymboida River	
Giant Barred Frog	E	E				E	E	E	E	K	K	E	E	E	E	K	E	K	K	E	E	E	E	E	E	E	K
Glandular Frog	E					K	E	E		K		K				K	E	K		K			K	E	E	E	K
Green and Golden Bell Frog				E								K	E	E								E	K				K
Green-thighed Frog	E	E	E	E		E	E	K		E	E	E	K	E	E	E	K	E	K	E	K	K	E	E	E	E	K
Loveridge's Frog																K			K	K	K					K	
Mountain Frog		E																								K	
Olungburra Frog				K									E									K					
Peppered Frog										K														K			
Pouched Frog						K		E		K	E	E				K	E	K	K	E			K	E			K
Sphagnum Frog						K				K						K		K						K			K
Stuttering Frog	E	E				K	E	E		K	E	K				K	E	K	E	K	E		K	E	E	E	K
Tusked Frog	K							K				K											K	K			
Wallum Froglet			E	K							E		E	E	E		E					K					
Yellow-spotted Tree Frog																											
Threatened bird species																											

	Aberfoyle River	Acacia Creek	Alumy Creek	Angourie-Redcliffe and Sandon Rivers	Bielsdown River	Blicks River	Bookookoorara Creek	Boonoo Boonoo River	Bottle Creek	Boyd River	Bucca Bucca Creek	Cataract River	Clarence Coastal	Clarence Tidal Pool	Coldstream Creek	Coombadjha Creek	Copmanhurst-Lower Mid Clarence	Dandahra Creek	Deep-Tunglebung Creek	Demon Creek	Duck Creek	Esk River	Guy Fawkes River	Henry River	Koreelah Creek	Little Nymboida River	
Australasian Bittern													K		K								K	K			
Beach Stone-curlew				K									K										K				
Black Bittern			E	K					E		K		K	K	K	E	E	E	E			E	K				E
Black-necked Stork			K	K						K	K		K	K	K	K							K				
Blue-billed Duck																											
Brolga			K	K							K		K	K	K								K				
Collared Kingfisher											K																
Comb-crested Jacana			K								K		K	K	K		K					K					
Cotton Pygmy-Goose			K																								
Freckled Duck														K													
Great Knot				K									K										K				
Greater Sand-plover													K										K				
Hooded Plover			K																								
Lesser Sand-plover				K									K										K				
Magpie Goose			K										K	K	K												

	Aberfoyle River	Acacia Creek	Alumy Creek	Angourie-Redcliffe and Sandon Rivers	Bielsdown River	Blicks River	Bookookoorara Creek	Boonoo Boonoo River	Bottle Creek	Boyd River	Bucca Bucca Creek	Cataract River	Clarence Coastal	Clarence Tidal Pool	Coldstream Creek	Coombadjha Creek	Copmanhurst-Lower Mid Clarence	Dandahra Creek	Deep-Tunglebung Creek	Demon Creek	Duck Creek	Esk River	Guy Fawkes River	Henry River	Koreelah Creek	Little Nymboida River
Mangrove Honeyeater				E								K										E				
Osprey			K	K							K		K	K			K					K	K			
Painted Snipe																										
Sanderling				K									K									K				
Terek Sandpiper													K													
Other fauna																										
Bell's Turtle								K																		
Large-footed Myotis			K					K		K	K	K	K		K		K			K		K	K			K
Threatened wet flora																										
Arthropteris palisotii																										
Austromyrtus fragrantissima																										
Cyperus aquatilis																						K				
Eleocharis tetraquetra																										
Elionurus citreus																										
Maundia triglochinos															K											
Phaius australis													K									K				
Phyllanthus microcladus			K																							
Ravine Orchid																										

	Aberfoyle River	Acacia Creek	Alumy Creek	Angourie-Redcliffe and Sandon Rivers	Bielsdown River	Blicks River	Bookookoorara Creek	Boonoo Boonoo River	Bottle Creek	Boyd River	Bucca Bucca Creek	Cataract River	Clarence Coastal	Clarence Tidal Pool	Coldstream Creek	Coombadjha Creek	Copmanhurst-Lower Mid Clarence	Dandahra Creek	Deep-Tunglebung Creek	Demon Creek	Duck Creek	Esk River	Guy Fawkes River	Henry River	Koreelah Creek	Little Nymboida River
Thorny Pea													K													
Declared locations																										
Ramsar/DIWA			E																							
Other Nationally Important Wetlands																										
World Heritage Area						E										E		E					E			
Declared Wilderness Area	E									E						E		E				E	E	E		
Other																										

	Lower Mann River	Lower Nymboida River	Lower Orara River	Lower Timbarra River	Maryland River	Mid Mann River	Mid Nymboida River	Mid Orara River	Paddys Flat-Upper Clarence	Peacock Creek	Plumbago Creek	Sara-Oban Rivers	Sportsman Creek and Stockyard Creek	Swan Creek	The Gorges-Upper Mid Clarence	Tooloom Creek	Upper Mann River	Upper Nymboida River	Upper Orara Rivr	Upper Timbarra River	Washpool Creek	Wild Cattle Creek	Woolli River	Woolowayah Lake	Yarrow River
Threatened fish species																									
Oxleyan Pygmy Perch																							K	K	
Eastern Cod	K	K	K	K	E	K	K	K	K	E	K	K	E	E	K	K	E	K	E	E	E			E	E
Threatened frog species																									

	Lower Mann River	Lower Nymboida River	Lower Orara River	Lower Timbarra River	Maryland River	Mid Mann River	Mid Nymboida River	Mid Orara River	Paddys Flat-Upper Clarence	Peacock Creek	Plumbago Creek	Sara-Oban Rivers	Sportsman Creek and Stockyard Creek	Swan Creek	The Gorges-Upper Mid Clarence	Tooloom Creek	Upper Mann River	Upper Nymboida River	Upper Orara Rivr	Upper Timbarra River	Washpool Creek	Wild Cattle Creek	Wooli River	Wooloweyah Lake	Yarrow River
Booroolong Frog	E	E	K	E		K	E	E				K	K				K	K	E	K	E				E
Fleay's Barred Frog									K	E						K									
Giant Barred Frog	E	K	K	E	E	K	K	K	K	K	K	E	K	E	K	K			K	K	K	K		K	E
Glandular Frog	E	E		K		E	K	E	E		E	K	E		E	E			K	E	K	E			E
Green and Golden Bell Frog	K												E											K	E
Green-thighed Frog	E	E	K	E	E	E	E	E	E	K	E	E	E	E	K	K			E	E	E	E		K	E
Loveridge's Frog	K			K												K					K	K			
Mountain Frog		K		K												K									
Olungburra Frog																								K	K
Peppered Frog				K		K						K									E				K
Pouched Frog	E	E		K		K	K	E	E	E	E				K				K	K	K	K			
Sphagnum Frog		K				K	K	K					K						K	K	K	K			
Stuttering Frog	K	K	E	K		K	K	K	E	E	E	K	K		K	E			K	K	K	K			E
Tusked Frog					K	K						K					K				K				
Wallum Froglet			E				E	E					E	E					E					K	K

	Lower Mann River	Lower Nymboida River	Lower Orara River	Lower Timbarra River	Maryland River	Mid Mann River	Mid Nymboida River	Mid Orara River	Paddys Flat-Upper Clarence	Peacock Creek	Plumbago Creek	Sara-Oban Rivers	Sportsman Creek and Stockyard Creek	Swan Creek	The Gorges-Upper Mid Clarence	Tooloom Creek	Upper Mann River	Upper Nymboida River	Upper Orara Rivr	Upper Timbarra River	Washpool Creek	Wild Cattle Creek	Wooli River	Wooloweyah Lake	Yarrow River
Yellow-spotted Tree Frog												K					K								
Threatened bird species																									
Australasian Bittern																									
Beach Stone-curlew																								K	
Black Bittern	E	E	K	E		E		K	E	E			E	E	K	K		E	E		E		E	K	
Black-necked Stork	K	E	K	K	K		E	K					K	K	K	K		K	E	K	E		K	E	
Blue-billed Duck												K			K		K								
Brolga													K										K		
Collared Kingfisher																									
Comb-crested Jacana	K		K					K				K	K	K	K	K									
Cotton Pygmy-Goose															K										
Freckled Duck															K										
Great Knot																								K	
Greater Sand-plover																								K	
Hooded Plover																									

	Lower Mann River	Lower Nymboida River	Lower Orara River	Lower Timbarra River	Maryland River	Mid Mann River	Mid Nymboida River	Mid Orara River	Paddys Flat-Upper Clarence	Peacock Creek	Plumbago Creek	Sara-Oban Rivers	Sportsman Creek and Stockyard Creek	Swan Creek	The Gorges-Upper Mid Clarence	Tooloom Creek	Upper Mann River	Upper Nymboida River	Upper Orara Rivr	Upper Timbarra River	Washpool Creek	Wild Cattle Creek	Wooli River	Wooloweyah Lake	Yarrow River
Lesser Sand-plover																							K	K	
Magpie Goose					K								K		K										
Mangrove Honeyeater																									E
Osprey	K							K					K	K									K	K	
Painted Snipe													K		K										
Sanderling																									
Terek Sandpiper																							K	K	
Other fauna																									
Bell's Turtle																									
Large-footed Myotis	K	K	K	K			K	K	K	K			K			K					K				
Threatened wet flora																									
Arthropteris palisotii				K																					
Austromyrtus fragrantissima																								K	
Cyperus aquatilis													K												
Eleocharis tetraquetra													K												
Elionurus citreus																									
Maundia triglochinooides																								K	

	Lower Mann River	Lower Nymboida River	Lower Orara River	Lower Timbarra River	Maryland River	Mid Mann River	Mid Nymboida River	Mid Orara River	Paddys Flat-Upper Clarence	Peacock Creek	Plumbago Creek	Sara-Oban Rivers	Sportsman Creek and Stockyard Creek	Swan Creek	The Gorges-Upper Mid Clarence	Tooloom Creek	Upper Mann River	Upper Nymboida River	Upper Orara Rivr	Upper Timbarra River	Washpool Creek	Wild Cattle Creek	Wooli River	Wooloweyah Lake	Yarrow River
Phaius australis																							K		
Phyllanthus microcladus		K																							
Ravine Orchid							K											K	K						
Thorny Pea																									
Declared locations																									
Ramsar/DIWA																									
Other Nationally Important Wetlands																									
World Heritage Area						E												E		E	E				
Declared Wilderness Area		E		E		E						E	E							E	E				
Other																									

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 4

Interagency Reference Panel and support staff

Table 8: North Coast Regional Panel-membership and expertise

Name	Agency	Role	Expertise
Dave Miller	DPI Water	Agency Representative	Water planning/administration/policy. Geomorphology. Riparian management. Stream ecology/restoration.
Marcus Riches	DPI Fisheries	Agency Representative	Regional experience in NRM management, catchment planning, fisheries management and interagency coordination
Rik Whitehead	DPI Agriculture	Agency Representative	Regional experience in NRM management, coastal agricultural industries, catchment management and interagency coordination.
Toong Chin	OEH	Agency Representative	Regional experience in NRM management, floodplain planning and interagency coordination.

Table 9: Support staff membership and expertise

Name	Agency	Role	Expertise
Jamie Foster	DPI Water	Plan Coordinator	Water policy and planning, plan development and implementation, facilitation and project management.
Peter Hackett		Technical Support (Water Licencing)	Licensing officer, local knowledge of water users, local access arrangements and reference points.
Chris Rumpf		Technical Support (Groundwater)	

Appendix 5

Reference information used by Interagency Reference Panel

DPI Water data sets

- Licensing Administrator System – the DPI Water state-wide database holding the licence details including volume of entitlement, location details and stream orders.
- Hydstra – Hydstra is an DPI Water state-wide database that holds all flow record data.
- Regional Groundwater Monitoring Network – the DPI Water is developing 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

Other 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

Other agency data

- National Parks and Wildlife (OEH) Wildlife Atlas – state-wide 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.

Appendix 6

Final classification summary

Table 10: Value matrix used to determine indicative dealing rules

	Low hydrologic stress or hydrologic risk	Medium hydrologic stress or hydrologic risk	High hydrologic stress or hydrologic risk
High Instream Values	a Upper Nymboida River Wild Cattle Creek	b	c Bielsdown River
Medium Instream Values	d Blicks River	e	f
Low Instream Values	g	h	i

* Represents a change to the initial classification based on Regional Panel local knowledge

Table 11: Risk matrix used to determine indicative access rules

	Low dependence on extraction	Medium dependence on extraction	High dependence on extraction
High Risk to Instream Values	A	B	C Bielsdown River
Medium Risk to Instream Values	D	E	F
Low Risk to Instream Values	G	H Blicks River	I Upper Nymboida River Wild Cattle Creek

* Represents a change to the initial classification based on Regional Panel local knowledge