WATER SHARING PLAN FOR THE HASTINGS UNREGULATED AND ALLUVIAL WATER SOURCES

Background Document

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Introduction

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

In recent years, water sharing plans for unregulated[1] 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 is designed to develop water sharing plans covering most of the outstanding 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 (fractured rock, for example). These macro plans generally apply to catchments or aquifers where there is less intensive water use.

The *Water Sharing Plan for the Hastings Unregulated and Alluvial Water Sources 2017* (hereafter referred to as the Hastings water sharing plan) covers 18 water sources that are grouped into three extraction management units (EMU).

This document provides background information to the development of the rules in the Hastings water sharing plan. It includes information on the purpose of the plan and the policy framework that supports it, a description of the Hastings River catchment including land and water use, and the process for 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 Hastings Unregulated and Alluvial Water Sources 2017* - a legal instrument written in its required statutory format,
- *An overview of water sharing plans for unregulated and alluvial water sources in coastal NSW, and*
- 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 Department Industry website www.industry.nsw.gov.au/water 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

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

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, licences held under the *Water Act 1912* are converted to water access licences and works approvals under the WMA 2000, which separates the water access licences from land tenure. This facilitates the trade of water 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 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, and
- 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 Hastings 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 to the occurrence of different hydrologic, geomorphic, biological and chemical processes. 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. This range of stream flows must be maintained to preserve a healthy river system.

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 take rules that require users to stop taking water when flows fall below a set level. The rules are based on an assessment of the risks to river health posed by the taking of water.

Each water source in the Hastings plan area has been classified as having either high, medium or low instream values. Water sources with high instream value are protected through the prohibition on the trade of licences 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 Hastings water sharing plan defines cease to take 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 Fractured and Porous Groundwater Sources 2016.* Water sharing rules for coastal sand aquifers are dealt with in the *Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016*.

The Hastings 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 Hastings 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, and

j) 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 Hastings water sharing plan covers two discrete water sources: 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 water sources.

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 further 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 usually consists of several water sources.

The Hastings water sharing plan defines 18 water sources and three EMUs as listed in Table 1. The location and extent of these water sources and EMUs are shown on the map in Appendix 1.

Table 1: Extraction management units and water sources

Hastings River Catchment Extraction Management Unit	Camden Haven River Catchment Extraction Management Unit	Lake Innes Catchment Extraction Management Unit
Coastal Hastings Water Source	Camden Haven River Water Source	Lake Innes Water Source
Ellenborough River Water Source	Stewarts River Water Source	
Forbes River Water Source	Queens Lake Water Source	
Kindee Creek Water Source	Watson Taylors Lake Water Source	
Limeburners Creek Water Source		
Maria River Water Source		
Middle Hastings River Water Source		
Mortons Creek Water Source		
Pappinbarra River Water Source		
Thone River Water Source		
Upper Hastings River Water Source		
Wilson River Water Source		

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*
- *Macro water sharing plans – the approach for unregulated rivers*
- National Water Initiative
- Natural Resource Commission state-wide targets
- Northern Rivers Catchment Action Plan
- Water planning policies and other considerations.

A full list of water policies is available on the DPI Water website at http://www.water.nsw.gov.au/water-management/law-and-policy

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 current version of the plan and the WMA are available at the NSW government legislation website www.legislation.nsw.gov.au.

Access Licence Dealing Principles

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

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 on licences and water accounts (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 establish additional restrictions on dealings 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 have been transferred to the Productivity Commission. This Commission now has the responsibility for assessments of progress toward achieving the NWI objectives and outcomes.

Natural Resource Commission targets

The NSW 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 planning.

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. A further seven water sharing plans were reviewed by the NRC in 2015.

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 Plans

Catchment action plans are statutory, non-regulatory plans that were previously prepared by the state's catchment management authorities under the *Catchment Management Authorities Act 2003* (now repealed). In January 2014 the NSW Government established Local Land Services 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. The Northern Rivers Local Land Services (LLS) will be responsible for continuing the delivery of natural resource management programs across the Hastings River catchment.

The Northern Rivers Catchment Action Plan 2013-23 (Northern Rivers CMA 2013) sets targets for natural resource management and sustainable agriculture in the Northern Rivers region over the next 10 years. The plan was approved by the Minister in 2013 following significant community input and effort. Implementation of the plan will continue to be a priority for Northern Rivers LLS and will form a transitional strategic plan for the natural resource management component of Local Land Services operations.

The objectives of the water sharing plan are consistent with Strategy 2.1.10 of the Catchment Action Plan which is to *"Investigate and implement appropriate and sustainable environmental flow management to improve water quality, water quantity and aquatic habitats".*

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, and directly influence the planning process and the formulation of water sharing rules.

Protecting pools, lagoons and lakes

Pools in NSW 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 Department of Industry, Water website www.industry.nsw.gov.au/water 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 that draw down of a pool below full capacity level is not permitted 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 may be developed. For natural pools, the default rule requires users to stop taking water 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 planning 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 WaterNSW.

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, cease to take rules for example, do not apply to BLR; extractions taken under BLR are afforded higher priority than licensed extractions and are not subject to cease to take rules.

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 established shares for native title rights, however the plan allows for the establishment of these shares should they be activated during the plan's ten year term.

Take of water under domestic and stock rights can be restricted by the Minister to protect the environment or public health, or to preserve existing BLR. These restrictions are, however, outside the framework of the water sharing plan.

The Hastings 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 trade of water allocations under limited circumstances, though prohibits trade of licence shares.

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 people's 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 peoples. 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 Hastings 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 Department of Industry website www.industry.nsw.gov.au/water

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 and how this bears on water sharing rules.

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 rights but can place restrictions on instream dams – dams that are located on streams of third order or higher. [2] 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. DPI Water recognises the potential impacts of forestry activities on catchment hydrology and is currently developing state-wide policy in relation to this issue.

Description of the plan area

Catchment description

The area covered by the Hastings water sharing plan (Appendix 1) comprises the Hastings River catchment and adjoining coastal catchments of Lake Innes and Camden Haven River. The plan area covers 18 water sources (including one alluvial groundwater source) and covers an area of around 4,500 km^2 on the north coast of NSW. Around 65% of the plan area remains forested and large areas of the catchment lie within state forest and national park.

The Hastings River catchment begins in the steep gorges of the Great Dividing Range and flows to the coast entering the sea at Port Macquarie. The Hastings River rises in the Werrikimbe National Park in the northwest of the catchment. It flows for 165 km before being joined by its major tributaries - the Forbes, Ellenborough and Throne Rivers, Pappinbarra

[2] The maximum harvestable right dam capacity is that capacity to harvest approximately 10% of the mean annual runoff from the landholder's property. It is determined using a calculator provided on the Office of Water website, with input parameters being property location and property size.

River, and finally the Wilson River. The lower reaches of the Hastings River supports extensive floodplains, wetlands and coastal lakes.

The Camden Haven River drains the south-east portion of the plan area. It flows east into Watson Taylors Lake, a large coastal estuary where it is joined by its main tributary the Stewarts River. Not far from the sea the Camden Haven River is joined by a third catchment from the north which drains into Queens Lake before joining the river at Laurieton.

All of the rivers and creeks in the area of the Hastings water sharing plan are unregulated with 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. Pressure on water supplies occurs mostly during dry times when water is low and demand is high.

The major town within the catchment is Port Macquarie, located at the entrance of the Hastings River. Camden Haven is the second largest urban area and includes the small towns of North Haven and Laurieton on the Camden Haven River. The rural settlement of Wauchope is located on the banks of the Hastings River upstream of the tidal zone.

Over 80% of the Hastings plan area falls within the Port Macquarie–Hastings local government area (covering 3,686 km^2). Small areas of the western, northern and southern catchment fall into the adjoining government areas of Walcha, Mid Coast and Kempsey.

Aboriginal history

The Birpai (or Biripi) and Dunghutti nations are the traditional custodians of the Hastings region. They lived in settled villages along the rivers and lakes of the Hastings and Manning river catchments, camping in substantial huts of timber and bark that could accommodate 8 to 10 people. Their environment was rich in seafood and bush foods and they had an intimate knowledge of the coastal forests. Some descendants suggest that there was an annual cycle of movement from the river flats and coast during the summer to the upper catchments and mountain ranges in the winter. Around Easter time the Birpai waited for schools of mullet to move into the rivers by watching for changes in the wind which would bring the fish closer to shore (Mathews 2005).

Early European contact showed the Birpai and Dunghutti people to be generally shy and friendly. Unlike other valleys on the north coast, relations between the Aboriginal tribes of the Hastings and European settlers were relatively harmonious with one significant hostility at Cogo in the upper Wilsons River in 1843 (Blomfield 1981). Many Aboriginal people lived a settled and opportunistic existence around government stations at Port Macquarie and Rolands Plains. Others simply retreated away from the settled areas for hunting and gathering where food and resources were still in good supply. Eventually however, disease decimated the local tribes with many of the Aboriginals around Port Macquarie dying of measles (Blomfield 1981).

Between 1840 and 1900 the remaining Birpai and Dunghutti people were gradually moved on to local reserves under the control of the Aboriginal Protection Board. Between 1900 and the 1940s they were moved away from the Hastings to reserves at Purfleet, Taree and Kempsey.

Much evidence of the Dunghutti's traditional lifestyle can be found within Limeburners Creek National Park which contains a particularly high concentration of Aboriginal sites including burial sites, middens, campsites, axe-grinding grooves, and stone quarries. A stone structure thought to be one of three Aboriginal fish traps recorded along the north coast of NSW is also located within the park (NPWS 1998).

European settlement and land use

The Hastings region was first occupied by Europeans in 1821 when a penal station was established at Port Macquarie. By October of that year 92 convicts were housed at Port

Macquarie and this increased to 1,500 convicts by 1825 (SRANSW 2015). Connected with the penal station was an Agricultural Station on the Wilsons River at Rollands Plains. This provided inmates with agricultural work while others were assigned to public works construction.

Cedar cutters first entered the Hastings in the 1920s, establishing a timber industry that still survives to this day. Towards the end of the century when much of the red cedar had been removed the loggers turned their attention to other native hardwoods such as white beech and mountain ash. By the 1880s Sydney timber merchants had started trading at Port Macquarie and Camden Haven. The first sawmill in the valley was established in 1900 on the south bank of Camden Haven Inlet, and this later became one of the largest mills in the industry. At the peak of the timber industry there were nine mills along the Camden Haven River between Laurieton and Comboyne and 95 mills throughout the rest of the Hastings. The largest number was in Wauchope with up to 56 at one time (Timbertown 2015).

The first land grants occurred in 1830 following closure of the penal station. Parcels of land were taken up along the Hastings River and the town of Wauchope was established in 1836 to service the growing timber industry. The river became an important trade route with boats plying the river as far as Wauchope on the Hastings River and near Rollands Plains on the Wilsons River. The road between Port Macquarie and the New England region was completed in 1841 opening up trade and migration between the two areas.

Maize was one of the first crops to be grown in the region for self-sufficiency, stock fodder and trade. The subtropical climate resulted in early attempts to grow sugar on Hastings River and Wilsons River in the 1860s however frost and floods ruined the various attempts (HO and DUAP 1996). With many new settlers moving down from the New England region the pastoral economy was initially based around sheep. However by 1850 the high rainfall and incidence of footrot resulted in the emergence of the beef cattle industry on the north coast (HO and DUAP 1996).

Towards the end of the 19th century dairying emerged as a dominant industry for the valley, pushing into areas formerly used for beef cattle. The Comboyne Plateau, cleared of all of its native timber, became a rich centre for dairying with 130 dairy farms operating in the area in the early 1900s.

Current land use and community profile

The rich soils of the Comboyne Plateau still support large dairying and horticultural industries. The lower reaches of the valley are used for grazing, grape-growing, and rural residential development. Dairy farming is the main use of irrigation water along the river flats while tea tree and avocado plantations are an expanding land use in the mid to upper catchment of the Hastings River. Fishing and oyster farming are important industries in the Hastings and Camden Haven estuaries. Urban and industrial development occurs mostly in the Port Macquarie area which supports a full range of community services. The largest employment sector is health and social services, followed by retail, hospitality and education.

Climate

The Hastings region has a warm subtropical climate. Average annual rainfall varies from 1200 mm in the far west of the catchment to more than 1800 mm on the Comboyne Plateau and the upper catchment of the Wilsons River (Figure 1). The mean annual rainfall on the coast is around 1400 mm at Laurieton and 1540 mm at Port Macquarie (BOM 2015). The highest rainfall is received between January and April with July, August and September being the driest months (Figure 2). Mean monthly rainfall varies from 76 mm in September to 186 mm in March.

January and February are the hottest months with the mean maximum temperature being 27°C in both months at Port Macquarie. Winter temperatures rarely fall below 6°C which is the mean minimum temperature in July and August (BOM 2015).

Figure 1: Average annual rainfall over the Hastings catchment

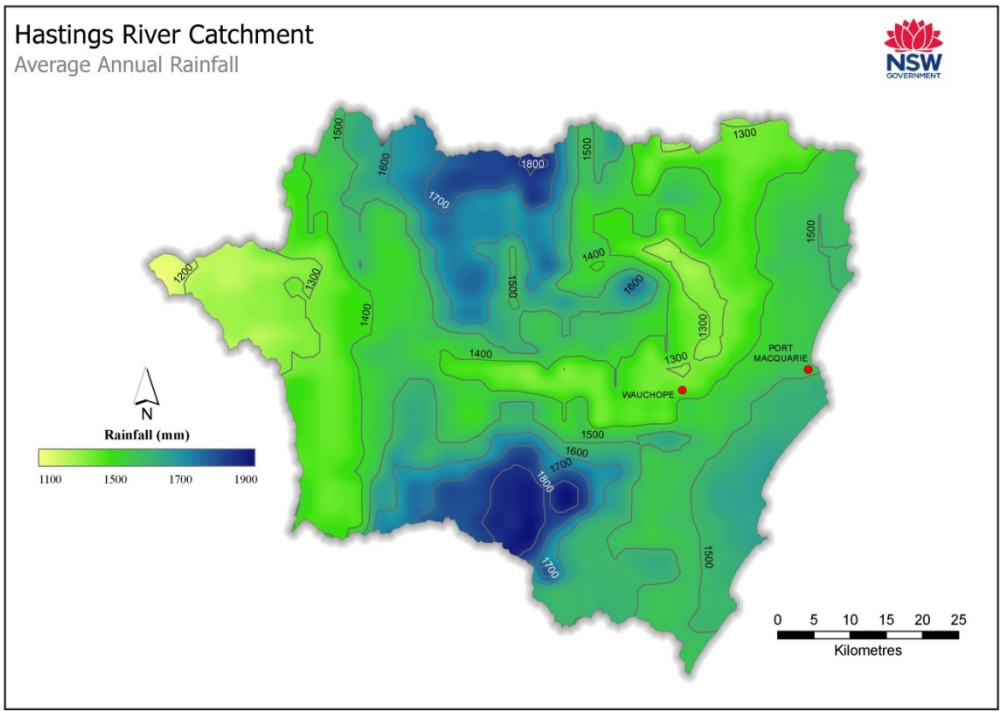
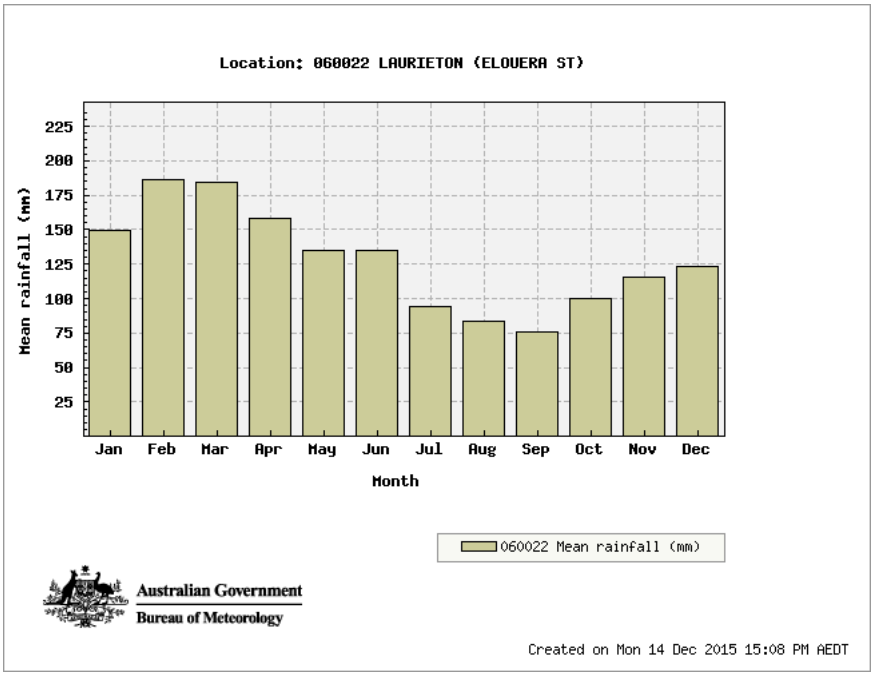


Figure 2: Mean monthly rainfall at Laurieton (1885-2015)



Ecological values

Limeburners Creek Nature Reserve contains nationally important coastal wetlands. The reserve is drained by Limeburners Creek and protects a large complex of dunal wetlands remaining in a relatively natural condition (Commonwealth of Australia 2010). These dunal wetlands consist of a mosaic of wet heath, sedgeland, dry heath, forested swamp and sclerophyll forest. Small pockets of littoral rainforest, mangroves, dune heathlands, and saltmarsh communities are also found within the nature reserve.

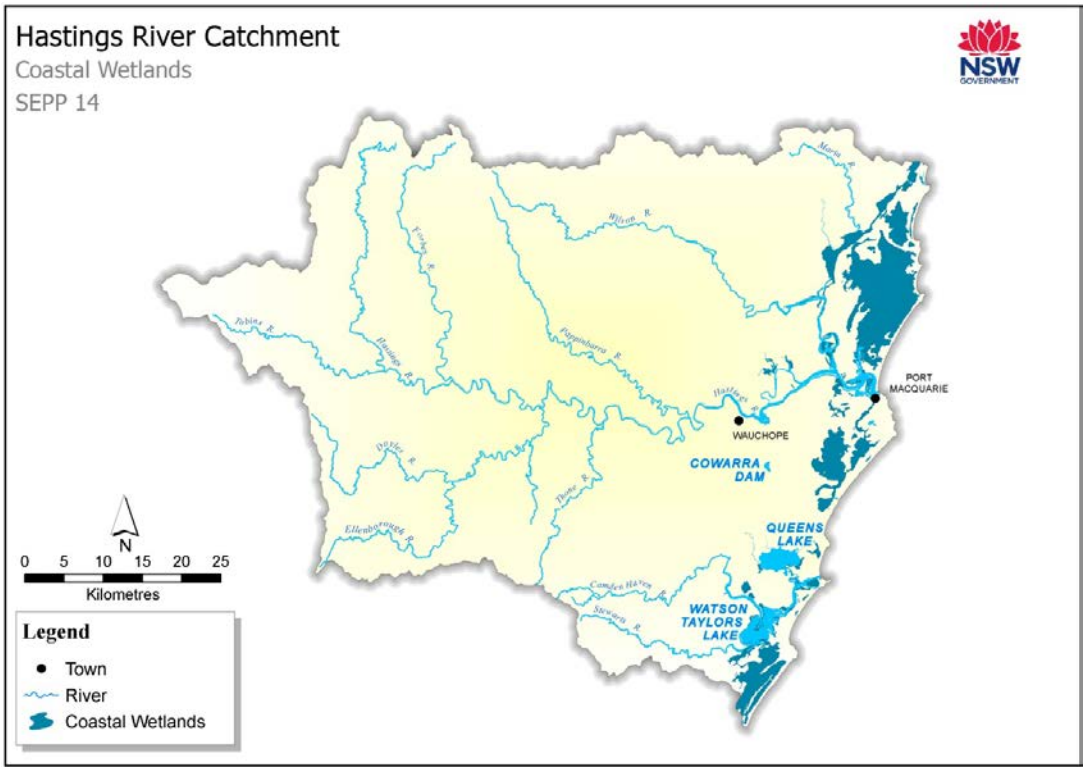
The Hastings catchment has 202 km^2 of coastal wetlands protected under State Environmental Planning Policy 14 (SEPP 14). Large areas of these wetlands are found within the Limeburners Creek Nature Reserve while others are associated with the Maria River and Lake Innes and in Crowdy Bay National Park south of Watson Taylors Lake (Figure 3).

The estuaries of the Hastings and Camden Haven rivers support the largest areas of seagrass in the Northern Rivers region (1.4 km^2 in the Hastings and 10.2 km^2 in Camden Haven). The Camden Haven Inlet also has the most diverse seagrass population with five species, while three species are found in the Hastings River estuary. (Creese *et al* 2009).

The Hastings catchment supports a number of endangered ecological communities including:

- Coastal saltmarsh in the NSW North Coast Bioregion
- Freshwater Wetlands on Coastal Floodplains
- River-flat Eucalypt Forest on Coastal Floodplain
- Swamp Oak Floodplain Forest
- Swamp Sclerophyll Forest on Coastal Floodplains
- Lowland Rainforest on Floodplain
- Subtropical Coastal Floodplain Forest

Figure 3: SEPP 14 wetlands of the Hastings River catchment



World heritage listed rainforest occurs in the upper Hastings catchment within Werrikimbe and Willi national parks. The Gondwana Rainforests World Heritage Area comprises the major remaining areas of rainforest in southeast Queensland and northeast NSW. It provides examples of major stages in evolutionary history, ongoing geological and biological processes, and exceptional biological diversity. Many of the rainforest plants, animals and communities have their ancient origins in Gondwana and are restricted largely or entirely to the Gondwana Rainforests (UNESCO World Heritage Centre 2015).

Threatened species

The ecological values and threatened species known or expected to occur in each of the Hastings water sources are identified in Appendix 2. These species have been considered as part of the macro-classification approach in determining water sources with high environmental values.

The Hastings catchment supports nine threatened frog species including the Booroolong Frog, Giant Barred Frog, Stuttering Frog and the Wallum Froglet. The Wilson River and Upper Hastings River are particularly significant for frog species with at least five of the threatened frog species known to occur in both of these water sources.

Fifteen threatened water-dependant bird species occur within the catchment. By far the most important area for bird species is the estuary of the Coastal Hastings Water Source; however the smaller estuaries including Limeburners Creek, Lake Innes and Maria River all support at least five threatened bird species. The most commonly found species are Australasian Bittern, Black-necked Stork, Comb-crested Jacana and Osprey.

The Large-footed Myotis is a small bat which is found along forested streams and estuaries or around reservoirs and lakes. It roosts in caves, tunnels, mines, tree hollows and under bridges and is most often recorded near large and permanent waterways at low elevations, usually surrounded by vegetation. It has been recorded in eight of the Hastings water sources both on the coast and in the upper catchment.

Four water-dependant threatened plant species are found in the Hastings catchment:

- Lesser creeping fern (*Arthropteris palisotii*) is a rainforest species known to occur in remnant forests of the Comboyne Plateau in the upper catchments of the Forbes River and Kindee Creek water sources.
- *Maundia triglochinoides* is a wetland plant recorded from shallow freshwater environments on the floodplain of the Coastal Hastings water source.
- Southern Swamp Orchid (*Phaius australis*) is a large ground orchid that grows in swampy grassland or forests including rainforest, eucalypt and paperbark, and has been recorded in the Lake Innes Water Source.
- Tangled bedstraw (*Galium australe*) is a small straggling herb found in near-coastal habitats including sandspits, shrubland and woodland. It has been recorded in the Middle Hastings River Water Source.

Estuary sensitivity

Estuary specialists from Department of Industry 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 Limeburners Creek, tend to be highly sensitive to inflow variations, with most being only intermittently connected to the ocean. Barrier estuaries such as the Hastings are generally less sensitive to inflow variations. As they mature and infill with sediment they tend

to be long and narrow 'river' estuaries. Table 2 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 2: Inflow sensitivities for the estuaries within the plan area

Name of estuary	Inflow sensitivity at low flow
Limeburners Creek	High
Lower Maria River	Medium
Lower Wilson River	Medium
Hastings River	Low
Lake Innes/Lake Cathie	High
Camden Haven River	Medium
Queens Lake	Medium
Watson Taylors Lake	Medium

Groundwater

Groundwater aquifers in the Hastings catchment are found in fractured rock, coastal sands and unconsolidated alluvial sediments. The fractured rock of the Liverpool Ranges Basalt Groundwater Source is the most extensive aquifer in the catchment.

Water sharing rules for the Liverpool Ranges Basalt Coast Groundwater Source are included in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*. Coastal sand aquifers in the Hastings Coastal Sands Groundwater Source are included in the *Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016*.

The Hastings water sharing plan includes rules for accessing water from the alluvial aquifers within the plan area. Alluvial sediments can be categorised as "upriver alluvium" or "coastal floodplain alluvium". Upriver alluvium nominally occurs upstream of the tidal limit and is sandier than coastal floodplain alluvium. The most extensive deposits of upriver alluvium are found along the Middle Hastings River, Wilson River, Camden Haven River and Stewarts River. The aquifers typically consist of medium to coarse grained sand, silts and gravel deposits. Groundwater within the aquifer is generally highly connected to the surface water and of good quality.

Deposits of coastal floodplain alluvium occur within the Maria River, Coastal Hastings, Lake Innes, Queens Lake and Watson Taylors Lake water sources. These coastal alluvial deposits make up the Hastings River Coastal Floodplain Alluvial Groundwater Source, which covers an area of 14,093 hectares. These shallow deposits generally consist of fine grained sand, silts and clays. Bore yields are generally low to moderate and suitable only for stock or small scale irrigation.

River flows

There are currently 10 active gauges within the Hastings and Camden Haven catchments that monitor stream flows on a daily basis (Table 3). Some of 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.

The longest running gauge is on the Hastings River at Ellenborough which began operating in 1945. Data for the Camden Haven gauges is discontinuous with large gaps in the 1980s and 1990s when the gauges were not operational.

Average annual flow in the Hastings River varies from 131,000 ML at Mount Seaview in the upper catchment to 580,000 ML at Ellenborough in the middle of the catchment. The lowest annual flow recorded was in 2002 when 74,014 ML was recorded at Ellenborough. The highest annual flow occurred in 1967 when 1.6 million megalitres flowed past the gauge (Figure 4).

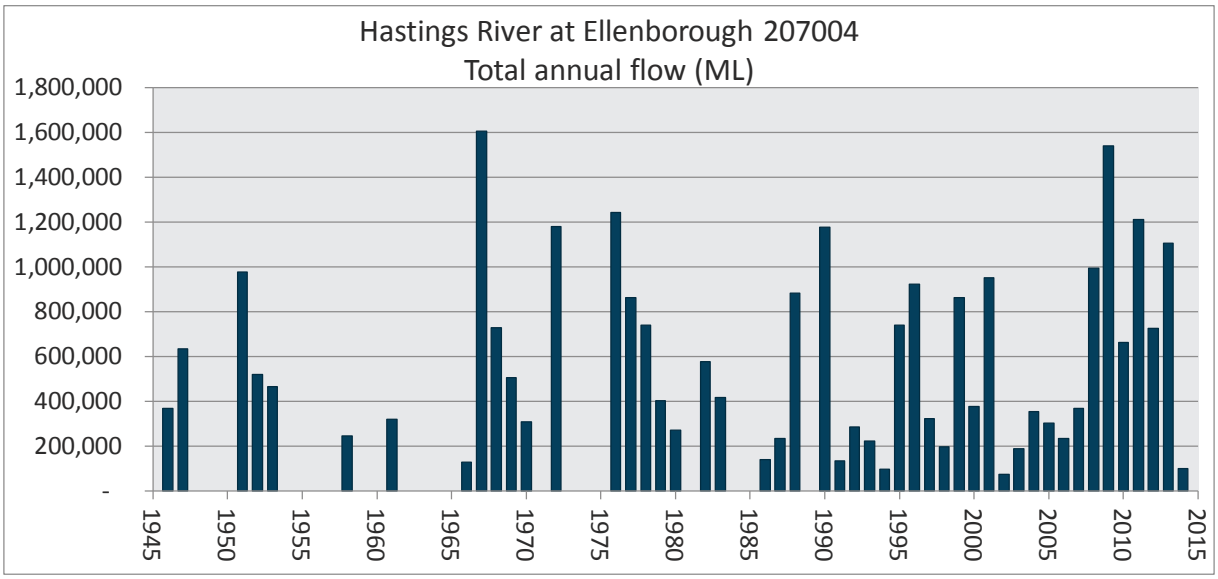
As the Hastings River is an unregulated catchment the pattern of river flows reflects the summer dominated rainfall of the region. The highest monthly flows occur from February to April with March being the month of highest flows. The lowest monthly flow occurs in September.

Table 3: Current river gauges in the Hastings catchment

Gauge	Location	Catchment area (km^2)	Mean Annual Flow (ML)	Year Commenced
Hastings River				
207004	Hastings River at Ellenborough	1610	580,740	1945
207006	Forbes River at Birdswood	363	184,172	1955
207013	Ellenborough River d/s Bunnoo River Junction	515	170,550	1975
207015	Hastings River at Mount Seaview	342	131,304	1984
207014	Wilson River at Avenel	505	222,351	1984
207010	Pappinbarra River at Beechwood	241	99,770	1997
207017	Mortons Creek at Mortons Creek Road	140	72,852	2010
Camden Haven River				
207009	Camden Haven River at Kendall	181	101,412	2007
207008	Stewarts River at Stewarts River	86	34,779	2007
207018	Throne River at Deep Creek Road	110	29,702	2011

Figure 4: Annual stream flows in the Hastings River at Ellenborough

Note: early record contains missing data so total flows not calculated for all years



Entitlement and water use

The granting of new licences on the Hastings River has been embargoed since 2007. Alluvial aquifers were embargoed in 2008.

At the commencement of the water sharing plan, approximately 401 water licences have been granted in the Hastings water sharing plan area, totalling 40,324.5 ML/yr of entitlement (Table 4). This entitlement is divided between unregulated surface water (37,653.5 ML/yr) and alluvial groundwater (2,270 ML/yr). The total entitlement represents approximately 7% of the average annual discharge of the Hastings River at Ellenborough.

These figures do not include possible extractions from the Hastings or Camden Haven tidal pools that are currently not licensed under the *Water Act 1912*. Under the WMA 2000, which takes effect when a water sharing plan commences, all works located in the tidal pool will need to be licensed. Given the salinity of these tidal pools it is unlikely that extraction of water occurs. However should any unlicensed works be identified, Department of Industry, Water will determine the associated history of use and establish whether a corresponding licence should be granted.

Table 4: Number of licences and total entitlement* for each water source at plan commencement

Water Source	Number of Licences	Unregulated	Domestic & Stock	Local Water Utility	Aquifer	Total
Camden Haven River	36	1,400	0	3,000	0	4,400
Coastal Hastings	16	375	4	0	0	379
Ellenborough River	37	980	3	0	0	983
Forbes River	3	87	0	0	0	87
Hastings River Coastal Floodplain	28	0	0	19	1,020	1,039
Kindee Creek	4	50	0	0	0	50
Lake Innes	1	52	3	0	0	55
Limeburners Creek	0	0	0	0	0	0
Maria River	5	201	0	0	0	201
Middle Hastings River	58	2,737	7	20,375	0	23,119
Mortons Creek	35	6,91.5	0	0	155	846.5
Pappinbarra River	36	1187	11	0	0	1198
Queens Lake	7	92	0	0	0	92
Stewarts River	37	1,894	0	0	39	1,933
Thone River	31	1,786	8	0	0	1,794
Upper Hastings River	14	384	0	32	0	416
Watson Taylors Lake	7	141	0	0	0	141
Wilson River	46	1,819	17	70	25	1,931
TOTAL	401	13,876.5	53	23,496	1239	38,664.5

* 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/year 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.

Water take in the unregulated river water sources

Several water sources within the plan area are of high economic significance due to community dependence on commercial water extraction. These are the Camden Haven, Coastal Hastings, Middle Hastings River, Stewarts River and Thone River water sources.

The majority of the unregulated surface water licences are located in the middle reaches of the catchment along the Hastings River, and on the nearby tributaries of Pappinbarra River, Mortons Creek, Ellenborough River and Thone River. In the Camden Haven EMU, most licences are located on Stewarts River and Camden Haven River.

Of the total surface water entitlement, 36% is for irrigation and 62% is for town water supply. The remainder is made up of small amounts of industrial, stock, domestic, farming and aquaculture. Long-term records of water use are not available in the Hastings River catchment as broad scale metering in unregulated catchments has not occurred.

Many water users within the plan area have been subject to voluntary restrictions and cease-to-take rules set by local water users' associations. These rules are listed in Table 5 and were considered as part of the process of determining access rules for these water sources.

Table 5: Existing water restrictions prior to plan development

Water source	Existing rules	Water User Association
Camden Haven River	Take restricted to 8 hours/day; CTP when no visible flow at Comboyne Road crossing or Upsalls Creek Road crossing.	Camden Haven WUA
Coastal Hastings	Progressive take restrictions (12,10,8 and 6 hours/day) between the 85th and 97th percentile flow; CTP at 20 ML/d in Hastings River at Ellenborough	Hastings River WUA
Ellenborough River	Take restricted to 8 hours/day at 15 ML/d; CTP at 6 ML/d in the Ellenborough River d/s Bunnoo Junction.	None
Forbes River	Take restricted to 8 hours/day at 13 ML/d; CTP at 9 ML/d in the Forbes River at Birdwood	None
Kindee Creek	Take restricted to 8 hours/day; CTP when no visible flow at Pipeclay Road crossing.	Kindee Creek WUA
Middle Hastings River	Progressive take restrictions (12,10,8 and 6 hours/day) between the 85th and 97th percentile flow; CTP at 20 ML/d in Hastings River at Ellenborough	Hastings River WUA
Morton Creek	Take restricted to 8 hours/day on alternate days; CTP when no visible flow below Mortons Creek Road crossing or below Slippery Creek.	Morton Creek WUA
Pappinbarra River	CTP at 2 ML/d	Pappinbarra River WUA
Stewarts River	Take restricted to 8 hours/day on alternate days; CTP when no visible flow at Hannam Vale Road crossing or Jerusalem Road crossing.	Stewarts River WUA
Thone River	Take restricted to 9 hours/day; CTP when no visible flow at Bagnoo Road crossing.	Thone River WUA
Upper Hastings River	Progressive take restrictions (12,10,8 and 6 hours/day) between the 85th and 97th percentile flow; CTP at 20 ML/d in Hastings River at Ellenborough	Hastings River WUA
Wilson River	Take restricted to 12 hours/day on alternate days at 12 ML/d; CTP at 4 ML/d in the Wilson River at Avenel.	Wilson River WUA

Water extraction in the alluvium

Most of the upriver alluvial entitlement is found within the Mortons Creek, Wilsons River and Queens Lake water sources. Water users extracting from upriver alluvium are managed according to the water access rules that apply to surface water users within each water source. Water users accessing water from coastal floodplain alluvium are managed according to the water access rules that apply to the Hastings River Coastal Floodplain Alluvial Groundwater Source.

The majority of groundwater is used for stock watering, domestic use and small-scale irrigation. Although domestic and stock bores need to be approved, 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 due to the absence of metering in these water sources. The NSW government is exploring this matter through the Water Use Monitoring Program.

Local water utility requirements

Port Macquarie-Hastings Council operates the Hastings District Water Supply scheme which comprises a bulk water supply system and five local water supply schemes. Infrastructure includes two off-river storage dams, 19 pumping stations, 37 storage reservoirs, one fluoridation plant and four water treatment plants. Council holds 23,477 ML of entitlement for extraction from the Hastings River, Camden Haven River, Throne River and Wilsons River.

Approximately 94% of the permanent population is connected to town water, including residential, business and industrial customers. Tourism significantly increases peak water demands over the Christmas holiday period. In 2013-14 the metered consumption was 5,618 ML.

The Hastings Bulk Water Supply Scheme includes the integrated bulk water supply pumping station, two off-creek storage dams and a distribution network to the towns of Wauchope, Port Macquarie and Camden Haven. Raw water is pumped from the Hastings River at Koree Island, five kilometres south-west of Wauchope. Three pumping stations divert up to 120 ML per day to nearby Rosewood Reservoir. The water is treated at Wauchope Water Treatment Plant, and fluoridation and chlorination occurs at Rosewood Reservoir. Water from the three reservoir tanks is gravity fed to off-creek storage dams at Port Macquarie (2,500 ML) and Cowarra (10,000 ML).

Council operates the following local water supply schemes:

- Port Macquarie–Camden Haven Water Supply Scheme is supplied with unfiltered, fluoridated water from Port Macquarie off-creek storage dam. The water is chlorinated and pumped to reservoirs within the Port Macquarie town area. The Camden Haven system is also supplied from the Port Macquarie off-creek storage via the highest reservoir in Port Macquarie, Transit Hill Reservoir. From here a trunk main travels south distributing water to Lake Cathie, Bonny Hills and Camden Haven.
- Wauchope Water Supply Scheme serves the localities of Beechwood, Wauchope, King Creek and Sancrox and includes a 6 ML/d filtration plant and four storage reservoirs.
- Telegraph Point Water Supply Scheme services around 250 properties from the Wilsons River.
- Comboyne Water Supply Scheme services around 136 properties from the Thone River
- Long Flat Water Supply Scheme is sourced from the Hastings River and serves around 68 properties.

The process of developing the Hastings water sharing plan

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

- the State Interagency Panel
- the North Coast Working Group
- the North Coast Interagency Regional Panel.

The role of each of these panels is discussed below.

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

- the indicative rules generated by a risk and value classification (explained later in this section),
- the deliberations of the Working Group and the Regional Panel, and
- submissions from stakeholders during targeted consultation.

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 Regional Panel in finalising the water sharing plan.

This section describes the panels and briefly discusses the process of developing the Hastings 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.

State Interagency Panel

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

The State Interagency Panel is chaired by Department of Industry, Water and comprises representatives from Department of Industry Water, OEH, LLS (formerly catchment management authorities), and agriculture, fisheries and aquaculture specialists from DPI Agriculture and DPI Fisheries. Department of Industry Water is responsible for the overall project management.

North Coast Working Group

The North Coast Working Group (the Working Group) comprises a range of officers representing the various functions of Department of Industry, 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 (the Regional Panel) comprised representatives from Department of Industry Water, OEH, DPI Agriculture and DPI Fisheries. Appendix 3 lists the names of panel representatives and their areas of expertise, and also lists relevant colleagues who the panel had access to for technical and scientific information.

The key responsibilities of the Regional Panel were to:

- ensure water sharing rules are consistent with state policy
- review the water management units provided by Department of Industry, 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 Regional Panel used local knowledge and expertise in developing and recommending the water sharing rules through a consensus decision-making approach.

Water source classification method

In developing water sharing plans for unregulated rivers, Department of Industry, 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 Hastings 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 4. Following this review the Regional Panel decided that no change was required to any of the classifications.

The water source classifications (Appendix 5) were used to generate indicative access and trade rules, which provided the basis for deliberation and recommendation of draft water sharing rules.

Refining the indicative rules

Guided by the indicative access and trade rules, the Regional Panel used local knowledge and expertise to develop the access and trade rules for the draft water sharing plan. Where necessary the 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 management 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, many water users in the Hastings River catchment have willingly participated in water sharing arrangements through their local water users association. These existing water sharing arrangements, plus any licence restrictions in place as a result of Land Board hearings were examined by the Regional Panel 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 ascertain whether 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.

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 Hastings water sharing plan was held from 27 June to 5 August 2016 with the plan documents available for viewing at Port Macquarie, Laurieton and Wauchope public libraries and Comboyne Community Centre and Cafe. Licence holders were sent letters advising of the public exhibition period. One on one information sessions were held at Comboyne, Hannam Vale and Wauchope during the exhibition period. The objectives of the meetings were:

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

Fifteen written submissions were received from stakeholders including landholders, water users, environmental groups and Port Macquarie-Hastings Council. The main issues raised in the submissions related to the cease-to-take rules, environmental concerns, town water supply and the suitability of flow reference points. The Regional Panel considered all the issues raised in written submissions and those voiced at public consultation meetings. A summary of these issues and the resulting outcomes and decisions of the Panel are presented in Appendix 6.

Water sharing rules

The Hastings 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, and
- 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 take rules and total daily extraction limits that 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 take rules for each water source in the Hastings River catchment which are discussed in the section on daily flow rules. For water sources where cease to take 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 take of water from instream or off-river pools when the pool is less than full capacity.

Requirements for water

The water sharing plan establishes all of the licensed and unlicensed requirements for water within the Hastings River plan area.

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 Hastings water sharing plan:

- BLR estimated at 1,598 ML per year,
- domestic and stock access licences accounted for 354 ML of entitlement per year,
- local water utility access licences accounted for 23,477 ML of entitlement per year,
- unregulated river access licences accounted for 14,092.5 unit shares (a unit share is equivalent to 1 ML in years where 100% of entitlement is allowed to be extracted), and
- aquifer access licences accounted for 2,510 unit shares.

Managing extractions

The Hastings water sharing plan establishes long term average annual extraction limits (LTAAEL) to manage total take of water from surface water sources and alluvial groundwater in each of the EMUs.

The LTAAEL for the Camden Haven River Catchment EMU comprises:

- the number of share components in the Camden Haven EMU at plan commencement (6,567 ML/yr), plus
- an estimate of BLR in these water sources (235 ML/yr).

The LTAAEL for the Lake Innes Catchment EMU comprises:

- the number of share components in the Lake Innes water source at plan commencement (28 ML/yr), plus
- an estimate of BLR in this water source (18 ML/yr).

The LTAAEL for the Hastings River Catchment EMU comprises:

- the number of share components in the Hastings River Catchment EMU at plan commencement (32,797 ML/yr), plus
- an estimate of BLR in these water sources (1,345 ML/yr)

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. In any of the above EMUs 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 usually 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 (domestic) 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 and the full annual water allocation may not be taken in a water year.

This approach to managing long term extractions in the Hastings water sharing plan area is the standard approach for all unregulated rivers across NSW.

Granting new access licences

Consistent with the WMA 2000, the Hastings water sharing plan does not permit the granting of new unregulated river access licences. New commercial developments requiring water

must purchase licence shares from existing access licences in accordance with the dealing rules defined in the water sharing plan. The water sharing plan does however permit the granting of new access licences for Aboriginal cultural purposes and for Aboriginal community development on the installation of a river flow gauge and the establishment of daily flow classes.

Aboriginal community development access licences

In coastal catchments, Aboriginal community development licences[3] (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).

Applying the current policy on high flows 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. ACDLs are permitted in the following unregulated water sources provided a gauge is installed for monitoring:

- Coastal Hastings
- Kindee Creek
- Lakes Innes
- Queens Lake
- Watson Taylors Lake

ACDLs are also permitted from the Hastings River Coastal Floodplain Alluvial Groundwater Source up to a limit of 34 ML/year.

The restriction of ACDLs to high flows has been raised as a general issue across all water sharing plans. 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.

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

[3] 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. They cannot be traded and as such will remain in the Aboriginal community for the term of the licence.

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.

Flow classes and daily access rules

The water sharing rules for several water sources were revised from the indicative rules to address matters raised in submissions received during public exhibition. Specific changes included:

- Licence holders that demonstrate best practice water efficient irrigation in the Ellenborough River Water Source shall be subject to less restrictive access rules.
- Access rules established for the Middle Hastings River Water Source shall apply in the Coastal Hastings Tidal Pool Management Zone.

Final daily access rules

The final water access rules including flow classes, cease-to-take rules and the staged implementation approach are summarised in Table 6.

In addition to the cease to take rule, many of the water sources have a ‘commence to take’ rule, where typically take is restricted for 24 hours after flow have risen above the cease to take volume (very low flow class). For full details of the rules for each water source consult the water sharing plan.

For some water sources, the Regional Panel recommended that cease to take rules be implemented incrementally to provide water users time to adapt to the new rules. In these cases there are different access rules for years 1-5 of the plan and years 6-10 of the plan.

In water sources where the existing cease to take rule under the *Water Act 1912* was more stringent than the proposed rule, the existing access rule is generally adopted. This was based on the premise that with no change to current operations (retention of the current cease to take rule) there should be no adverse social or economic impact. In these circumstances the Regional Panel acknowledged that many of the existing cease to take rules had been negotiated by water users or stipulated as an outcome of Rural Land Board hearings, had been in place for a period of time, and considered to be adequately protecting values while providing certainty for water users.

Further information may also be found on individual rule summary sheets for the Hastings River plan area. The sheets are available on the https://www.industry.nsw.gov.au/water.

Table 6: Summary of access rules for the Hastings unregulated water sources

Water source	Flow classes	Access rules	Flow reference point
Camden Haven River	Year 1-5: Very low flow ≤1 ML/d A Class >1 ML/d	Year 1-5: Take is not permitted when flows are at or less than 1 ML/d. Take is restricted to 8 hours/day when flows are between 1-3 ML/d.	Camden Haven River at Kendall 207009
	Year 6-10: Very low flow ≤ 2 ML/d A Class >2 ML/d	Year 6-10: Take is not permitted when flows are at or less than 2 ML/d. Take is restricted to 8 hours/day when flows are between 2-3 ML/d.	
Ellenborough River	Year 1-5: Very low flow ≤ 10 ML/d A Class > 10 ML/d	Year 1-5: Take is not permitted when flows are at or less than 10 ML/d. Take is restricted to 8 hours/day when flows are between 10 and 26 ML/d.	Ellenborough River downstream of Bunnoo Road Junction 206013
	Year 6-10: Very low flow ≤ 15 ML/d A Class >15 ML/d	Year 6-10: Take is not permitted when flows are at or less than 15 ML/d. Pumping is restricted to 8 hours/day when flows are between 15 and 26 ML/d.	
Forbes River	Year 1-5: Very low flow ≤ 9 ML/d A Class > 9 ML/d	Year 1-5: Take is not permitted when flows are at or less than 9 ML/d. Take is restricted to 8 hours/day when flows are between 9 and 21 ML/d.	Forbes River at Birdwood 207006
	Year 6-10: Very low flow ≤ 13 ML/d A Class >13 ML/d	Year 6-10: Take is not permitted when flows are at or less than 13 ML/d. Take is restricted to 8 hours/day when flows are between 13 and 21 ML/d.	
Coastal Hastings and Middle Hastings River	Year 1-5: Very low flow ≤ 29 ML/d A Class > 29 ML/d	Year 1-5: Take is not permitted when flows are at or less than 29 ML/d. Take is restricted to 12 hours/day when flows are between 47 and 73 ML/d.	Hastings River at Ellenborough 207004
	Year 6-10: Very low flow ≤ 34 ML/d A Class >34 ML/d	Year 6-10: Take is not permitted when flows are at or less than 34 ML/d. Pumping is restricted to 8 hours/day when flows are between 47 and 34 ML/d.	
Mortons Creek	Very low flow ≤ 1 ML/d A Class 1-22 ML/d C Class >22 ML/d	Take is not permitted when flows are less than 1 ML/d.	Mortons Creek at Mortons Creek Road 207017
Pappinbarra River	Very low flow ≤ 1 ML/d A Class > 1ML/d	Take is not permitted when flows are at and less than 1 ML/d. Pumping is restricted to 12 hours/day when flows are between 1 and 5 ML/d.	Pappinbarra River at Beechwood Road 207010
Stewarts River	Very low flow ≤ 1 ML/d A Class > 1ML/d	Take is not permitted when flows are at or below 1 ML/d. Take is restricted to 10 hours/day when flows are between 1 and 5 ML/d.	Stewarts River at Stewarts River 207008

Water source	Flow classes	Access rules	Flow reference point
Thone River	Very low flow ≤ 2 ML/d A Class > 2 ML/d	Take is not permitted when flows are at or less than 2 ML/d. Take is restricted to 10 hours/day when flows are between 2 and 5 ML/d.	Throne River at Deep Creek Road 207018
Upper Hastings River	Year 1-5: Very low flow ≤ 29 ML/d A Class > 29 ML/d	Year 1-5: Take is not permitted when flows are at or less than 29 ML/d. Take is restricted to 12 hours/day when flows are between 47 and 73 ML/d.	Hastings River at Ellenborough 207004
	Year 6-10: Very low flow ≤ 34 ML/d A Class >34 ML/d	Year 6-10: Take is not permitted when flows are at or less than 34 ML/d. Take is restricted to 8 hours/day when flows are between 47 and 34 ML/d.	
Wilson River	Very low flow ≤ 4 ML/d A Class > 4 ML/d	Take is not permitted when flows are at or less than 4 ML/d. Take is restricted to 12 hours/day when flows are between 4 and 12 ML/d.	Wilson River at Avenel 207014
Coastal Hastings Kindee Creek Lake Innes Limeburners Creek Maria River Queens Lake Watson Taylors Lake	None	Take is not permitted when there is no visible flow at the pump site or when the water level of a natural pool is less than full capacity.	Pump site or natural pool

Access to very low flow

Water dependent activities that are considered critical to human needs or animal health are permitted access to very low flows. Licences with access to very low flows are listed in Schedule 2 of the plan. These activities 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, and
- cleaning of enclosures used for intensive animal production for the purposes of hygiene.

Alluvial licences

The Hastings water sharing plan establishes a 40 metre wide buffer zone along the river from the high bank. The plan establishes specific rules to aquifer licences that are located within this zone. The zone and the rules recognise the strong connectivity between groundwater and surface water in the water source. Existing bores located within the 40 metre buffer zone are subject 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 (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 licensees adjust to the new access rules.

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 orders of the Minister.

Water supply works approvals

Approvals are required under the *Water Management Act 2000* for water supply works. Water supply works are works that take, capture, store, convey, divert or impound water, and include yet not limited to dams, pumps, bores, tanks, pipes, irrigation channels, weirs, banks and levees. The Hastings River plan includes rules that apply to approvals of certain water supply works.

Construction of dams

Following state-wide policy, the Hastings water sharing plan prohibits the construction of instream dams in the following water sources which have been assessed to have high instream values:

- Camden Haven River,
- Ellenborough River,
- Forbes River,
- Lake Innes,
- Limeburners Creek,
- Pappinbarra River,
- Upper Hastings River, and
- Wilson River.

In river dams are permitted in all other water sources on third order streams only.

Construction of bores in alluvial aquifers

The Hastings River water sharing plan establishes distances that new bores are permitted from streams, other bores, groundwater dependent ecosystems (GDEs) and cultural sites. These distances are based on distances established in state-wide policy.

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

- 200 metres of an approved water supply bore nominated by another access licence,
- 200 metres of an approved water supply bore from which BLR is being extracted,
- 100 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, and
- 100 metres from a Department observation or monitoring bore.

These restrictions do not apply if the new bore is solely for accessing BLR, replaces an existing groundwater bore, or is for the purpose of monitoring or environmental management. 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 ground dependent ecosystems (GDE). These ecosystems are identified on the maps in Appendix 3 of the water sharing plan. The plan states that no new works will be approved:

- within 100 metres of a GDE for bores that supply BLR,
- within 400 metres of a GDE for new water access licences with a volume of 20 ML or less, and
- within 800 metres of a GDE for new water access licences with a volume of 100 ML or more.

These restrictions do not apply if a hydrologic assessment is undertaken that demonstrates that the impacts of drawdown will be minimal at the perimeter of those high priority GDEs identified on the maps.

Groundwater-dependent culturally significant sites are currently under investigation by DPI Water and may be identified during the term of this Plan. Water supply works must not be constructed:

- within 100 metres of a groundwater-dependent culturally significant site for bores that supply BLR, and
- within 200 metres of a groundwater-dependent culturally significant site for any access licence.

Dealing rules

Dealing rules (rules governing the trading of licence shares and water allocations) serve 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 licence shares and water allocations within a water sharing plan area needs to maximise the flexibility water users have in applying water to its highest value use without adverse impacts on water sources or existing water users.

The water sharing plan prohibits trade into six water sources and permits trade into 12 water sources up to a specified level of entitlement (Table 7). Trades within water sources are permitted generally subject to assessment.

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, and
- are not permitted to be converted to surface water licences.

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

Table 7: Summary of water dealing rules

Water source	Dealing rule	Justification
Camden Haven	Trade into water source permitted provided there is no net increase in shares	High hydrologic stress and high dependence on irrigation
Coastal Hastings	Trade into water source permitted up to a limit of 50% of entitlement at start of the plan.	Estuarine water source with low flow sensitivity. No gauge so limit defined by total entitlement
Ellenborough River	Trade into water source not permitted	High instream value
Forbes River	Trade into water source not permitted	High instream value
Kindee Creek	Trade into water source permitted provided there is no net increase in shares	High hydrologic stress
Lake Innes	Trade into water source permitted up to a limit of 100% of entitlement at the start of the plan.	Low hydrologic stress; No gauge so limit defined by total entitlement.
Limeburners Creek	Trade into water source not permitted	High instream value and high sensitivity to extraction at low flows
Maria River	Trade into water source permitted to a limit of 116 licence shares	Low hydrologic stress but medium instream value; no gauge.
Middle Hastings River	Trade into water source permitted provided there is no net increase in shares.	High hydrologic stress
Mortons Creek	Trade into water source permitted provided there is no net increase in shares	High hydrologic stress
Pappinbarra River	Trade into water source not permitted	High instream value and high hydrologic stress
Queens Lake	Permitted from other water sources within the EMU to a limit of 90 ML	Low hydrologic stress
Stewarts River	Trade into water source permitted provided there is no net increase in shares	High hydrologic stress
Throne River	Trade into water source permitted provided there is no net increase in shares	High hydrologic stress
Upper Hastings River	Trade into water source permitted only from upstream water sources (Kindee Creek, Ellenborough River and Forbes River)	High instream value but low hydrologic stress. Trade from upstream unlikely to alter overall hydrologic stress.

Water source	Dealing rule	Justification
Watson Taylors Lake	Trade into water source permitted only from upstream water sources (Camden Haven and Stewarts River) to an additional 360 licence shares	Trade from upstream unlikely to alter overall hydrologic stress.
Wilson River	Trade into water source not permitted	High instream values and high hydrologic stress
Hastings River Coastal Floodplain Alluvial Groundwater	Trade into water source not permitted	Not permitted under *Access Licence Dealing Principles Order 2002* as no hydrologic connection

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 Hastings 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 Hastings 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 Hastings water sharing plan includes a number of specified amendments that may be made to the plan during the term of the plan. 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 in which applications for approvals for dams on third order streams or higher will not be granted,
- amending requirements for metering or the keeping of records in relation to licensed access works,
- updating of or deletion of information in Schedules,
- amending access and trading rules for the protection of water-dependent Aboriginal cultural assets; should they be identified?

The plan may be amended to decrease the amount of the long-term average annual rainfall recharge in the Hastings River Coastal Floodplain Alluvial Groundwater Source that is reserved as planned environmental water as a result of recharge studies or increases to the LTAAEL for the groundwater source. Planned environmental water may be reduced to no less than 75% of the rainfall recharge in areas that are not high environmental value areas.

The plan allows for modification of the LTAAEL up to a limit of 3,269 ML/year for the groundwater source as a result of recharge studies or new socio-economic information. The plan also allows for variation to the LTAAEL following the surrender and cancellation of an access licence within the groundwater source.

The plan may be amended to allow for Aboriginal community development access licences in the following water sources following installation of river flow gauges and determination of total number of share components to be permitted:

- Coastal Hastings Water Source,
- Kindee Creek Water Source,
- Lake Innes Water Source,
- Queens Lake Water Source,
- Watson Taylors Lake Water Source.

Monitoring, evaluation and reporting

Department of Industry, Water has developed a Monitoring, Evaluation and Reporting Framework in collaboration with key stakeholders. The framework conforms to NSW and Commonwealth government guidelines for monitoring, evaluation and reporting, and demonstrates an adaptive management approach to water planning required under the principles of the WMA 2000. The evaluation framework aims to inform the community of the outcomes of water sharing plans, and to collate the results of various legislatively required evaluations and relevant knowledge to inform the review of the water sharing plans. The framework will assess the inputs, outputs and outcomes of the water sharing plans and their operations. The assessment will consider:

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

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

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

Performance indicators

Part 2 of the water sharing plan includes a number of standard performance indicators that will be monitored during the term of the plan. The performance indicators identify monitoring that will be undertaken for specific issues in key water sources. The procedure for monitoring each indicator may change over the term of the plan as improved methods are developed.

In order to assess performance indicators, Department of Industry, Water has established an Environmental Flows Monitoring and Modelling program. The program is designed to facilitate the transferability of environmental flow studies between water sources and to develop generic relationships between flow, hydraulics and ecological responses. This should 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 Industry must appoint an Audit Panel to undertake this review.

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

The audit shall focus on the extent to which the provisions of 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 Department of Industry through its monitoring and evaluation process).

When conducting an audit the panel will review a range of analysis and material provided by Department of Industry, Water, including but not limited 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 a water sharing plan's ten year term the Minister may, on the recommendation of 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 changes are proposed, a replacement water sharing plan shall be prepared.

Before the Minister decides to either extend or replace an existing plan, consideration must be given to

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

Under the WMA 2000, a water sharing plan may be extended for 12 months beyond the expiry date of the plan to allow for the preparation of a replacement plan.

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.

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, 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: Take 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 flow gauge that measures river flows for the purposes of signalling which flow class observed river flow on any one day falls within and in turn which daily access rule (cease to take, commence to take, total daily extraction limits for example) applies on any one day during the term of 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 Earth's surface that has filtered down to the zone where earth or rock is 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 on take of water that may apply to an individual licence 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 during periods of drought and low flow. Instream biota will migrate to these more permanent habitats.

Long-term average annual extraction limit (LTAAEL): The long term annual limit on total water taken pursuant to all water access licences and an estimate of BLR requirements within an EMU. The limit is normally established as either the sum of total licence shares plus an estimate of BLR requirements or the estimated annual total water take pursuant to water access licences averaged over a specified period under given development conditions plus an estimate of BLR requirements.

Macro water sharing plans: Plans which apply to a number of water sources across catchments or different types of aquifer. 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-take' 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 WMA 2000, except for tidal pools and estuaries.

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

Total daily extraction limit (TDEL): The total limit on the volume of water that may be taken on any one day pursuant to all access licences. TDELs may be assigned to individual licences as individual daily extraction limits.

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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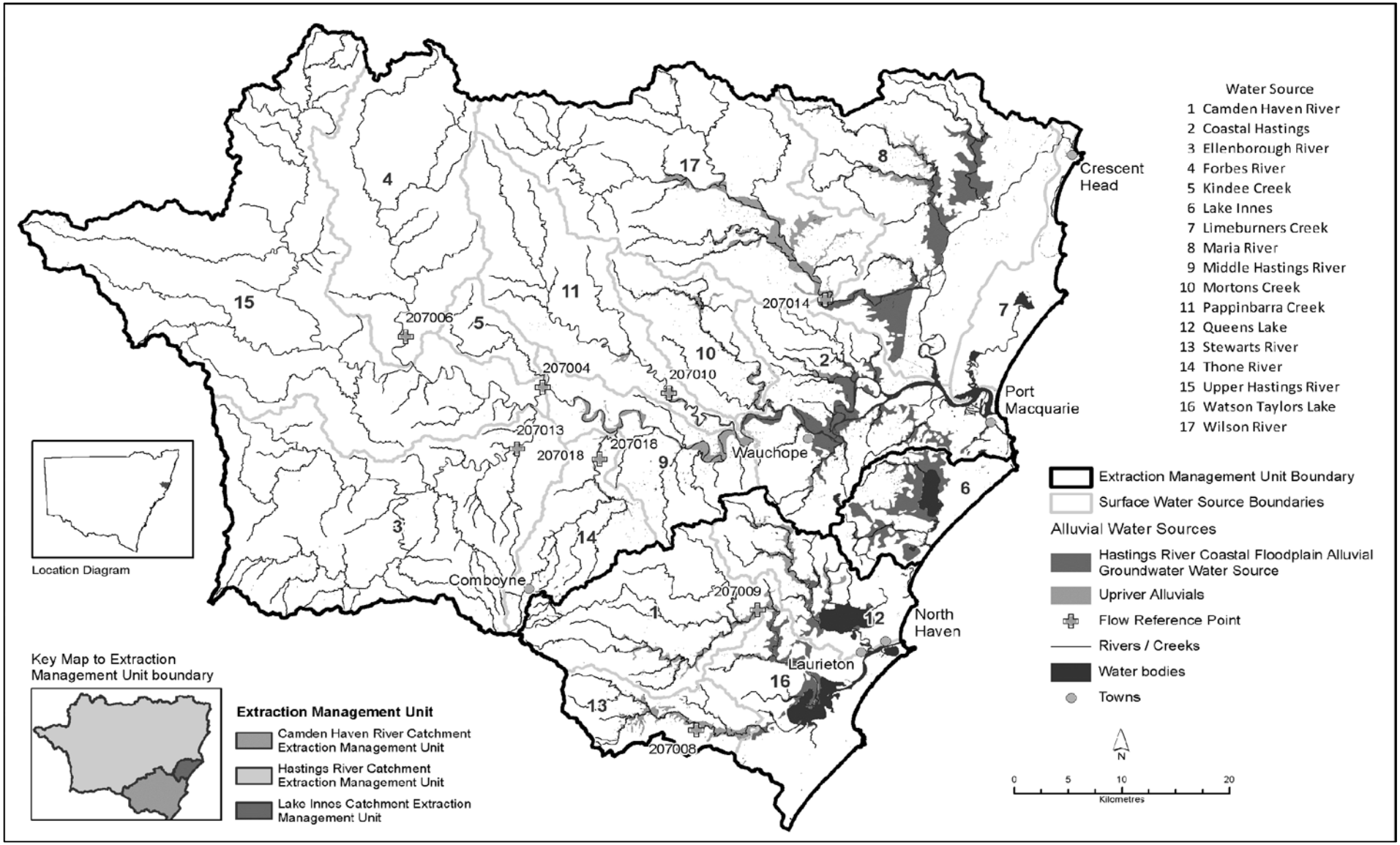
Appendices

Appendix 1: Water sharing plan map



Appendix 2: 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. 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 8 shows threatened species that are known (K) or expected (E) to occur in the 17 unregulated water sources.

Table 8: Threatened species and other environmental values known or expected to occur in the Hastings unregulated water sources

Threatened frog species	Camden Haven River	Coastal Hastings	Ellenborough River	Forbes River	Kindee Creek	Lake Innes	Limeburners Creek	Maria River	Middle Hastings River	Mortons Creek	Pappinbarra River	Queens Lake	Stewarts River	Throne River	Upper Hastings River	Watson Taylors Lake	Wilson River
Booroolong Frog			K	K	E						E				E		K
Davies Tree Frog			K	K							K				K		
Giant Barred Frog	E	K	E	K	E	E	E	E	E	K	K	E	K	E	K	K	K
Glandular Frog	E		E	E	E					E	E		E	E	K		E
Green and Golden Bell Frog		K				K	K	E				E				K	K
Green-thighed Frog	E	K	E	E	E	K	E	K	E	E	E	K	E	K	E	E	K
Sphagnum Frog			K	K						K	K				K		K
Stuttering Frog	K		K	K	E	E		E	E	E	K	E	K	E	K	K	K
Wallum Froglet	E	K	E	E		K	K	E	E	E	E	K	E		E	K	E

Threatened bird species	Camden Haven River	Coastal Hastings	Ellenborough River	Forbes River	Kindee Creek	Lake Innes	Limeburners Creek	Maria River	Middle Hastings River	Mortons Creek	Pappinbarra River	Queens Lake	Stewarts River	Throne River	Upper Hastings River	Watson Taylors Lake	Wilson River
Australasian Bittern						K	K	K			K	K		K		K	
Beach Stone-curlew		K															
Black bittern	E	K	E	E	E	E	K	E	E	E	E	E	E	E	E	K	E
Black-necked Stork	K	K				K	K	K	E	K	K	K	K	K	K	K	K
Blue-billed Duck		K				K	K										
Brolga		K						K		K							
Comb-crested Jacana		K					K	K									K
Freckled Duck		K															
Great Knot		K															
Greater Sand Plover		K															
Lesser Sand Plover		K				K	K							K			
Mangrove Honeyeater		K				E	E	E				E					E
Osprey		K				K	K	K				K	E		K	K	E
Sanderling		K															
Terek Sandpiper		K															

Other threatened species	Camden Haven River	Coastal Hastings	Ellenborough River	Forbes River	Kindee Creek	Lake Innes	Limeburners Creek	Maria River	Middle Hastings River	Mortons Creek	Pappinbarra River	Queens Lake	Stewarts River	Throne River	Upper Hastings River	Watson Taylors Lake	Wilson River
Large-footed Myotis	K	K	K			K	K						K		K		K
Wet flora species																	
Arthropteris palisotii			K	K													
Maundia triglochinoides		K															
Phaius australis						K											
Tangled bedstraw									K								
Declared locations																	
World Heritage Area				K											K		
Declared Wilderness Area				K											K		K

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 3: Interagency Reference Panel and support staff

Table 9: North Coast Regional Panel-membership and expertise

Name	Agency	Role	Expertise
Rik Whitehead	DPI Agriculture	Agency representative	Knowledge of local and statewide water planning issues
Marcus Riches	DPI Fisheries	Agency representative	Aquatic ecology and knowledge of flow requirements of specific fish species
David Miller	DPI Water	Agency representative	Knowledge of local and statewide water planning issues
Toong Chin	Office of Environment and Heritage	Agency representative	Knowledge of local and statewide water planning issues

Table 10: Support staff membership and expertise

Name	Agency	Role	Expertise
Stephen Allen	Department of Industry Water	Plan coordination	
Peter Hackett	WaterNSW	Water licensing	Licensing knowledge, local knowledge of catchment and water management issues
Chris Rumph	DPI Water	Hydrogeology	
Malcolm Fernance	DPI Water	Plan coordination	
Frances Guest	Department of Industry Water	Plan writer	

Appendix 4: Reference information used by Interagency Reference Panel

DPI Water data sets

- Licensing Administrator System – the DPI Water statewide database holding the licence details including volume of entitlement, location details and stream orders.
- Hydstra – Hydstra is a DPI Water database that holds all flow data.
- Regional Groundwater Monitoring Network – 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 – 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 Fisheries.
- 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 – statewide flora and fauna database
- NSW DPI Fisheries modelled data sets (Fish Community Index, Fish Community Vulnerability).
- NSW DPI Fisheries freshwater and saltwater recreational fishing database.

Appendix 5: Final classification summary

Table 11: 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** Ellenborough River Forbes River Lake Innes Upper Hastings River Limeburners Creek *	**b**	**c** Pappinbarra River Wilson River
Medium Instream Values	**d** Maria River Queens Lake	**e**	**f** Coastal Hastings * Camden Haven River Kindee Creek Middle Hastings River Mortons Creek Stewarts River Throne River Watson Taylors Lake
Low Instream Values	**g**	**h**	**i**

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

Table 12: 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** Limeburners Creek *	**B** Pappinbarra River Wilson River	**C** Camden Haven River Middle Hastings River Stewarts River
Medium Risk to Instream Values	**D** Queens Lake *	**E** Kindee Creek Mortons Creek	**F** Throne River Coastal Hastings *
Low Risk to Instream Values	**G** Forbes River Lake Innes Maria River Upper Hastings River Watson Taylors Lake *	**H** Ellenborough River	**I**

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

Appendix 6: Summary of submissions received on the draft plan

Issue	Concerns raised	Outcomes and decisions
Cease to take rule for Camden Haven River	Submission requested that cease to take rule whilst being practical should be more lenient	North Coast Interagency Regional Panel (Panel) considers that the rule is a continuation of the existing rules and resolved to retain the rule.
Cease to take rule for Ellenborough River	Submission requested that cease to take rule needs to be flexible to allow take of very low flows during critical plant watering times.	North Coast IRP resolved to introduce a dual cease to take level which would permit licencees who demonstrate efficient irrigation practices.
Cease to take rule for Limeburners Creek	Submission stated that proposed cease to take (visible flow rule at the pump site) does not provide adequate environmental protection.	Panel resolved to adopt rule proposed since licences have not been granted in the water source, and trade rules do not permit trade into the water source.
Cease to take rule for lagoons in Mortons Creek and Middle Hastings River water sources	Submission stated that proposed pool rule (cease to take when pool falls below full capacity) is not practical as lagoon is disconnected to river flows.	Panel resolved to allow licencees on lagoons to demonstrate commercial water take by year three, thereupon DPI Water shall determine a suitable cease to take rule that applies to licensed take from lagoons.
Cease to take rule for Stewarts River	Submission stated that proposed cease to take would have an unreasonable impact on irrigation operations.	Panel resolved to retain 1 ML cease to take rule since this volume would provide sufficient water for riparian vegetation and domestic and stock watering and also since the gauge only records to the closest integer.
Cease to take rule for Thone River	Submissions stated that cease to take rule proposed would have significant impact on irrigation operations.	Panel resolved to adopt the cease to take proposed during public exhibition since it protects volume flows necessary to provide minimum protection of fundamental ecosystem health.
Cease to take rule for Wilson River Water Source	Submission stated that cease to take rule proposed would not provide connection between pools and therefore not maintain fundamental ecosystem health.	Panel resolved to adopt rule proposed during public exhibition since the reach of the river that is subject to licenced take has been degraded by sand and gravel extraction, and that 4 ML is the 86th percentile for the critical month of November, which is less restrictive than the minimum indicative rule of 95th percentile.
Applications for Aboriginal community development licences	Aboriginal peoples raised concerns that limited opportunity for applications.	Panel resolved to allow granting of Aboriginal community development licences in a number of water sources.
High flow conversions	Submissions requested opportunity to convert to high flow licences.	Panel resolved to provide opportunities in Thone and Wilson River water sources.